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THE DEPARTMENT OF THE INTERIOR'S FINAL LIST OF CRITICAL MINERALS FOR 2018 AND OPPORTUNITIES TO STRENGTHEN THE UNITED STATES' MINERAL SECURITY

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED FIFTEENTH CONGRESS

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THE DEPARTMENT OF THE INTERIOR'S FINAL LIST OF CRITICAL MINERALS FOR 2018 AND OPPORTUNITIES TO STRENGTHEN THE UNITED STATES' MINERAL SECURITY

TUESDAY, JULY 17, 2018

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The Committee met, pursuant to notice, at 10:03 a.m. in Room SD–366, Dirksen Senate Office Building, Hon. Lisa Murkowski, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

The CHAIRMAN. Good morning, everyone. The Committee will come to order.

We are here today to discuss our nation's mineral security or, as I note, the continued lack of mineral security in this country. This is not a new issue for us. In fact, this is actually the fifth hearing that we have held on this subject in almost as many years.

I think, Senator Wyden, you will recall, we have been talking about this for a while. While we continue to discuss it, the United States' dependence on foreign minerals has continued to increase. Last year our nation imported 100 percent of our supply of 21 minerals and at least 50 percent of 50 minerals. So to, kind of, put that in perspective, in 1997 we imported 100 percent of 11 minerals and at least 50 percent of 26 minerals. We have just about doubled our dependence in the past two decades alone.

These trends were ignored for a long time, but I think we are finally starting to see some positive efforts to reverse the tide. Last December, the President took a significant step by issuing an Executive Order that directed multiple departments to develop a strategy to reduce our foreign dependence. The first piece of that order directed the Department of the Interior (DOI) to develop a list of "critical minerals." Secretary Zinke published that first annual list back in May. It includes 35 minerals deemed to be critical because of their economic importance, but vulnerable to potential supply disruptions. I am pleased the Secretary and his team at the U.S. Geological Survey (USGS) put that list out for us.

As members of Congress, we also have an opportunity to pass legislation to address this growing vulnerability. I want to thank those Senators who co-sponsored and supported my recent amendment to the NDAA. We were not able to add it to the bill on a

unanimous basis, but I am certainly continuing to encourage the NDAA conferees to retain language to boost our mineral security.

This hearing and our opportunity with NDAA are particularly timely based on what is happening with international trade. A few years back, China chose to cut off Japan's supply of rare earth elements. At that time, the U.S. had a small supply from the Mountain Pass Mine in California, but it only produced certain rare earths. It has since closed, so we don't even have that as a safety net anymore.

My concern is if China ultimately responds to tariffs by restricting our supply of rare earths, or any number of other minerals, the U.S. could be in serious trouble.

We have heard testimony in the past about the dangers of the concentration of supply from a handful of countries that control the supply chain. I am hopeful that we are not about to experience those dangers firsthand and will continue to urge action to reduce this significant vulnerability.

That is really what this is all about, a serious but, I think, needless vulnerability. Our mineral security does not have to be at rock bottom. Many parts of our country, including Alaska, are rich in mineral resources. What we lack is a sense of urgency to ensure that our policies promote their responsible production. We have to get away from this "immaculate conception" theory of your iPhone, fighter jets, solar panels, all these things just happen, they just appear out of thin air. We have to acknowledge the fact that many of the materials that are used to make them actually come from the ground. We have to dig them up, and that is an inconvenient truth for some.

I recognize that some are reluctant to address the main driver of this problem, and I look to our broken federal permitting system. But I believe that we can make some improvements, that we have to make improvements, and we must do this all while we are protecting the environment.

The U.S. has the highest safety standards for mining anywhere in the world. We have the experience. We have the expertise to do it right. We need to work on our workforce. We also live in a world where permitting delays and litigation deter investment in our country, so we want to speak to that.

We have a very distinguished panel with us this morning to help us understand the latest trends and what we can do about them. We will hear from technical experts from the USGS and the Critical Materials Institute who are following markets and working to develop alternatives to the many minerals, which is an important part of the conversation is, what else is out there. We will also hear from companies who want to produce minerals in states that strongly support their efforts. And we will hear from material manufacturers who take minerals and turn them into alloys for medical imaging equipment, defense applications, and more.

So I thank you all for being here. Some days, I feel like this is Groundhog Day all over again, we are back again, we are talking about the same thing.

Perhaps that is just the role of this Committee. We will continue to push on it, because it is an issue that deserves, demands the attention and the focus that this Committee is giving it.

With that, I turn to my friend from Oregon, Senator Wyden. It is good to have you back here.

STATEMENT OF HON. RON WYDEN,
U.S. SENATOR FROM OREGON

Senator WYDEN. Thank you, Madam Chair, and I very much appreciate your holding this hearing. I think we both know that reminiscing around here can just be insufferable.

I do just briefly want to note that you and I have a history on this topic. When I was Chair, we held a hearing to discuss our comprehensive, bipartisan bill, the Murkowski-Wyden Critical Minerals Policy Act. That bill was smart minerals policy because it demonstrated that efficient, predictable management of U.S. mineral supplies and protecting America's land and water are not mutually exclusive. That bill showed it is possible to do both.

Now today's hearing is especially important because, in my view, the President has embarked on an about-face on both fronts. The Trump Administration is now promoting an unfair policy on tariffs that means that because of his approach with respect to tariffs on critical minerals, U.S. companies will be needlessly hurt in their ability to compete. This is going on while simultaneously there is an effort to gut the environmental laws. That is a real combination. Hurting family-wage jobs and clean air and water is, in my view, foolish even by Washington, DC, beltway standards. Here's why: The U.S. imports most of these key minerals, including 100 percent of rare earth metals. The imports come mostly from China. Critical minerals are at the heart of technologies like solar cells, wind turbines and batteries that are moving our country to a more efficient, lower carbon energy future. They are essential to creating more red, white and blue jobs as the clean energy economy already supports 6.4 million jobs across the country.

Now, as the Chair just noted, it is especially important this morning to also talk about trade issues. As the Ranking Democrat on the Senate Finance Committee with jurisdiction over trade, my trade philosophy has been really simple. Make it in America, grow it in America, add value to it in America, and then ship it somewhere. One sentence.

Instead of that kind of approach, which means you have to have a level playing field for our red, white and blue manufacturers, the President is now taking a bad situation and making it worse. Our manufacturers are already heavily dependent on Chinese supplies and China has made it difficult for them to obtain raw materials. Now the President wishes to make it even harder for U.S. manufacturers with a flawed tariff approach that would impose new U.S. tariffs on the raw materials import, making it yet more expensive and potentially prohibitive for U.S. tech manufacturers to make products here at home.

In 2010, China tried to restrict the export of critical rare earth minerals, causing both price spikes and supply shortages across the tech sector. The United States successfully challenged China before the World Trade Organization and we were able to restore a measure of stability in the market. But now, thanks to the Trump Administration, U.S. manufacturers that depend on China for these and other critical materials are once again in great jeopardy.

To basically have that trade policy that I just outlined, growing things here, making things here, American manufacturers have to have access to critical minerals. The President's trade strategy is almost impossible to determine, but what I know for sure is that we get a daily dose of trade chaos and that kind of chaos, particularly here, threatens access to minerals, and it will be American workers and American companies who suffer for it.

Our country has come a long way in efficiently locating, extracting, processing and using critical minerals. And I want to come back, just as we wrap up because I see Senator Manchin is here. I enjoyed going to West Virginia and talking about energy policy with him.

Colleagues, this does not have to be an either/or choice. Making sure we have markets for our companies while not harming our land, air and water—those things are not mutually exclusive. We can have smart policies that do both.

I think I remember, Mr. Eggert, we talked about this already once here in this Committee.

I am very much in favor, as I know the Chair is, of developing domestic supplies of rare earth and critical minerals. The two of us showed, back in 2013, how to go about doing it. We also called for a review of federal hard rock mining regulations and permitting, which the Chair noted, and leasing procedures.

I really look forward to this morning's discussion. We should not have to wait another six years to come out with the kind of smart policy that I thought the Chair and I were striving for back in 2013.

Madam Chair, thank you and I look forward to tackling this issue, and I know a number of others do, with you.

The CHAIRMAN. Senator Wyden, thank you and thanks for, kind of, outlining some of the history there. You have reiterated that there has been a multiyear effort to direct a focus on this as a problem, recognizing that there is a level of urgency. When there are other policies that then come on top of what we might be seeking to do, that conflict and confound it, we have our work cut out for us.

Senator WYDEN. Sounds like a law firm, conflict and confound.

The CHAIRMAN. Conflict and confound, yes. I am not going there.

[Laughter.]

I want to welcome our panel this morning. I think we recognize that we have a good group to help educate us further on these issues, so I welcome each of you.

I would ask you to try to keep your comments to about five minutes. Your full statements will be included as part of the record.

I do believe that we have a couple votes that are scheduled around 11:45 or noon, so we will be on the lookout for that. We are going to try to get through all of your opening statements and all of our questions.

We are joined this morning by Dr. Steven Fortier. He is the Director at the National Minerals Information Center at USGS. We are pleased to have you here this morning.

As Senator Wyden has noted, Dr. Eggert has been with us before. He is with the Viola Vestal Coulter Foundation. He is the

Chair in Mineral Economics at the Colorado School of Mines and the Deputy Director for the Critical Materials Institute.

Mr. Jim Sims is the Vice President for External Affairs at Nio Corporation Developments Limited. We are pleased to have you.

Aaron Mintzes is the Senior Policy Counsel at Earthworks. We welcome you.

Ms. Laurel Sayer is the President and CEO for Midas Gold Idaho. Welcome.

And Mr. Greg Gregory is the President for Materion Natural Resources Incorporated.

We are pleased to have all of you with us this morning.

Dr. Fortier, if you would like to lead off the panel?

Again, thank you.

STATEMENT OF DR. STEVEN M. FORTIER, DIRECTOR, NATIONAL MINERALS INFORMATION CENTER, U.S. GEOLOGICAL SURVEY, U.S. DEPARTMENT OF THE INTERIOR

Dr. FORTIER. Good morning, Chairman Murkowski, Ranking, or Senator Wyden and members of the Committee.

Thank you for the opportunity to discuss the U.S. Geological Survey's efforts related to critical minerals.

The U.S. Geological Survey conducts scientific research on minerals, assesses subsurface mineral resources in geological deposits and provides statistics on the worldwide supply and demand for minerals commodities essential to the U.S. economy and national security.

USGS data show that domestic and global demand for mineral commodities continues to increase. An increasingly broad range of mineral commodities is used in consumer and national security applications, especially those involving advanced technologies.

While the United States remains a major mineral producer with an estimated total of non-fuel mineral resources of $75.2 billion in 2017, our country is increasingly reliant on foreign sources for many sources of raw and processed mineral materials.

As the Chair noted, in 2017 the U.S. was 100 percent import reliant for 21 mineral commodities and at least 50 percent import reliant for 50 mineral commodities. This dependency of the United States on foreign sources creates the potential for strategic vulnerabilities for our economic and national security interests as a result of adverse foreign government actions, natural disasters or other events that can disrupt supply of important minerals.

On September 20, 2017, President Trump issued Executive Order 13817, a federal strategy to ensure secure and reliable supplies of critical minerals. The Executive Order directed the Federal Government to deliver an interagency report to include: (1) a strategy to reduce the nation's reliance on critical minerals; (2) an assessment of progress toward developing critical minerals recycling and reprocessing technologies and technological alternatives to critical minerals; (3) options for accessing and developing critical minerals through investment and trade with our allies and partners; (4) a plan to improve the topographic, geologic and geophysical mapping of the United States; and (5) recommendations to streamline permitting and review processes related to critical minerals.

The Executive Order directed the Secretary of the Interior, in coordination with the Department of Defense (DoD) and in consultation with other Executive Branch agencies, to produce a list of critical minerals. The USGS, in coordination with the Bureau of Land Management and with broad federal interagency input, led the development of the critical minerals list.

The Secretary of Interior published a final list of 35 critical minerals in the Federal Register on May 18, 2018. This list was developed using multiple sources of data but started with a screening methodology developed by the National Science and Technology Council. Following this methodology, the U.S. applied two principle quantitative criteria to evaluate minerals for inclusion on the list of critical minerals: a quantitative metric to measure country concentration of production and a net import reliance metric which measures the extent to which the U.S. is dependent on other countries for its supply of the material. Both metrics are based on USGS data.

The list of critical minerals does not include a number of important minerals that are produced domestically in large quantities. The U.S. is not highly reliant on imports for these minerals and typically has a combination of domestic reserves and reliable foreign sources adequate to meet foreseeable domestic consumption requirements.

Pursuant to the Executive Order, the USGS is also leading development of a plan to greatly enhance the nation's understanding of its subsurface geological endowment of critical mineral resources. The plan would lead to the creation of a new generation of geological, geophysical and topographic maps based on the newest technologies in science. The analysis and interpretation of these new maps will also improve our understanding of groundwater resources, energy resources, geologic hazards and other societal needs.

Thank you for the opportunity to present on the important subject of critical minerals. We appreciate the strong engagement of Congress, other federal agencies and of the coordinating roles played by the White House Office of Science and Technology Policy, the Council on Environmental Quality and the National Economic Council.

I will be happy to answer any questions.

[The prepared statement of Dr. Fortier follows:]

Statement of Dr. Steven M. Fortier
Director, National Minerals Information Center
U.S. Geological Survey
before the
Senate Committee on Energy and Natural Resources
on
July 17, 2018

Good morning Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee, and thank you for the opportunity to discuss the U.S. Geological Survey's efforts related to critical minerals.

Background

The Department of the Interior manages one-fifth of the Nation's lands, as well as the Nation's offshore energy. These responsibilities include leasing and permitting activities for both onshore and offshore access to and development of the Nation's mineral resources, through the Bureau of Land Management (BLM) and the Bureau of Ocean Energy Management. The U.S. Geological Survey (USGS) conducts scientific research on how mineral resources form geologically, provides earth-science based assessments on the geologic potential for mineral commodity occurrences across the Nation and globe, and provides statistics on the worldwide supply, demand, consumption, and flow of mineral commodities essential to the Nation's economy and national security.

Reliance on Foreign Sources of Minerals

USGS data show that domestic and global demand for mineral commodities continues to increase.[1] An increasingly broad range of mineral commodities are used in consumer and national security applications , especially those involving advanced technologies. The United States remains a major mineral producer with an estimated total value of non-fuel mineral resources of $75.2 billion in 2017, and is a net exporter of 16 non-fuel mineral commodities. However, our country continues to rely on foreign sources for some raw and processed mineral materials. In 2017, the country was 100 percent import-reliant for 21 mineral commodities. For comparison, in 1984, the country was 100 percent import-reliant for just 11 mineral commodities. Furthermore, the country was at least 50 percent import-reliant for 50 mineral commodities in 2017. Figures 1 and 2 provide an overview of these import sources, and show that China, followed by Canada, supplied the largest number of nonfuel mineral commodities for which the U.S. is more than 50 percent import reliant.

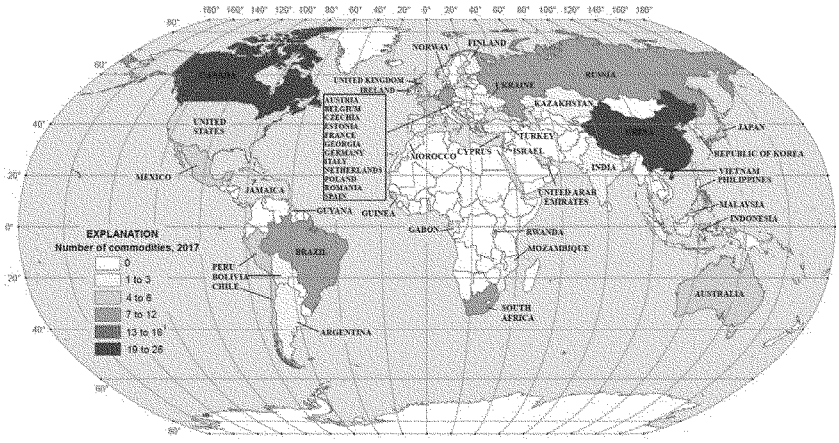
This dependency of the United States on foreign sources creates the potential for strategic vulnerabilities for the Nation's economic and national security interests, to adverse foreign government actions, natural disasters, or other events that can disrupt supply of important minerals.

[1] U.S. Geological Survey, 2018, Mineral Commodity Summaries 2018, 200 pp, https://minerals.usgs.gov/minerals/pubs/mcs/

Commodity	Percent	Major import sources (2013–16)[2]
ARSENIC (trioxide)	100	Morocco, China, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Canada
FLUORSPAR	100	Mexico, China, South Africa, Vietnam
GALLIUM	100	China, Germany, United Kingdom, Ukraine
GRAPHITE (natural)	100	China, Mexico, Canada, Brazil
INDIUM	100	Canada, China, France, Republic of Korea
MANGANESE	100	South Africa, Gabon, Australia, Georgia
MICA, sheet (natural)	100	China, Brazil, Belgium, Austria
NEPHELINE SYENITE	100	Canada
NIOBIUM (columbium)	100	Brazil, Canada, Russia
QUARTZ CRYSTAL (industrial)	100	China, Japan, Romania, United Kingdom
RARE EARTHS	100	China, Estonia, France, Japan
RUBIDIUM	100	Canada
SCANDIUM	100	China
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	Brazil, Rwanda, Australia, Canada
THALLIUM	100	Russia, Germany
THORIUM	100	India, United Kingdom
VANADIUM	100	Czechia, Austria, Canada, Republic of Korea
YTTRIUM	100	China, Estonia, Japan, Germany
GEMSTONES	99	Israel, India, Belgium, South Africa
BISMUTH	96	China, Belgium, Peru
POTASH	92	Canada, Russia, Israel, Chile
TITANIUM MINERAL CONCENTRATES	91	South Africa, Australia, Canada, Mozambique
ANTIMONY (oxide)	85	China, Belgium, Bolivia
ZINC	85	Canada, Mexico, Peru, Australia
STONE, dimension	83	China, Brazil, Italy, Turkey
RHENIUM	80	Chile, Belgium, Germany, Poland
ABRASIVES, fused aluminum oxide (crude)	>75	China, Canada, France
ABRASIVES, silicon carbide (crude)	>75	China, Netherlands, South Africa, Romania
BARITE	>75	China, India, Mexico, Morocco
BAUXITE	>75	Jamaica, Brazil, Guinea, Guyana
TELLURIUM	>75	Canada, China, Belgium, Philippines
TIN	75	Peru, Indonesia, Malaysia, Bolivia
COBALT	72	Norway, China, Japan, Finland
PEAT	71	Canada
DIAMOND (dust, grit, and powder)	70	China, Ireland, Russia, Romania
CHROMIUM	69	South Africa, Kazakhstan, Russia
PLATINUM	68	South Africa, Germany, United Kingdom, Russia
SILVER	62	Mexico, Canada, Peru, Poland
ALUMINUM	61	Canada, Russia, United Arab Emirates, China
NICKEL	59	Canada, Norway, Australia, Russia
TITANIUM (sponge)	53	Japan, China, Kazakhstan, Ukraine
GERMANIUM	>50	China, Belgium, Russia, Germany
IODINE	>50	Chile, Japan
IRON OXIDE PIGMENTS (natural)	>50	Cyprus, Spain, France, Austria
IRON OXIDE PIGMENTS (synthetic)	>50	China, Germany, Canada, Brazil
LITHIUM	>50	Chile, Argentina, China
TUNGSTEN	>50	China, Canada, Bolivia, Germany
BROMINE	<50	Israel, China, Jordan
ZIRCONIUM MINERAL CONCENTRATES	<50	South Africa, Australia, Senegal
ZIRCONIUM	<50	China, Germany, Japan
MAGNESIUM COMPOUNDS	47	China, Canada, Australia, Brazil
GARNET (industrial)	46	Australia, India, South Africa, China
PALLADIUM	45	South Africa, Russia, Italy, United Kingdom
MICA, scrap and flake (natural)	42	Canada, China, India, Finland
LEAD	40	Canada, Republic of Korea, Mexico, India
ALUMINA	37	Australia, Suriname, Brazil, Jamaica
SILICON	35	Russia, Brazil, Canada, China
COPPER	33	Chile, Canada, Mexico
VERMICULITE	30	Brazil, South Africa, China, Zimbabwe
PUMICE	27	Greece, Iceland, Mexico
FELDSPAR	26	Turkey, Mexico, Spain

Figure 1. 2017 U.S. net import reliance[2], expressed as a percentage of apparent consumption. (Source: USGS Mineral Commodity Summaries 2018.)

[2] In descending order of import share.



[1]In 2017, no countries qualified for the "13 to 18 commodities" category.

Figure 2. Major import sources of non-fuel mineral commodities, shaded to indicate the number of commodities for which the United States was more than 50 percent net import reliant in 2017. (Source: USGS Mineral Commodity Summaries 2018.)

A New Whole-of-Government Strategy

On December 20, 2017, President Trump issued Executive Order 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals". The Executive Order directed the Federal Government to develop an interagency report, to include:

(i) a strategy to reduce the Nation's reliance on critical minerals;

(ii) an assessment of progress toward developing critical minerals recycling and reprocessing technologies, and technological alternatives to critical minerals;

(iii) options for accessing and developing critical minerals through investment and trade with our allies and partners;

(iv) a plan to improve the topographic, geologic, and geophysical mapping of the United States and make the resulting data and metadata electronically accessible; and

(v) recommendations to streamline permitting and review processes related to developing leases; enhancing access to critical mineral resources; and increasing discovery, production, and domestic refining of critical minerals.

The Department of the Interior is contributing to several aspects of the report, with the Department of Commerce responsible for the overall report. Additional interagency contributions are being coordinated through the White House Office of Science and Technology Policy's National Science and Technology Council (NSTC) Subcommittee on Critical and Strategic Mineral Supply Chains. I'll describe some of the steps that USGS has taken in response to the Executive Order, and then discuss our approach to identifying critical minerals.

The Executive Order directed the Secretary of the Interior, in coordination with the Department of Defense and in consultation with other executive branch agencies, to publish a list of critical minerals. Under Department of the Interior Secretarial Order 3359, the USGS, in coordination with the BLM and with broad Federal interagency input, led development of the critical minerals list; this list will guide the focus of the Commerce-led report.

The USGS is also leading development of a plan to improve the Nation's mapping and understanding of subsurface mineral resources (item iv above), with input from agencies with both onshore and offshore mapping responsibilities (including USGS science and mapping programs, the Bureau of Ocean Energy Management, the National Oceanic and Atmospheric Administration, and the Department of Energy), and anticipated partnerships with states. The plan aims to improve the Nation's geophysical, geological and topographic mapping, building on existing national maps to create modern maps based on the newest technologies and science. USGS data collection, analysis and interpretation greatly enhances our understanding of the Nation's geological endowment of critical minerals, and directly benefits our understanding of other economically valuable mineral resources, energy resources, groundwater resources, geologic hazards, infrastructure dependencies on subsurface geology, and other societal needs.

In addition, the USGS is contributing technical input to the report in response to the Executive Order on the geologic composition of above-ground sources of minerals such as mine wastes and other waste streams; and on global production and trade statistics for mineral commodities.

Identifying Minerals as "Critical"

Federal agencies and other organizations use a number of existing definitions and criteria to identify a material or mineral as "critical", "strategic", or otherwise important. The Executive Order defined a critical mineral as (i) a non-fuel mineral or mineral material essential to the economic and national security of the United States, (ii) the supply chain of which is vulnerable to disruption, and (iii) that serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for the U.S. economy or national security.

To identify minerals meeting the definition of criticality under the Executive Order, the USGS used as a starting point a screening tool developed in 2016 and updated in 2017[3,4] by the NSTC

[3] White House Office of Science and Technology Policy, National Science and Technology Council, 2016, "Assessment of critical minerals: screening methodology and initial application", https://www.whitehouse.gov/sites/whitehouse.gov/files/images/CSMSC%20Assessment%20of%20Critical%20Minerals%20Report%202016-03-16%20FINAL.pdf

[4] EA McCullough and N Nassar, 2017, "Assessment of critical minerals: Updated application of an early-warning screening methodology", in Mineral Economics 30(3), https://pubs.er.usgs.gov/publication/70191019

Subcommittee. The NSTC Subcommittee has representation from Federal Departments including, but not limited to, Defense, Interior, Energy, State, Commerce, and Homeland Security. This interagency engagement resulted in a tool that drew from the contributing agencies' existing prioritization processes, and represents a range of Federal agency missions and understanding of industries. The tool is a quantitative methodology for identifying and ranking mineral commodities based on widely accepted criteria published in the mineral commodity literature. Using that methodology, and several other sources of data, the USGS applied two principal quantitative criteria to evaluate minerals for inclusion on the draft list of critical minerals: the Herfindahl-Hirschman index, which measures country concentration of production, and the USGS net import reliance metric based on USGS's annual Mineral Commodities Summaries.[5]

The Secretary of the Interior published a draft list of critical minerals in the Federal Register on February 16, 2018[6], accepted public comment for 30 days ending March 19, 2018[7], and received more than 450 comments, which are available at regulations.gov (https://www.regulations.gov/document?D=DOI-2018-0001-0001). After reviewing the comments, the Department of the Interior finalized the list in a second Federal Register notice on May 18, 2018.[8] The list of critical minerals, while "final," is not a permanent list, but is dynamic and will be updated periodically to reflect current data on supply, demand, and concentration of production, as well as current policy priorities. The list consists of 35 minerals or mineral groups: Aluminum (bauxite), antimony, arsenic, barite, beryllium, bismuth, cesium, chromium, cobalt, fluorspar, gallium, germanium, graphite (natural), hafnium, helium, indium, lithium, magnesium, manganese, niobium, platinum group metals, potash, the rare earth elements group, rhenium, rubidium, scandium, strontium, tantalum, tellurium, tin, titanium, tungsten, uranium, vanadium, and zirconium. Figure 3 provides an overview of these critical minerals' major uses at the sector level and trade dependencies at the country level.

This list of critical minerals does not include a number of economically significant minerals, such as copper, zinc, molybdenum, gold, silver; and industrial minerals such as phosphate rock, sand, gravel, and aggregates that are produced domestically in large quantities. Given current levels of domestic production, the U.S. is not highly reliant on imports for these minerals and typically has a combination of domestic reserves and reliable foreign sources adequate to meet foreseeable domestic consumption requirements. While these minerals do not currently meet the definition of critical, they are important to a modern society for the purposes of national security, technology, infrastructure, and energy production from both fossil fuels and renewable energy generation.

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[5] The methodology used by the USGS is published in USGS Open-File Report 2018-1021, https://pubs.usgs.gov/of/2018/1021/ofr20181021.pdf

[6] Draft List of Critical Minerals, 83 FR 7065, https://www.federalregister.gov/documents/2018/02/16/2018-03219/draft-list-of-critical-minerals

[7] Comments received are available at https://www.regulations.gov under docket DOI-2018-0001.

[8] Final List of Critical Minerals 2018, 83 FR 23295, https://www.federalregister.gov/documents/2018/05/18/2018-10667/final-list-of-critical-minerals-2018

Mineral commodity	Sectors						Top Producer	Top Supplier	Notable example application
	Aerospace (non-defense)	Defense	Energy	Telecommunications & electronics	Transportation (non-aerospace)	Other			
Aluminum	■	■	■	■	■	■	China	Canada	Aircraft, power transmission lines, lightweight alloys
Antimony		■	■	■	■	■	China	China	Lead-acid batteries
Arsenic		■	■	■		■	China	China	Microwave communications (gallium arsenide)
Barite			■	■		■	China	China	Oil and gas drilling fluid
Beryllium	■	■	■	■		■	United States	Kazakhstan	Satellite communications, beryllium metal for aerospace
Bismuth		■	■	■		■	China	China	Pharmaceuticals, lead-free solders
Cesium and rubidium	■	■	■	■		■	Canada	Canada	Medical applications, global positioning satellites, night-vision devices
Chromium	■	■	■	■	■	■	South Africa	South Africa	Jet engines (superalloys), stainless steels
Cobalt	■	■	■	■	■	■	Congo (Kinshasa)	Norway	Jet engines (superalloys), rechargeable batteries
Fluorspar	■		■	■		■	China	Mexico	Aluminum and steel production, uranium processing
Gallium	■	■	■	■		■	China	China	Radar, light-emitting diodes (LEDs), cellular phones
Germanium	■	■	■	■		■	China	China	Infrared devices, fiber optics
Graphite (natural)	■	■	■	■	■	■	China	China	Rechargeable batteries, body armor
Helium				■		■	United States	Qatar	Cryogenic [magnetic resonance imaging (MRI)]
Indium	■	■	■	■		■	China	Canada	Flat-panel displays (indium-tin-oxide), specialty alloys
Lithium	■	■	■	■	■	■	Australia	Chile	Rechargeable batteries, aluminum-lithium alloys for aerospace
Magnesium	■	■	■	■	■	■	China	China	Incendiary countermeasures for aerospace
Manganese	■	■	■	■	■	■	China	South Africa	Aluminum and steel production, lightweight alloys
Niobium	■	■	■	■		■	Brazil	Brazil	High-strength steel for defense and infrastructure
Platinum group metals	■		■	■	■	■	South Africa	South Africa	Catalysts, superalloys for jet engines
Potash			■	■		■	Canada	Canada	Agricultural fertilizer
Rare earth elements	■	■	■	■	■	■	China	China	Aerospace guidance, lasers, fiber optics
Rhenium	■		■	■		■	Chile	Chile	Jet engines (superalloys), catalysts
Scandium	■	■	■	■		■	China	China	Lightweight alloys, fuel cells
Strontium	■	■	■	■	■	■	Spain	Mexico	Aluminum alloys, permanent magnets, flares
Tantalum	■	■	■	■		■	Rwanda	China	Capacitors in cellular phones, jet engines (superalloys)
Tellurium		■	■	■		■	China	Canada	Infrared devices (night-vision), solar cells
Tin		■		■		■	China	Peru	Solder, flat-panel displays (indium-tin-oxide)
Titanium	■	■	■	■		■	China	South Africa	Jet engines (superalloys) and airframes (titanium alloys), armor
Tungsten	■	■	■	■		■	China	China	Cutting and drilling tools, catalysts, jet engines (superalloys)
Uranium	■	■	■			■	Kazakhstan	Canada	Nuclear applications, medical applications
Vanadium	■	■	■	■		■	China	South Africa	Jet engines (superalloys) and airframes (titanium alloys), high-strength steel
Zirconium and hafnium	■	■	■	■		■	Australia	China	Thermal barrier coating in jet engines, nuclear applications

Figure 3. The 2018 list of critical minerals, as defined by Executive Order 13817.

Input from other agencies represented on the NSTC Subcommittee emphasized that uranium, while primarily used as a fuel mineral, also has important non-fuel uses related to national security, such as radiation shields, counterweights, and armor piercing kinetic energy penetrators. In addition, Energy Information Administration data indicate high production concentration and significant import reliance. Based on these factors, uranium meets the criteria for inclusion on the 2018 list.

Of the 35 minerals deemed critical, 12 are commodities recovered during the processing, smelting, or refining of a host material and are, therefore, deemed "byproducts." For example, rhenium is recovered as a byproduct of smelting copper-molybdenum ores. Similarly, helium is a byproduct of natural gas production.

Conclusion

The USGS is actively working to support the Executive Order through our minerals science and mineral information. We appreciate the strong engagement of Congress, other Federal agencies, and of the coordinating roles played by the White House Office of Science and Technology Policy, Council on Environmental Quality and the National Economic Council.

Thank you for the opportunity to present on behalf of the U.S. Geological Survey on the important subject of critical minerals. I will be happy to answer any questions.

The CHAIRMAN. Thank you, Dr. Fortier.

Dr. Eggert, welcome.

STATEMENT OF DR. RODERICK G. EGGERT, VIOLA VESTAL COULTER FOUNDATION CHAIR IN MINERAL ECONOMICS, COLORADO SCHOOL OF MINES, AND DEPUTY DIRECTOR, CRITICAL MATERIALS INSTITUTE, AN ENERGY INNOVATION HUB FUNDED BY THE DEPARTMENT OF ENERGY, ADVANCED MANUFACTURING OFFICE

Dr. EGGERT. Good morning, Chairman Murkowski, Senator Wyden, members of the Committee. Thank you for the opportunity to testify once again before this Committee.

As you noted in your introduction, I wear two hats this morning. I'm a mineral economist at Colorado School of Mines, and I also am Deputy Director of something called the Critical Materials Institute, an existing federal initiative related to mineral security.

This morning I will devote my oral testimony to two aspects of the second theme of the hearing, not the critical minerals list, but rather, opportunities for enhancing U.S. mineral security.

I begin by talking about what I think of are five essential roles for the Federal Government in this space and then second, I will talk about the Critical Materials Institute.

So with respect to five roles for government. First, there's ensuring raw materials for military needs. Second, facilitating undistorted international trade. Third, establishing a regulatory framework for efficient, domestic development of mineral resources that appropriately balances national needs for minerals with environmental protection, worker health and safety and the interests of local communities. Fourth, collecting and disseminating information and conducting strategic analysis on which both private and public decisions can be made. And fifth and finally, fostering technological innovation through education and research throughout the material supply chain which, in turn, leads me to the second topic of my written and oral testimony, the Critical Materials Institute, an existing federal initiative in this area.

The Critical Materials Institute, or CMI, is a multi-institutional, multi-disciplinary consortium funded through Department of Energy's (DOE) Advanced Manufacturing Office and led by the DOE's Ames Laboratory. We're a consortium of national labs, universities and companies. Our mission at CMI is to create technological options for assuring material supply chains through three types of complimentary research, research aimed at diversifying and enhancing primary production, research aimed at reducing wastes through improved manufacturing efficiency, recycling and reuse and research aimed at using less by developing substitute materials for the critical minerals. CMI is active in all three areas. I should note that we are not involved in the upstream activities of geoscience research or mining, so we really start with mineral processing and extractive metallurgy.

We just completed our first five years of activity. We grew out of the 2010 and 2011 DOE Critical Materials Strategy document. To date, our principal focus has been on rare earths with a modest amount of activity focused on lithium. We have filed 78 invention

disclosures, filed 50 patent applications, received six patents and received two R&D 100 awards.

We've had 12 innovations adopted by U.S. industry through licenses or other mechanisms. Examples include membrane solvent extraction for rare earth separations, 3D printing of magnets, rare earth magnets, cost-effective process for recycling rare earth magnets from hard disk drives and developing replacement materials for the rare earths, europium and terbium in florescent lighting. So a combination of, in effect, technological innovations to produce more, waste less and use less.

As we enter our sixth year, we're excited to continue our work in linking early stage, applied research with industrial and societal needs. We're expanding our set of materials. We're engaging with a wider range of industrial partners. We're working to enhance our activities in education and training.

In closing, let me cite, go back to a point I raised at the beginning, technology development is one of government's essential roles and the Critical Materials Institute is one existing federal initiative that has accelerated delivery of technological solutions to the marketplace.

Thank you.

[The prepared statement of Dr. Eggert follows:]

Hearing to Examine the Department of the Interior's Final List of Critical Minerals and Opportunities to Strengthen the United States' Mineral Security

Statement of

Roderick G. Eggert
Viola Vestal Coulter Foundation Chair in Mineral Economics
Colorado School of Mines, and

Deputy Director, Critical Materials Institute, an Energy Innovation Hub funded by the Department of Energy, Advanced Manufacturing Office

Before the

U.S. Senate Committee on Energy and Natural Resources

July 17, 2018

Roderick G. Eggert
Colorado School of Mines & Critical Materials Institute
July 17, 2018

Introduction

Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee, thank you for the opportunity to speak today. I am Rod Eggert, Viola Vestal Coulter Foundation Chair in Mineral Economics at Colorado School of Mines.

As part of my university responsibilities, I am deputy director of the Critical Materials Institute (CMI), an energy innovation hub (multi-institutional, multi-disciplinary research consortium) funded by the U.S. Department of Energy and led by the Ames Laboratory. CMI is developing technological solutions to critical-materials problems as they affect emerging energy technologies.

Regarding the themes of today's hearing, I do not have specific comments on the first theme, the list of critical minerals, but am happy to answer questions.

My testimony focuses on the second theme, opportunities for enhancing U.S. mineral security. Specifically, I offer personal views on the relevance of import dependence for critical minerals, as well as on appropriate federal roles in responding to concerns about mineral security. I also describe the activities, accomplishments and plans of the Critical Materials Institute.

Critical Minerals, Import Dependence and the Role of Government[1]

A critical mineral or material provides essential functionality to a modern engineered material, component or system; has few if any easy substitutes; and is subject to supply-chain risks or longer-term concerns about availability.

As I testified previously, import dependence by itself is an incomplete and often misleading indicator of supply insecurity. Rather it is *risky* import sources that are threats to U.S. users of mineral resources and the technologies that are dependent on these resources. In fact, import reliance is good if foreign sources are available at lower costs or are of higher quality than alternative domestic sources. In many cases, imports are simply intra-company transfers within a vertically integrated company; import reliance reflects an efficiently organized supply chain in which each material handling step takes place in the location best suited to undertake this step. Approximately 62% of all U.S. imports, not just mineral resources, are intermediate products that U.S. entities use as inputs into the production of goods produced within the United States.[2]

Import dependence is a problem, however, when it puts supply chains and U.S. companies and material users at risk. Such is the case when imports come from one or a small number of production facilities, companies or countries – especially countries in which political decisions, restrictions on international trade, civil disruptions, or other developments present risks that may restrict access to materials for U.S. users.

Import dependence is one aspect of the broader and more-fundamental issue of supply-chain risk and raw-material availability. Short-term supply-chain risks may be due to: a limited number of mines, production facilities or companies (whether domestic or foreign); rapid, unanticipated demand growth for a material with small, existing markets; or reliance on by-product production of a material. Over the longer term, raw-material availability reflects: fundamental geochemical abundance of specific chemical elements; investments in basic science, mineral exploration, mine development, process engineering, and project demonstration and piloting to enable extraction and recovery of elements from rocks and minerals, manufacturing wastes and end-of-life products; environmental and social issues associated with mining lower-grade raw materials in more-remote locations; participation of industry and financial partners in syndicating deployment risk; and, finally, availability of scientists, engineers and other professionals in the disciplines necessary for assuring material supply chains.

Regarding the role of government, we appropriately rely primarily on private initiative to develop the mineral resources, materials and technologies that underpin today's society – technologies that encompass energy, health care, electronics and communications, transportation, environmental protection and national defense, among others.

But government plays essential roles in both establishing the institutional framework in which private activities occur and acting when markets do not work well. With respect to mineral resources and raw-material supply chains, government plays essential roles in:

- Ensuring the availability of raw materials necessary for national defense,
- Facilitating undistorted international trade,
- Establishing a framework for efficient development of domestic natural resources that appropriately protects the natural environment and considers not only national needs but also the interests of the communities in which resource development occurs,
- Collecting and disseminating information, as well as carrying out strategic analysis, on which both private and public decisions can be made, and
- Fostering innovation through education and research throughout the materials supply chain.

There are special roles for government to play in two specific aspects of research:

- Facilitating early-stage research and development (R&D) that is especially prone to underinvestment from society's perspective by the private sector acting alone, and
- Facilitating the commercialization of promising ideas and new knowledge created in early-stage R&D through mechanisms such as public-private partnerships. In a perfect world, any promising new idea developed at a national laboratory or university would be picked up by the private sector. In practice, however, promising ideas often languish because of insufficient communication between basic researchers and commercial developers of new technologies.

I focus the remainder of my testimony on one example of a federal investment in early-stage R&D, linking basic research with industrial and societal applications.

Critical Materials Institute: The First Five Years

As I noted earlier, the Critical Materials Institute (CMI) is a multi-institutional, multi-disciplinary consortium of national labs, universities and companies – led by the U.S. Department of Energy's (DOE's) Ames Laboratory and managed by DOE's Advanced Manufacturing Office (http://cmi.ameslab.gov).

CMI's mission is to create technological options for assuring supply chains of materials critical to clean energy technologies. Fundamentally there are three options for assuring supply chains: (a) diversify and expand the availability of critical materials throughout their supply chains, (b) reduce wastes by increasing manufacturing efficiency and recycling and (c) reduce demand by developing substitutes for critical materials. CMI carries out research in all three areas, linking basic and early-stage research with industrial needs. CMI's activities encompass process and materials engineering, as well as underlying science, for the entire materials supply chain except geoscience and mining.

CMI emerged out of the DOE's *Critical Materials Strategy* (2010, 2011), which in turn reflected a decade or so of growing concern about the availability and supply-chain security of certain minor metals that provide essential properties to modern engineered materials (see U.S. National Research Council 2008). Rare earths – an important family of minor metals with essential uses in a wide range of technologies – became the poster child of critical materials when their prices surged in 2010 and 2011, following several years in which China restricted rare-earth exports and after an ultimately temporary Chinese cut-off of supplies to Japan led to panic buying by rare-earth users. China accounts for more than three-quarters of world rare-earth production and processing, as well as some two-thirds of world use of rare earths in manufacturing.

CMI began operations in 2013. In the five years since then, it has focused principally on technology development to alleviate actual or potential supply-chain risks for rare earths, which provide essential properties for magnets in high-efficiency motors in vehicles, wind turbines, industrial motors and air conditioners; phosphor materials in fluorescent and LED lighting; and other applications. In addition, CMI carried out research aimed at recovering lithium, an essential battery material, from geothermal brines.

In its first five years, CMI issued 78 invention disclosures, filed 50 patent applications, received six patents, created two open-source software packages and won two R&D 100 awards. It licensed seven technologies to U.S. companies; see the appendix to this testimony listing these licenses and other technologies adopted by industry. Examples of these technologies include:

- Membrane solvent extraction for rare-earth separations, relevant for both primary production and recycling,
- 3D printing of rare-earth magnets to reduce manufacturing wastes,

- A cost-effective, high-throughput system for recycling rare-earth magnets from computer hard drives, and
- Replacements for the rare earths europium and terbium in fluorescent lighting.

CMI demonstrated the production of neodymium-iron-boron (rare-earth) magnets, essential in high-efficiency motors and now produced almost entirely in China, using raw materials and technologies located entirely in the United States.

CMI facilitates the commercialization of the new knowledge it creates through the active participation of its industry members.

CMI Going Forward

This month CMI began its sixth year of operation. We at CMI are continuing to work with industry to accelerate innovation and develop solutions to critical-materials problems. Building on our experiences over the first five years, we are:

- Continuing to address critical-materials problems through world-leading early-stage, applied research, incorporating machine learning and artificial intelligence where promising;
- Expanding the range of materials and technologies on which we conduct research, going beyond rare earths to expand research on lithium and initiate efforts on cobalt, gallium, indium, manganese, platinum-group elements, tellurium, vanadium and battery-quality graphite;
- Engaging with a wider range of industrial partners;
- Educating and training the leaders, technical experts and skilled professionals needed by U.S. industry to assure its supply chains; and
- Working to become a self-sustaining entity by the end of our tenth year of operation.

Among the grand research challenges CMI is focusing on are:

- Chemical separations, as highlighted by a 2016 paper in *Nature,* which identifies improving the separation of rare-earth elements as potentially revolutionary in terms of unlocking new and greater quantities of resources using less energy and with less environmental damage (Sholl and Lively, 2016), and
- Resource efficiency, enhancing the degree to which we recover multiple elements and materials that exist in a mineral deposit, manufacturing waste or end-of-life product (Söderholm and Tilton, 2012; Eggert, 2016). Innovation has the potential to improve the technical efficiency of recovery, lower processing costs and reduce environmental damage.

Closing

Technology development and commercialization are keys to assuring raw-material supply chains and mitigating risks to U.S. manufacturing, defense needs and energy security. The private sector, appropriately, has primary responsibility for managing these

risks and developing the mineral resources, materials and technologies that underpin manufacturing, defense and energy.

But government plays an essential role in facilitating market activities and intervening when markets do not work well. One of these essential roles is fostering technology development, especially in linking basic early-stage science with industrial and societal needs. The Critical Materials Institute is an example of a federal investment that has accelerated delivery of technological solutions to the market place.

Thank you for the opportunity to testify today. I am happy to address any questions the Committee Members have.

References

American Physical Society and Materials Research Society. *Energy Critical Elements: Securing Materials for Emerging Technologies* (Washington, D.C., American Physical Society, 2011). Available at www.aps.org.

Eggert, Roderick G. "Critical Minerals and Emerging Technologies," *Issues in Science and Technology*, volume XXVI, number 4, 2010, pp. 49-58. Available at www.issues.org.

Eggert, Roderick G. "Minerals Go Critical," *Nature Chemistry*, volume 3, September 2011, pp. 688-691. Available at www.nature.com/nchem/journal/v3/n9/index.html.

Eggert, Roderick G. "Economic perspectives on sustainability, mineral development, and metal life cycles," pp. 467-484 in Reed M. Izatt, editor *Metal Sustainability: Global Challenges, Consequences, and Prospects* (Hoboken, New Jersey, Wiley, 2016).

Sholl, David S. and Ryan P. Lively. "Seven chemical separations to change the world," *Nature*, volume 532, Issue 7600, 28 April 2016, pp. 435-437. Available at www.nature.com.

Söderholm, P. and J.E. Tilton. "Material efficiency: an economic perspective," *Resources, Conservation and Recycling*, volume 61, April 2012, pp. 75-82. Available at http://www.sciencedirect.com/science?_ob=ArticleListURL&_method=list&_ArticleListID=1170016130&_sort=r&_st=13&view=c&md5=649aaf21c8a33c30dadf7241db3e21a0&searchtype=a.

U.S. Department of Energy. *Critical Materials Strategy*, 2010 and 2011 editions (Washington, D.C., Department of Energy, 2010, 2011). Available at: https://www.energy.gov/policy/downloads/2010-critical-materials-strategy and https://www.energy.gov/policy/downloads/2011-critical-materials-strategy.

U.S. National Research Council. *Minerals, Critical Minerals, and the U.S. Economy* (Washington, D.C., National Academies Press, 2008). Available at www.nap.edu.

APPENDIX: CMI Technologies Adopted by Industry (July 2018)

Source Diversification

- *Castable High-Temperature Ce-Modified Al Alloys.*
  Licensed to Eck Industries. First commercial sales in August 2017.
  R&D 100 Award, 2017. FLC Tech Transfer Award, 2018.

Materials Substitution

- *Aluminum nitride phosphors for fluorescent lighting* – replacing europium.
  In production testing at GE
- *Green phosphor for fluorescent lamps* – replacing terbium.
  In production testing at GE
- *Additive Manufacturing of Bonded Permanent Magnets using a Novel Polymer Matrix.*
  Licensed to Momentum Technologies, Inc.
  R&D 100 Award, 2017
- *3D Printable Liquid Crystalline Elastomers with Tunable Shape Memory Behaviors and Bio-derived Renditions*
  Patent application filed by third party.

Improved Manufacturing Efficiency, Recycling and Re-use

- *Membrane Solvent Extraction for Rare Earth Separations*
  Licensed to Momentum Technologies, Inc.
  Featured in GAO report 16-699 on Advanced Technologies
- *High Throughput Cost Effective Rare Earth Magnets Recycling System*
  Licensed to Momentum Technologies, Inc.; CRADA with Oddello Industries
- *Selective Surface Modification of* $Nd_2Fe_{14}B$ *Magnets to Achieve High Performance*
  Licensed to Momentum Technologies, Inc.
- *Novel 3D Printing Method to Fabricate Bonded Magnets of Complex Shape*
  Licensed to Momentum Technologies, Inc.
- *Additive Printing of Bonded Magnets Using Magnet Powders and a Polymer Composition*
  Licensed to Momentum Technologies, Inc.
- *A Process for the Recovery of Mercury and Rare Earth Elements from Used Fluorescent Lamps*
  Licensed to and CRADA with LCW Supercritical Technologies Corp.
- *Yttria-Stabilized Zirconia Thermal Barrier Coating Reversion Process*
  In use by GE Aerospace

[1] See Eggert (2010) and Eggert (2011), as well as two expert-panel reports in which I participated (American Physical Society and Materials Research Society, 2011; U.S. National Research Council, 2008). My testimony today on critical minerals, import dependence and government roles represents views I expressed in previous testimony before the Senate Committee on Energy and Natural Resources or its subcommittees, September 30, 2010, January 28, 2014, and March 28, 2017; the Committee on Industry, Research, and Energy of the European Parliament, January 26, 2011; and the Subcommittee on Energy and Mineral Resources, House Committee on Natural Resources, May 24, 2011.

[2] Calculated with data from https://jgea.org/resources/jgea/ojs/index.php/jgea/article/view/23

The CHAIRMAN. Dr. Eggert, thank you.

Mr. Sims, welcome.

STATEMENT OF JIM SIMS, VICE PRESIDENT OF EXTERNAL AFFAIRS, NIOCORP DEVELOPMENTS LTD.

Mr. SIMS. Chair Murkowski, Ranking Member Cantwell and other members of the Committee, thank you.

I'm Jim Sims with NioCorp Developments.

NioCorp, we're a small business, but we're on a very large mission. That mission is to bring into commercial operation a breakthrough critical minerals mine and processing facility in the State of Nebraska.

Why do I use the word breakthrough in this project? Well, because it's very unique. We're going to produce multiple critical minerals, and we're going to produce only critical minerals at this mine in Nebraska.

The niobium and scandium and titanium that we're going to make, in addition to being critical minerals, are all used in a variety of commercial applications and a number of defense and military applications. All of those, the U.S. is overwhelmingly reliant on foreign nations for the supplies of each of those three elements.

I would also note, I think this project is unique because of the way in which we've designed it to minimize and limit and, in some cases, eliminate planned impacts to the environment. I'll talk briefly about those, Madam Chair.

Our flagship mineral is niobium. Many of you remember niobium, I think, on your period table from your high school chemistry classes. Well, you will soon.

[Laughter.]

Almost everybody who came to this hearing today, whether you came in a car or a cab or a truck or a bus or a train or like me, in a commercial jetliner, you experienced some of the benefits of niobium in the super alloys and the high strength steel that now goes into almost all of those vehicles and systems today.

How much of that niobium that you experienced today, was made in the U.S.? Zero. We're 100 percent reliant on foreign nations for niobium. The Elk Creek project will turn that around. We're going to put the U.S. in a position of being a producer of niobium for the first time in U.S. history.

Our second critical mineral is called scandium. It's also an element on the periodic table. What niobium does for steel, scandium does for aluminum, strengthens aluminum to a great degree. Scandium has applications, a variety of applications, in both commercial and defense. The U.S. uses it in a number of different military technologies.

How much of the scandium that we use today is made in the U.S.? Zero. One hundred percent reliant on foreign imports. The U.S. will not only emerge as a scandium producer with the Nebraska project, the Elk Creek project, we will emerge as a scandium superpower. And I say that because there's only 15 metric tons made everywhere in the world today for scandium. Nebraska is going to come online and make 100 metric tons per year.

I think our third mineral is also important. That's titanium. We are about 91 percent reliant on titanium mineral concentrates. So we're going to help the U.S. increase our production of that as well.

This is also a breakthrough of a very unique project because of how we've worked on the front end of the project. We spent a little more money, we spent a little more time to try to limit the environmental impacts of this project. Most mines of this type have to go through a number of federal permits, with NEPA processes. We've been able to limit our, the need for us to go through a lot of these because we have limited impacts on the front end.

For example, we have avoided the need to go through a full NEPA analysis for the 404 permit that we have now in hand from the Army Corps of Engineers. And we did that by avoiding any permanent impacts to waters of the U.S. It was not easy to do. We had to do some metallurgical innovations that reduce the amount of chemicals we had to bring in. That then reduced our expected waste stream. It reduced the size of our tailings basin. It did a lot of things. It allowed us to avoid those impacts in the first place.

Now not all projects are similarly situated and can do what we did. It makes us a little unusual. But that helps us move forward faster. It also reduces the risk, the permitting risk, that investors look at when they look to capitalize these projects. That helps our project go forward a lot faster.

Finally, I just want to note in summary, Madam Chair, that scandium in particular, I think, is a very exciting element. It represents or it presents revolutionary opportunities to decrease the weight of automobiles, commercial airliners, in particular. That will increase fuel efficiency pretty dramatically and, of course, reduce emissions as well. We need more scandium. We don't have it. It's critical and strategic to the U.S.

I also just want to note quickly that this project enjoys tremendous "local support" in Nebraska. That's largely due to our local landowners with whom we have partnerships. We're all on private land. We have agreements with all them for this project. That's usually helpful.

Governor Ricketts has been very, very helpful, all the members of the Nebraska Congressional delegation, folks in the legislature. We just—we're gratified by that support.

I'll also mention finally, that not only is that support just nice to have, it really is a requirement for a mine like ours to get up and running, to have that local support and we're glad we have it.

Madam Chair, thank you.

[The prepared statement of Mr. Sims follows:]

BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

Hearing to Examine the Department of the Interior's Final List of Critical Minerals
July 17, 2018

Testimony of Jim Sims
Vice President of External Affairs
NioCorp Developments Ltd.

Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee, I am Jim Sims with NioCorp Developments, Ltd. I very much appreciate the opportunity to address the Committee regarding critical minerals and opportunities to strengthen the United States' mineral security. Following a short Executive Summary, my testimony will address these areas:

1. The Elk Creek Critical Minerals Mine and Processing Facility
2. How We Have Reduced the Project's Environmental Footprint
3. The Power of Elk Creek Critical Minerals: Some Examples
4. Applications and Markets That Utilize These Critical Minerals
5. Policy Recommendations for Strengthening U.S. Mineral Security

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EXECUTIVE SUMMARY

Headquartered in Denver, Colorado, NioCorp is public company regulated by both U.S. Securities Commission and the Ontario Securities Commission. All required disclosure filings are available for public review on the SEC's EDGAR website and on www.sedar.com.

NioCorp is a small business focused on a large mission: bringing into commercial operation a breakthrough critical minerals mine and processing facility in Nebraska. We are pursuing this mission at a time when the U.S. has never been more reliant on other nations for so many of the critical minerals that keep our nation safe, support our standard of living, enable new technologies that reduce environmental impacts, and allow our economy to thrive.

I use the adjective "breakthrough" when speaking of the Elk Creek, Nebraska Critical Minerals Project for good reason. The Elk Creek Project is designed to produce multiple critical minerals, and only critical minerals. When operational, it will alleviate our total dependence on foreign nations for two critical minerals, and it will improve our production capacity of a third critical mineral. It also will position the U.S. as a global superpower in the production of a critical mineral that was once dominated for many years by one nation: the former Soviet Union.

1) **First-Ever U.S. Production of Niobium:** The Elk Creek Project will give America, for the first time ever, the ability to produce the superalloy metal Niobium, a critical and strategic metal that plays a vital role in both commercial and military technologies. America is 100% dependent upon foreign nations for Niobium, which is one reason why Niobium was recently named by the Department of Interior as a critical mineral. The criticality of Niobium was previously recognized by the U.S. Congress in the FY2014 National Defense Authorization Act when it authorized the National Defense Stockpile to purchase and store a form of Niobium in the event of national emergency. We need Niobium, we don't have it, and that makes it both critical and strategic to the U.S.

2) **First Initiation in Decades of U.S. Production of Scandium**: The Elk Creek Project will give America the ability to produce the superalloy metal Scandium from U.S.-sourced ore for the first time in decades. As with Niobium, America is 100% dependent upon foreign suppliers for Scandium. While Scandium is not yet used extensively in the U.S., that is because of constrained supply: very little Scandium is produced anywhere in the world today. The former Soviet Union once dominated production of Scandium, and reportedly used it

extensively in a variety of military technologies. Scandium also multiple current and prospective uses in clean energy and in transportation systems, where it promises to revolutionize fuel economy. The DOI recently named Scandium a critical mineral. We need Scandium, we don't have it, and that makes it critical and strategic to the U.S.

3) **Expanded Production of Titanium:** This project also will boost America's domestic production of Titanium, a highly versatile metal with many uses across both civilian and defense sectors. Today, the U.S. is 91% reliant on foreign producers for titanium mineral concentrate. Titanium – the third metal to be produced at Elk Creek -- is also on the DOI critical minerals list. We need Titanium, we don't have sufficient production of it, and that makes it critical and strategic to the U.S.

4) **America as a Global Scandium Superpower:** Not only will the Elk Creek Project help America produce its own Scandium, it is positioned to establish the U.S. as a global superpower of Scandium production. Currently, only about 15 tonnes of scandium are produced each year in the world, mostly from sources in China and Russia. Our Nebraska project plans to produce more than 100 tonnes per year of Scandium. That will position the U.S. as a global leader in the production of this critical and strategic metal.

5) **High-Performance Alloy Development:** While we are working to establish Scandium production in Nebraska, we also are engaged in a joint development effort with IBC Advanced Alloys to develop new aluminum-scandium alloys that can be utilized in a variety of markets and applications. IBC has deep expertise in producing high-performance alloys, including precision cast beryllium-aluminum alloy parts for commercial systems and defense platforms, including the F-35 Lightning II aircraft.

6) **Reduced Environmental Footprint**: The Elk Creek Critical Minerals Project has been extensively designed to limit environmental impacts that are typically associated with projects of this type and size. NioCorp has already secured its primary federal permit: a Section 404 permit from the U.S. Army Corps of Engineers. Moreover, we further reduced the Project's environmental footprint recently by removing plans to construct a waterline to the Missouri River. That design change, in turn, eliminated the need for any further NEPA-level federal permits for the Project. This fact that this Project now enjoys remarkable low permitting risk is a direct result of NioCorp's decision to make an early investment, and go the extra mile, in early stage environmental planning.

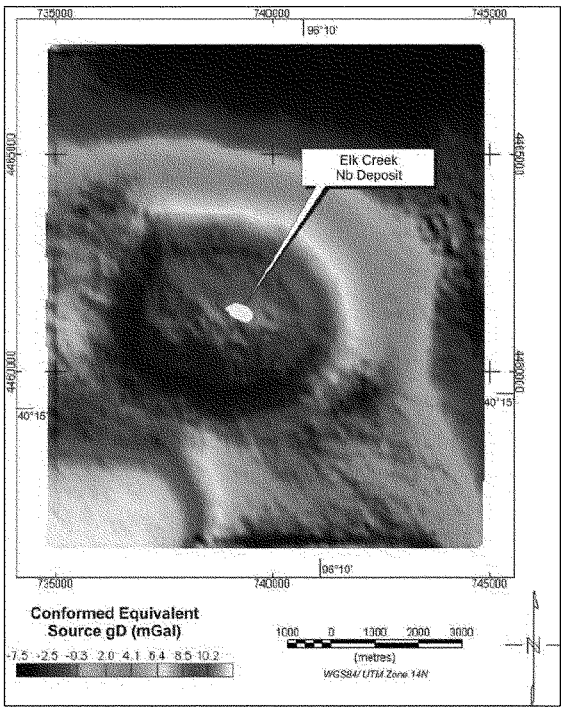
7) **Strong State and Local Support**: The project enjoys strong support from local residents and from state and local leaders, due in part to several factors. These include: (a) the Project's expected creation of hundreds of new jobs, increased economic opportunity, and higher tax revenues to state and local governments; (b) the increased diversification it will provide to Nebraska's economy; (c) its reduced environmental impacts; (d) the role these critical minerals play in energy efficiency, reduced fuel consumption, and reduced air emissions in downstream applications; (e) the Company's commitment to openness and transparency with area residents; and (f) the fact that this Project will position Nebraska as a global leader in the production of several critical minerals.

8) **Key Role in Infrastructure Repair/Re-Building**: This Project will help accelerate the ongoing "lightweighting" revolution in transportation systems. As a steel strengthener, Niobium is already is used in virtually all steel chassis cars and trucks today to lightweight the vehicle, make it safer, and increase fuel economy. It also is increasingly used in infrastructure projects such as bridges, tunnels, airports, and other structures because its anti-corrosion qualities allow bridges to last 100+ years, rather than 30-50 years. What Niobium does for steel, Scandium does for aluminum alloys. Its potential to lightweight commercial aviation and surface transportation is truly revolutionary.

9) **Potential Financial Support from Germany:** While the Elk Creek Critical Minerals Project is not currently seeking financial assistance by the U.S. Government, the Project has received in-principal eligibility from the German Government's Untied Loan Guarantee Program for a loan guarantee of approximately $130 million.

10) **Rapid Progress.** While no greenfield mining project in the U.S. moves forward at the speed preferred by management and its investors and supporters, the Elk Creek Critical Minerals Project is progressing more rapidly than most mining projects of its size and scope. Assuming the Company is successful in its current efforts to raise the $1 billion in required up-front capital, construction activities in Nebraska would begin as rapidly as possible.

THE ELK CREEK CRITICAL MINERALS PROJECT



Our Project is designed to tap into a relatively small part of a much larger underground resource in Nebraska. In the gravity gradiometer map at right, the ore body targeted for development is shown in yellow, against the backdrop of a much larger potentially favorable geologic structure, shown in red.

The Elk Creek orebody is classified geologically as a carbonatite. These types of geologic structures are highly unique and often contain high concentrations of valuable minerals. The Elk Creek Carbonatite is no exception. The orebody lies beneath approximately 100 feet of the area's topsoil, referred to as glacial till, which contains the area's freshwater resources, and beneath another 500 feet of limestone, which serves as an aquitard between the layers. Because there are no surface outcroppings of the carbonatite, it was discovered only through by aerial surveys conducted by the State of Nebraska in the 1960s. Because of its large size and strong magnetic and gravimetric signature, the carbonatite showed up like a large gravitic and magnetic bullseye on maps such as the one at right. Nebraska officials knew that a significant concentration of metallic elements existed in the ground near the town of Elk Creek, and that the prospective resource could be quite large.

Several companies conducted exploratory drilling campaigns over the following decades. But it wasn't until NioCorp negotiated agreements with local landowners, conducted the exploration work necessary to characterize an ore reserve, and completed a 3.5-year, $35 million Feasibility Study that this critical mineral resource was placed on the pathway to commercial operation.

Below are some data points on the Elk Creek Project. This and much more detailed information is contained in the Revised Elk Creek Feasibility Study, which can be downloaded here: http://niocorp.com/images/ElkCreek_FS_NI43-101_Revised_TechnicalReport_241900-040_Rev25_20171215.pdf.

- **Mineral Resources and Reserves**

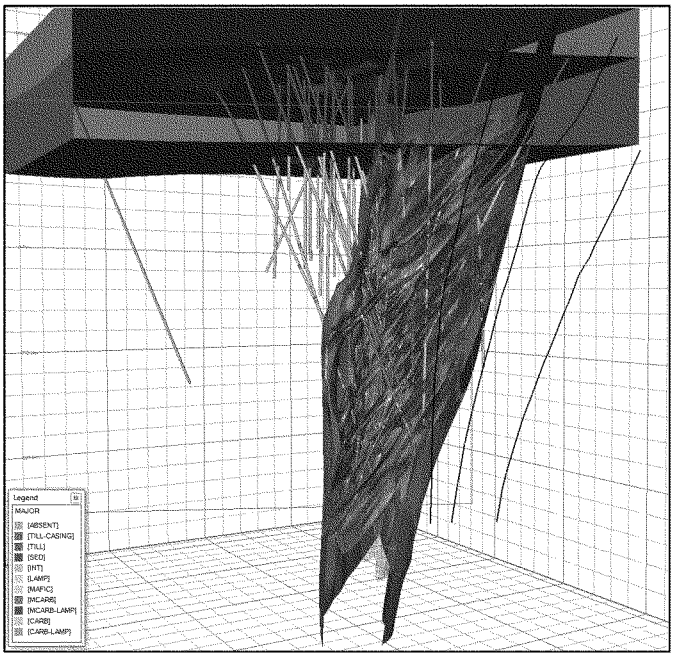
  Probable reserves of 31.7 million tonnes of ore at 0.79% niobium (Nb_2O_5), 71.6 grams per tonne (g/t) scandium (Sc), and 2.81% TiO_2. Total indicated mineral resources are 90.9 million tonnes at 0.66% Nb_2O_5, 70 g/t Sc, and 2.59% TiO_2, with inferred resources of 133.6 million tonnes at 0.48% Nb_2O_5, 59 g/t Sc, and 2.23% TiO_2.[1] Mineral Resources are reported inclusive of Mineral Reserves. Mineral Resources and Mineral Reserves have an effective date of May 15, 2017.

- **Mine Life**

  32 years, producing over the life of mine approximately 143,824 tonnes of payable niobium, 3,237 tonnes of Sc2O3, and 359,128 tonnes of TiO2.

- **Ore Body**

  Below is an illustration of the Elk Creek Carbonatite. The top gray layer is the glacial till layer, where topsoil and groundwater supplies exist. The blue layer represents limestone that separates the glacial till and groundwater resources from the orebody, which is shown in the main portion of the illustration. The straight lines extending from the surface represent exploratory drilling that was done to characterize the ore body. The zones colored purple host the critical minerals.



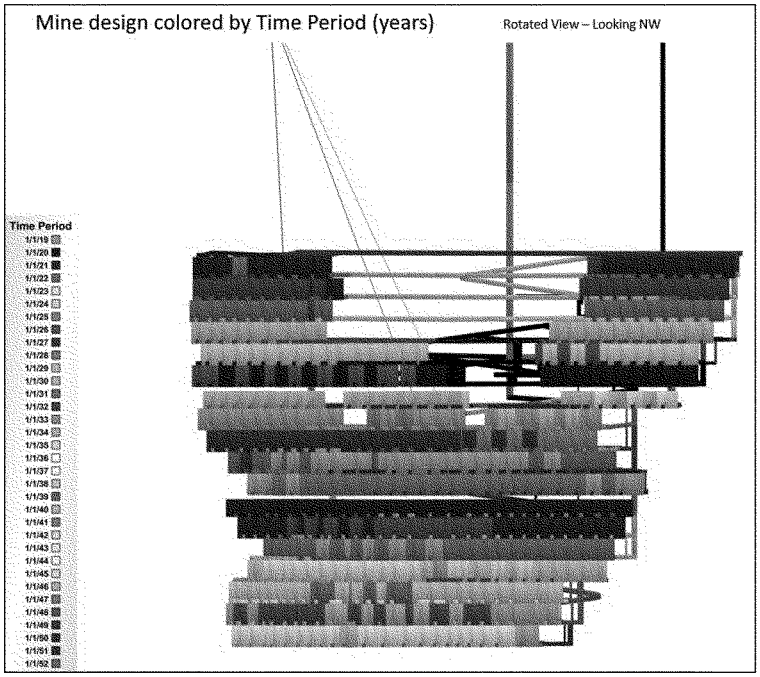
- **Planned Annual Production**
  - Ferroniobium ("FeNb"): annualized production rate of 7,055 tonnes.
  - Scandium Trioxide ("Sc_2O_3"): annualized production rate of 103 tonnes.
  - Titanium Dioxide ("TiO_2"): annualized production rate of 11,445 tonnes per year

- **CAPEX**

  Up-front direct capital costs of $705 million, in addition to indirect costs of $189 million, pre-production capital costs of $85 million, contingency of $109 million, and pre-production net revenue credit of $79 million.

- **Mining Plan**

  The Project plans to utilize industry-standard ground freezing technology during shaft sinking, which has the ability to facilitate the simultaneous sinking of both the production and ventilation shafts, instead of sequential shaft sinking. It also is expected to save schedule time, minimize water inflows, and improve overall safety during shaft sinking operations.



Source: SRK, 2017

Mine Production Schedule Colored by Year, Rotated View Looking Toward the Footwall (Northeast)

- **Land Position**

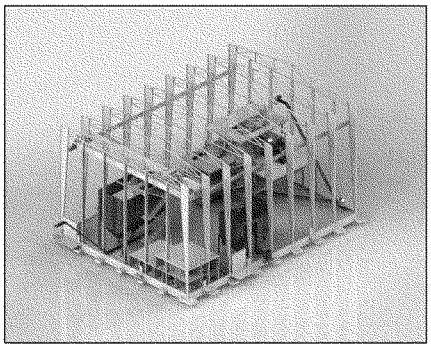
  The Project is located entirely on privately-owned lands, and no public lands are involved. NioCorp has successfully negotiated options agreements with all landowners necessary to build and operate the Project. Local landowners are crucial partners in this Project and are highly supportive of the effort to bring it to commercial reality.

- **Surface Processing Facility**

  The processing of mined ore into commercial products will largely be accomplished in three stages in the surface processing facility.

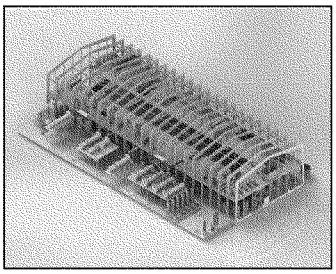
  Mineral Processing

  The Mineral Processing building will house all of its equipment within a single large building. The primary driver of the comminution circuit design is the dry processing of ore. The process design relies upon two things; receiving a primary crusher product with a characteristic particle size of (P80) 115 mm (6 inches or smaller) at the comminution circuit feed bin and producing feed material for the downstream hydrometallurgical processing at a characteristic particle size of (P80) 1.1 mm (i.e. sand sized). The primary crusher product will be fed to the secondary cone crusher system, operating in closed circuit with a double deck screen. The screen undersize from the cone crusher system will be fed to a HPGR unit, operating in closed circuit with another double deck screen. The HPGR screen undersize is the comminution product that will report to the hydrometallurgical process.



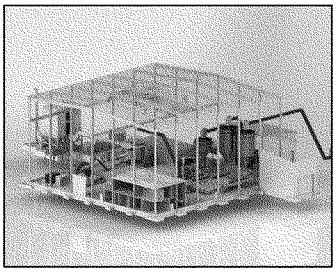
Hydrometallurgical Processing (Hydromet)

The Hydromet Plant building will house equipment on two levels for the 12 individual processes required to separate the three recoverable minerals. The Hydromet Plant is supported by a Hydrochloric Acid Regeneration (HCL) plant and a Sulfuric Acid Recycling Plant. The Hydromet plant will produce the final titanium and scandium products, and an intermediate niobium product that will be converted to a final product in the Pyromet plant.

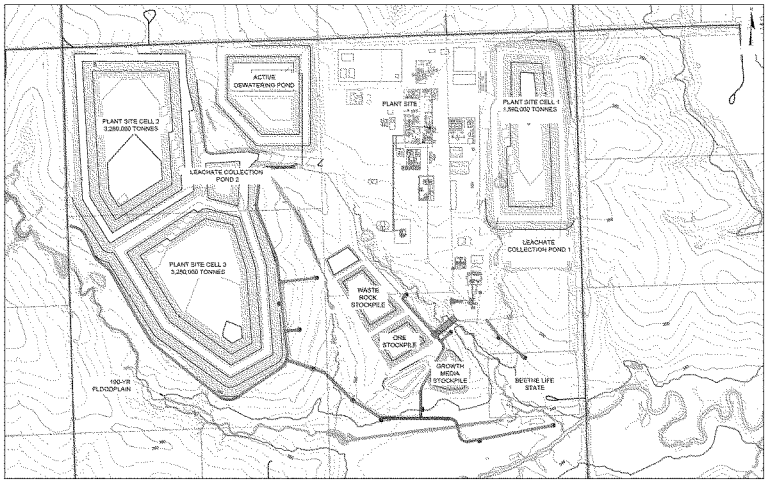


Pyrometallurgical Processing (Pyromet)

The purpose of the pyrometallurgical (Pyromet) plant is to convert the intermediate niobium product from the Hydromet Plant into a saleable ferroniobium (FeNb) metal. This conversion is performed in a single electrical arc furnace with a continuous feed of precipitate, additives and fluxes to produce a saleable a FeNb metal alloy.

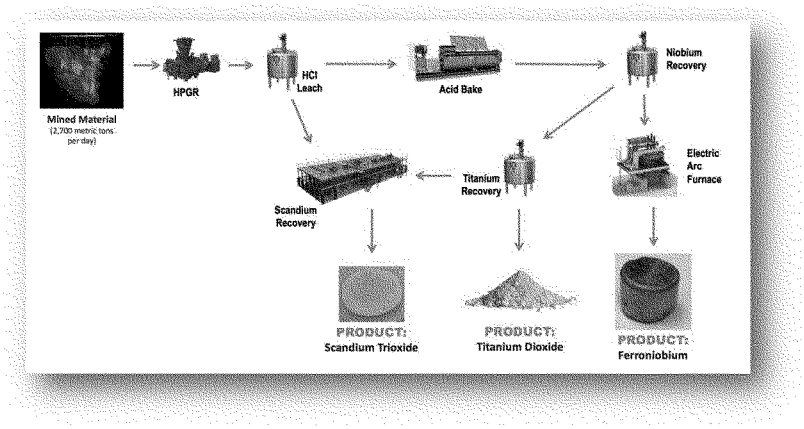


The proposed layout of the surface processing facilities appears below.



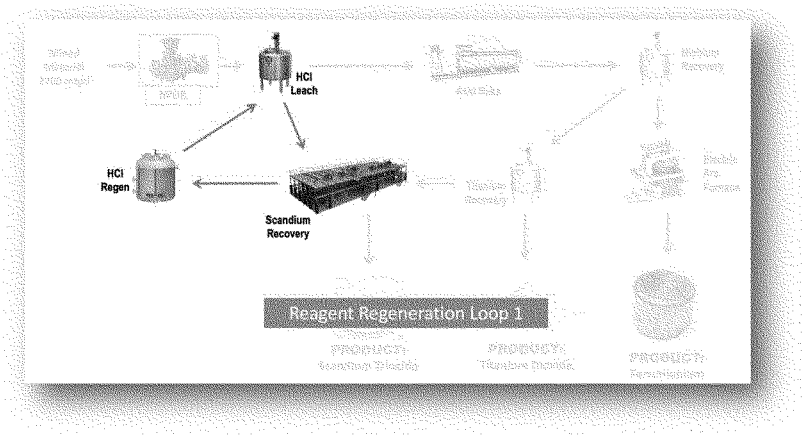
Simplified Process Flow Sheet

A simplified illustration of the process flow sheet is shown below. A detailed description of the processes in each of these steps can be found in the Revised Elk Creek Feasibility Study, downloadable here: http://niocorp.com/images/ElkCreek_FS_NI43-101_Revised_TechnicalReport_241900-040_Rev25_20171215.pdf

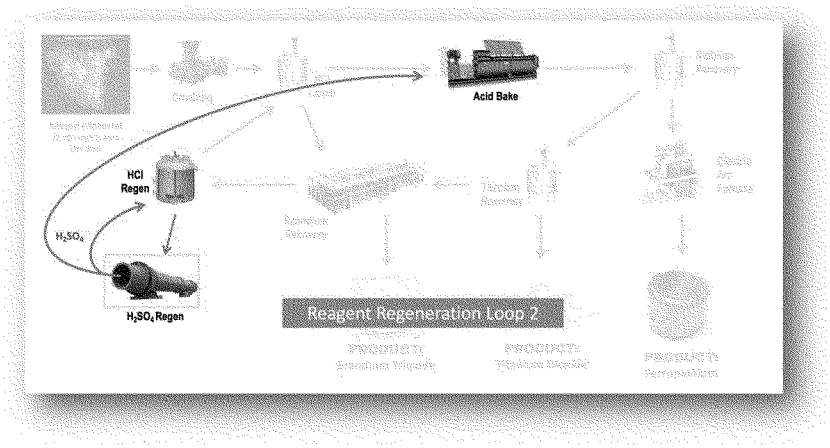


Recycling and Regeneration Operations

The facility will employ two recycling and regeneration operations. The first, shown below, is designed to regenerate the hydrocholoric acid (HCl) used to process the ore. This regeneration significantly reduces the need for the facility to ship in large quantities of HCl or its precursor chemicals, and this helped to reduce the overall environmental footprint and impacts of the Project.



The second reagent recycling / regeneration loop will help the facility regenerate sulphuric acid (H_2SO_4), also used in processing. This further reduces the facility's need to consume outside supplies of process reagents.



HOW WE HAVE REDUCED OUR ENVIRONMENTAL FOOTPRINT

The Elk Creek Critical Minerals Project is a relatively large, $1 billion CAPEX facility that will required dozens of federal, state, and local government permits to construct and operate. A detailed list of these permits is shown below.

NioCorp was able to reduce its permitting requirements in several areas of the Project by reducing or eliminating the environmental impacts that would have required those permits. The Company made an early decision to invest more time and resources on the front end of the Project in order to limit environmental impacts as much as possible. As various metallurgical innovations, design changes, and process optimizations were discovered and implemented into the Project's design, the environmental footprint of the Project shrunk considerably from earlier designs.

For example, NioCorp's initial design of the surface processing facility would have caused impacts to federally regulated wetlands and stream channels sufficient to require an authorization under Section 404 of the Clean Water Act from the U.S. Army Corps of Engineers (USACE). Typically, these permits require an associated NEPA-level review, such as an Environmental Assessment or Environmental Impact Study. However, because of a number of metallurgical and process improvements to the design of the facility, and the reagent recycling / regeneration circuits that were added to the process flow sheet, the Company was able to eliminate the need for a planned railroad spur line to the site that was to deliver large amounts of incoming chemicals. Additionally, NioCorp engineers found ways of reducing the production of mine tailings and reducing the size of surface tailings storage areas. It also made changes to the surface facility's layout to avoid federally regulated wetlands and stream channels.

As a result of this work, and significant upfront investment, the Project's estimated impacts to federally jurisdictional waters was reduced to such low levels that the Project was able to qualify for a Nationwide Permit under Section 404 of the Clean Water Act, which is a more streamlined process than a typical Individual Permit under Section 404. NioCorp was granted its 404 authorization in June of 2017.

Two other federal permits from the USACE were initially required for a planned 33-mile waterline from the Project site to the Missouri River. This waterline was designed to discharge into the river brackish water that was expected to be pumped out of the underground ore body and surrounding bedrock to facilitate shaft sinking and mining operations. This waterline would have required two federal permits from the USACE: an additional Section 404 authorization and a Section 408 permit. The latter, in turn, would have required an Environmental Assessment to be completed through a NEPA-level review.

However, by adjusting the mine plan to utilize artificial ground freezing, and as a result of additional hydrogeological analysis of the ore body, NioCorp was able to dispense with the need for the waterline to the Missouri. This eliminated the need for the additional two federal permits and an Environmental Assessment associated with the waterline.

NioCorp has incorporated other elements into the Project to reduce its overall environmental impact:

- Returning a significant percentage of mine tailings to the underground mine, in the form of a structural backfill, as mining operations are completed in sections of the ore body.
- Utilizing locally produced fly ash as a binder in the underground mine, which puts the fly ash to beneficial use and avoids disposal of the fly ash in a surface landfill.
- Designing to make maximum use of water pumped out of the underground mine to supply the operation with potable and process water, minimizing the impact on water resources currently used by local communities for drinking and agriculture.

Remaining Permits

While the Elk Creek Project has been able to reduce its permitting requirements by shrinking its environment footprint, the Project must still obtain dozens of permits from federal, state, and local government units. Following is a list of the permits still required to be obtained by the Project, as outlined in the Revised Project Feasibility Study. This list will be updated as detailed engineering is completed on the Project.

Permit/Approval	Issuing Authority	Permit Purpose
Federal Permits Approvals and Registrations		
Explosives Permit	U.S. Bureau of Alcohol, Tobacco and Firearms (BATF)	Storage and use of explosives
EPA Hazardous Waste ID No.	U.S. Environmental Protection Agency (EPA)	Registration as a Conditionally Exempt Small Quantity Generator (CESQG) or a Small Quantity Generator (SQG) of waste
Spill Prevention, Control, and Countermeasure (SPCC) Plan	U.S. Environmental Protection Agency (EPA)	Regulation of facilities having an aggregate aboveground oil storage capacity greater than 1,320 gallons or a completely buried storage capacity greater than 42,000 gallons with a nexus to jurisdictional waters
Notification of Commencement of Operations	Mine Safety and Health Administration (MSHA)	Mine safety inspections, safety training plan, mine registration
Federal Communications Commission Permit	Federal Communications Commission (FCC)	Frequency registrations for radio/microwave communication facilities
Clean Water Act Section 404 Permit	U.S. Army Corps of Engineers (USACE)	Permit for discharge of dredged or fill material into waters of the U.S. under Section 404 of the CWA
State Permits, Authorizations and Registrations		

Permit/Approval	Issuing Authority	Permit Purpose
Permit to Appropriate Water	State of Nebraska Department of Natural Resources (DNR)	Regulates the use and storage of surface and ground waters
Explosives Permit	Nebraska State Patrol	Regulates the use, storage, or manufacture of explosive materials.
Permit to Discharge under the National Pollutant Discharge Elimination System (NPDES)	State of Nebraska Department of Environmental Quality (DEQ)	Multiple permits applicable to the discharge of industrial wastewater and stormwater.
Mineral Exploration Permit	State of Nebraska DEQ	Regulates the exploration for minerals by boring, drilling, driving, or digging.
Air Construction Permit	State of Nebraska DEQ (under Federal PSD Program)	Regulates emissions during construction activities to protect ambient air quality.
Air Operating Permit	State of Nebraska DEQ (under Federal PSD Program)	Regulates emissions during operation to protect ambient air quality. Will be based on a FS mine plan.
Water Well Installation Declaratory Ruling Request	Nebraska Department of Health and Human Services, Division of Public Health	Water well installation requirements; well must be registered with the Department of Natural Resources.
Authorization for Class V Well Underground Injection	State of Nebraska DEQ	All activities conducted pursuant to Title 122 - Rules and Regulations for Underground Injection and Mineral Production Wells.
Septic Systems – Permit for Onsite Wastewater Treatment System Construction/Operations	State of Nebraska DEQ	Protects surface water and groundwater as well as public health and welfare through the use of standardized design requirements.
Boiler Inspection Certificate	Nebraska Department of Labor	Protects public safety through an inspection and approval process of boilers.
Section 401 Water Quality Certification	State of Nebraska DEQ	Program evaluates applications for federal permits and licenses that involve a discharge to waters of the state and determine whether the proposed activity complies with NAC Title 117- Nebraska Surface Water Quality Standards. Isolated wetlands are included in NAC Title 117.
Development Permit	State of Nebraska DEQ/Johnson County Floodplain Administrator	Program regulates building requirements for any structures that are constructed on a floodplain.
Fire and Life Safety Permit	Nebraska State Fire Marshall	Review of non-structural features of fire and life safety.
State Business License	Nebraska Secretary of State	License to operate in the state of Nebraska.
Retail Sales Permit or Exemption Certificate	Nebraska State Tax Commissioner	Permit to buy wholesale or sell retail.
Solid Waste Management Permit	State of Nebraska DEQ	Regulates the construction and operation of solid waste management facilities.

Permit/Approval	Issuing Authority	Permit Purpose
Drinking Water Construction Permit	Nebraska Department of Health and Safety	The Drinking Water Construction Permit regulates the design and construction of a public water system.
Drinking Water Permit to Operate	Nebraska Department of Health and Safety	Defines testing and water quality criteria for public drinking water systems.
Radioactive Materials Program and Licensing	Nebraska Department of Health and Human Safety	Regulates and inspects users of radioactive materials.
Hazardous Waste Management	State of Nebraska DEQ	Management and recycling of hazardous wastes.
Dam Safety Approval	State of Nebraska DNR	Regulates the design and construction of any dam (i.e., any artificial barrier with the ability to impound water or liquid-borne materials).
Water Storage Permit	State of Nebraska DNR	Regulates any water impoundment that has a normal operating water volume of at least 15 AF below the spillway.
Local Permits for Johnson and Pawnee Counties		
Building and Construction Permits	Johnson County Zoning Administrator	Ensure compliance with local building standards/requirements.
County Road Use and Maintenance Permit/Agreement	Johnson County Zoning Administrator	Use and maintenance of county roads.
County Road Use and Maintenance Permit/Agreement	Pawnee County Commission	Use and maintenance of county roads.
Permitted Use Zoning Permit	Johnson County Zoning Administrator	Regulates and authorizes permitted uses.
Special Use Permit	Pawnee County Assessor	Regulates and authorizes permitted uses

Permitting Process Delays

Has the Project experienced unreasonable delays in some of its permitting processes? Unfortunately, yes. For example:

- A jurisdiction delineation from the USACE that determines where federally regulated wetlands and stream channels in the Project area were located took nearly two years for the USACE to complete. Under published agency guidelines, that process is supposed to be completed within 60 days.

- A U.S. Fish & Wildlife (USFWS) evaluation of potential issues related to threatened and endangered species was promised by that agency in 2015. It was produced in July 2018.

- The Army Corp's 408 program office stopped work on the 408 permit for the project in February 2018 on the basis that a fee agreement with the company was needed to continue working. The fee agreement was never produced by the Corps, and the Corps did not complete any additional work on the 408 permit. This was a partial driver in the Company's decision to remove from the project's design those features of the project that triggered the 408 permit.

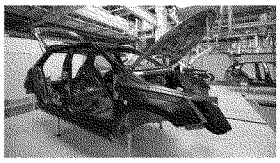
In spite of these experiences, NioCorp has generally found that federal, state, and local regulatory authorities have worked diligently to assist the Company and the Project in navigating the various permitting processes that are required for this Project.

THE POWER OF THESE CRITICAL ELEMENTS: SOME EXAMPLES

1. **Niobium provides a better bang for the taxpayer buck as we re-build America's crumbling infrastructure**. High performance "super steels" that contain Niobium are increasingly used by states in building and repairing bridges and other major infrastructure projects. These steels greatly extend the expected lifespan of structures from a 50-year design life to more than 100 years. This can dramatically lower lifecycle costs while increasing safety and performance.

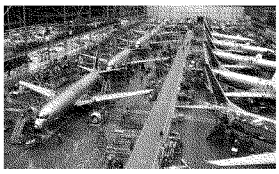
2. **Niobium reduces air emissions associated with infrastructure construction and transportation systems.** Niobium-strengthened super steels deliver significant environmental benefits because of their ability to dramatically reduce air emissions and other environmental impacts when used in bridges and other infrastructure projects. For example, the addition of only .0025% of niobium into the steel of the Millau Viaduct in France allowed that bridge to use 60% less steel and concrete, which resulted in large avoided air emissions and other environmental impacts.

3. **Niobium increases fuel efficiency and reduces air emissions from vehicles.** Niobium-strengthened super steels also reduce emissions from surface transportation systems such as cars, trucks, buses, and trains. Because of their superior strength, they can help reduce the mass (or weight) of a vehicle. For example, only $9 of niobium added to a mid-sized passenger vehicle today helps to reduce the weight of the vehicle by about 220 pounds, resulting in a 5 percent increase in fuel efficiency and reduced emissions per mile.



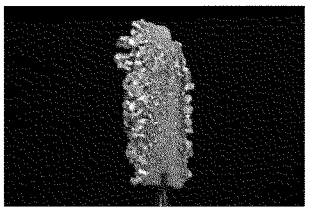
4. **Scandium can increase fuel efficiency and reduces air emissions from commercial aircraft.** When alloyed with aluminum, scandium creates an ultra-high-performance alloys that can lightweight jetliners, reducing emissions and cutting costs. For example, Scandium-contained aluminum alloys can save airline operators approximately $9 million in net present value for a single B737-sized jetliner, assuming Scandium oxide pricing at $3,500/kg.

5. **Scandium can deliver large saving in aircraft manufacture**. Aluminum-Scandium (AlSc) alloys allow aluminum components to be welded instead of joined via hundreds of thousands of rivets per plane. This could lead to tens of millions of dollars/year in lower bill of materials costs, tens of millions of dollars/year in lower direct manufacturing costs, and higher manufacturing throughput: a 1% increase in annual production of a narrow body jet is worth ~$500 million in added revenue to an original equipment manufacturer (OEM).



APPLICATIONS THAT USE THESE CRITICAL ELEMENTS

Niobium

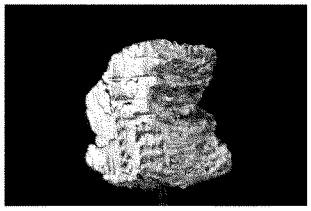


Niobium is used in various superalloys and in High-Speed, Low-Alloy (HSLA) steels. Niobium helps to strengthen steel and make it more lightweight and corrosion resistant. It is used extensively today in cars, trucks, buses, trains and other transportation systems to make them both safer and more fuel efficient. The HSLA and High Performance Steels (HPS) that contain Niobium help to ensure that bridges, pipelines, buildings, rail lines, and other structures can last decades longer than the current generation of structures that are now crumbling across America. Niobium-containing superalloys also play a key role in many military systems.

A listing of some of the applications that use Niobium follows:

- Steel mega-projects such as bridges, dams, buildings and many other structures
- Superalloys for use in aircraft engines and jet turbines
- Rockets, satellites and other aerospace platforms
- High-Strength, Low-Alloy (HSLA) steel components in automobiles, trucks, buses and trains
- High-pressure oil and gas pipelines
- Power plants
- Stainless steel
- Medical applications such as Magnetic Resonance Imaging and implants and braces
- Arc welding applications
- Nuclear power plants
- Superconductors
- Particle accelerators
- Batteries
- Optical systems
- Electronics

Scandium



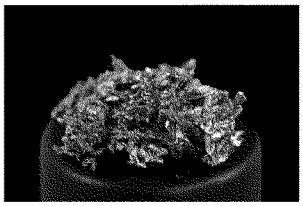
Scandium has important uses in environmentally preferred Solid Oxide Fuel Cells, as well as in ultra-high-performance aluminum alloys. Scandium greatly strengthens aluminum alloys and allows them to be reliably welded, which presents high potential savings for the commercial airline industry. Scandium-contained aluminum alloys can save airline operators approximately $9 million in net present value for a single B737-sized jetliner, assuming Scandium oxide pricing at $3,500/kg.[2]

Here is a list of some of the current and potential applications for Scandium:

- Solid Oxide Fuel Cells
- High-performance alloy parts
- Commercial and military aircraft
- Automotive
- High-intensity lighting
- Lasers
- High-voltage transmission components
- Additive manufacturing for alloy parts
- Ceramics
- Electronics
- Phosphors and Displays
- Sporting goods

Titanium

Titanium has the highest strength-to-density ratio of any metallic element, and it is used in a wide variety of sectors, including aerospace, national defense, chemical processing, desalination, automotive, health care, communications, sporting goods, and many others. Titanium also is used in the pigments in paints, plastics and paper, and as a photocatalyst.



In 2017, according to the USGS, an estimated 80% of titanium metal was used in aerospace applications; the remaining 20% was used in armor, chemical processing, marine hardware, medical implants, power generation, and consumer and other applications.

POLICY RECOMMENDATIONS FOR STRENGTHENING U.S. MINERAL SECURITY

The following are policy recommendations that should be considered by the Congress, and the Executive Branch, in order to strengthen America's mineral security. Some of these are specific to the three superalloy materials that NioCorp intends to produce, while others are more general in nature.

1. **Support passage of the critical minerals provisions contained in the current House-passed FY2019 National Defense Authorization Act.**

2. **Recognize that increased domestic production of strategic and critical materials will help catalyze investment in downstream, value-adding processing and manufacturing processes.** Downstream, value-adding supply chains tend to form when upstream supply chains are established that are reliable and secure. Upstream production in the U.S. of metals such as Niobium and Scandium will likely attract investment in new downstream businesses that can convert mined materials into more advanced forms (alloys, compounds, etc.). needed by end-use manufacturing.

3. **Encourage non-statutory administrative reforms to improve permitting efficiency.** While Congress examines possible legislative changes to the federal mining and mineral extraction permitting regimes, it should recognize that non-statutory reforms and permitting best practices by federal agencies can make a very significant difference in the time it takes for permitting processes to complete. For example:

   - ✓ Congress should encourage greater utilization of the FAST-41 process, approved as part of the Fixing America's Surface Transportation (FAST) Act and signed into law by President Obama on December 4, 2015, for domestic projects that produce materials that further the goals of Section 1428 of the FAST Act. That Section encourages the use of "durable, resilient, and sustainable materials" in highway bridges and other transportation-related structures. The Ferroniobium that we intend to produce in Nebraska is a critical additive to certain High-Strength Low-Alloy ("HSLA") steels that are increasingly used to build stronger and more corrosion resistant bridges and other transportation structures, which significantly extends design lifespans, decreases lifecycle costs, and reduces environmental impacts.

   - ✓ Require federal agencies to meet or exceed process deadlines laid out in current statute or forfeit their determinative role in a specific process. Of course, this reform also requires that federal agencies be provided with sufficient financial resources to do their jobs in the time required.

- ✓ Encourage that as many NEPA-level reviews by separate federal agencies as possible be conducted concurrently with other agencies, instead of consecutively. This is one of the goals of the FAST-41 process and should be applied more broadly where appropriate.

- ✓ Amend federal civil servant bonus performance criteria to include performance that is related to advancing resource development and project permitting.

- ✓ Require federal agencies to issue quarterly metrics reports, as does the Nebraska Department of Environmental Quality, reporting on "Received Applications," "Application Decisions," "Monthly Goals," and "Agency Inspections with Average Days to Complete Reports."

- ✓ Adopt systems such as those recently implement by the Nebraska Department of Environmental Quality (NDEQ) to encourage efficient processing of permitting applications. On a monthly basis, the NDEQ tracks and monitors key metrics around permit processing, such as permit backlog and processing times. The NDEQ then establishes initiatives to improve performance. The NDEQ has made notable improvements in permit processing times without additional legislation or appropriations using this system.

4. **Encourage greater use of High Performance Steels in infrastructure and construction projects.** States are making greater use of HSLA and HPS steels containing Niobium, Vanadium, and other metals in bridges and other infrastructure projects because of the enhanced strength and greatly extended working lifespans these materials provide to structures. Longer lived bridges can save taxpayers many billions of dollars in reduced lifecycle costs. Legislative incentives and financial assistance should be considered to encourage greater use of niobium-contained high-performance steels in federally funded infrastructure projects.

5. **Encourage the National Defense Stockpile to enter into purchase agreements with prospective producers of strategic and critical materials prior to the onset of domestic production.** Section 303(a)(1) of the Defense Production Act (50 U.S.C. Appx. §2093(a)) authorizes the DoD to encourage greater domestic production of critical and strategic materials by engaging in "commitments to purchase" strategic and critical materials. This could take the form of forward purchase agreements from prospective U.S. producers prior to the onset of commercial production. Such forward purchase agreements could be structured so that they are contingent on future appropriations. Such agreements would greatly assist prospective producers in raising project development funds from capital markets.

6. **Encourage federal agencies such as DOT, DOE, and DoD to analyze the benefits of a secure domestic supply of scandium for transportation, clean energy, and military uses.**

Conclusion

In conclusion, let me thank the members of this Committee – and Chairman Murkowski and Ranking Member Cantwell in particular – for your leadership and the several years of grinding hard work you have contributed to finding common sense approaches to addressing the challenges of critical minerals. This is certainly not an easy set of topics.

I also want to thank Nebraska Governor Pete Ricketts, and the members of the Nebraska Congressional delegation -- Senators Deb Fischer and Ben Sasse, and Congressmen Jeff Fortenberry, Don Bacon, and Adrian Smith -- for their ongoing support of this Project.

Our nation is preparing to tackle some formidable tasks: strengthening our national defense; rejuvenating our industrial and manufacturing base, repairing and rebuilding our transportation infrastructure; increasing the efficiency and effectiveness of our energy generation and distribution systems, among many others. As we work on these challenges, we also want to improve our environment performance wherever possible.

Critical minerals are the foundation that enables us to achieve each and every one of these goals. We can appropriate money to rebuild America. But we cannot create the critical minerals we need without first harvesting them from the Earth's crust. And, we cannot assume that nations that currently supply us with these minerals will continue to do so – particularly when so many do not have America's best interests at heart. The disruption that can occur when America's access to critical minerals is threatened -- or even cut off -- is not theoretical. In recent years, we have experienced it. It is less a question of if, but when. That is why America's current deficit of critical minerals production capacity represents a clear and present danger to our Nation that must be addressed soon.

Thank you very much.

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[i] Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. All figures are rounded to reflect the relative accuracy of the estimate and have been used to derive sub-totals, totals and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, SRK does not consider them to be material. All composites have been capped where appropriate. The reporting standard adopted for the reporting of the MRE uses the terminology, definitions and guidelines given in the Canadian Institute of Mining, Metallurgy and Petroleum Standards on Mineral Resources and Mineral Reserves (May 10, 2014) as required by NI 43-101.

The CHAIRMAN. Thank you, Mr. Sims.

Mr. Mintzes, welcome.

STATEMENT OF AARON MINTZES, SENIOR POLICY COUNSEL, EARTHWORKS

Mr. MINTZES. Good morning. Thank you, Madam Chair, Ranking Member Wyden and members of the Committee for the opportunity to testify before you on opportunities to strengthen the United States' mineral security.

My name is Aaron Mintzes. I'm with Earthworks. We're a nonprofit dedicated to protecting communities and the environment from the impacts of mineral and energy development while seeking sustainable solutions.

In December 2017 President Trump issued his critical minerals Executive Order (EO). The policy recommendations flowing from that EO are due on the President's desk this November.

We are deeply concerned about any critical minerals policy that attempts to limit the scope of environmental reviews or undermines public input in our government's mining decisions. We understand the metals are important and used in the manufacture of items we use every day, including minerals needed for renewable energies. Yet, simply because we designate a mineral as critical does not mean we need more mining. This is particularly important given the harms and costs mining has on communities and the environment, extracting these minerals from mines damages water quality frequently, forever.

Securing our supply of critical minerals, as Mr. Wyden noted, often has little to do with domestic mining. Supply chains, refining and product manufacturing occur globally. A number of our allied countries have both critical mineral supply and refining capacity. The best way to ensure a reliable supply of critical minerals is for Dr. Eggert's job, public and private partnerships, the sectors divest and research, conservation, recycling and substitution.

DoD has a national defense stockpile and, of course, the Committee, as the Chairman noted, has passed legislation with provisions improving critical minerals research, recycling, workforce training and supply chain management.

Securing our critical mineral supply does not require weakening of any of our environmental laws. Section 3(d) of the President's EO directs agencies toward, "streamlining leasing and permitting processes." Permit streamlining is tantamount to removing environmental and community protections. We worry the Administration may justify limiting public comment, tribal consultation, environmental study and judicial review because critical minerals have defense or other important applications.

The Administration has added to these concerns with the Critical Minerals Secretarial Order and CEQ's proposed NEPA regulations revisions. For nearly 50 years, NEPA, the National Environmental Policy Act, has provided certainty and predictability through a transparent process well understood by governments, permit applicants and affected communities. It ensures that Americans can take part in the review and development of projects affecting our social, economic and environmental health and it works. That's what Mr. Sims just said, it works. Public input has improved agen-

cy consideration of project alternatives and resulted in better environmental outcomes. Ultimately, NEPA is a source of strength and predictability. It helps lay the foundation for a mining company's social license to operate which gives domestic mining a distinct competitive advantage.

Other nations like China, without this longstanding commitment to public input in mining decisions, remain relatively undesirable destinations for mining investment. NEPA lowers investment risk as compared to jurisdictions without a similar public outreach process. Limiting NEPA or reducing meaningful public participation could actually undermine investment by revoking the industry's social license to operate.

Existing law already creates the kind of regulatory certainty mining companies seek. Mining is risky and mining companies crave that certainty. The 1872 Mining Law statute is still on the books from our Manifest Destiny era of westward expansion, still governs domestic mining. Under the 1872 law Americans have no choice in balancing mining with any competing land use. Federal land managers have little or no discretion with whether to permit a mine. And so, if a permittee seeks certainty on public lands, it doesn't get much more certain than that.

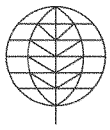
Besides, any critical mineral policy must also link with our rapid transition to 100 percent renewable energy. Critical minerals play an important role in our nation's emerging renewable energy industry and responsible sourcing of these minerals means clean energy can truly be clean.

Mining companies interested in getting on the ground floor and making clean energy clean may seek certification with the Initiative Responsible Mining Assurance, or IRMA, a multi-stakeholder mining certification that improves social and environmental performance and creates value for mines. The voluntary IRMA process provides investors, governments and mining impacted communities with a seal of approval that follows responsible practices. The standard is iterative, can be adapted to incentivize from the waste management practices that capture some of the byproducts on the critical minerals list. The private sector can help drive innovation. Honda expects to recycle 80 percent of their rare earths from some of their batteries, Siemens plans to recycle rare earths from some of their electric motor vehicles, and Congress and the Administration should focus their efforts on increasing funding research for the Critical Materials Institute. West Virginia has developed a pilot project that designed to harvest rare earth minerals from waste piles generated during abandoned coal mine reclamation.

Finally, conservation, efficiency, recycling, substitution will each do more to ensure available supply of critical minerals than any policy that limits community input in mining decisions. The United States should embrace innovation, demand best practices and lead the world in responsibly securing our critical mineral supply while protecting our precious water resources.

Thank you.

[The prepared statement of Mr. Mintzes follows:]



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Testimony of Aaron Mintzes, Senior Policy Counsel, Earthworks
Before the U.S. Senate Energy and Natural Resources Committee

The Department of Interior's Final List of Critical Minerals for 2018 and Opportunities to Strengthen the United States' Mineral Security

July 17, 2018

Thank you, Madam Chair, Ranking Member Cantwell, and Members of the Committee, for the opportunity to testify before you on the Department of Interior's Final List of Critical Minerals for 2018 and Opportunities to Strengthen the United States' Mineral Security.

My name is Aaron Mintzes, and I am Senior Policy Counsel at Earthworks. We are a non-profit organization dedicated to protecting communities and the environment from the destructive impacts of mineral and energy development, while seeking sustainable solutions. We work closely with a broad coalition of governments, Native Americans, citizen groups and other conservation organizations to improve policies governing hardrock mining and oil and gas development.

In December 2017, President Trump issued an Executive Order on a Federal Strategy to Ensure and Secure Reliable Supplies of Critical Minerals (EO).[i] The policy recommendations flowing from that EO are due to the President in November. We are deeply concerned about any critical minerals policy that attempts to limit the scope of environmental reviews or undermines public input in our government's mining decisions.

We understand that metals are important and used in the manufacture of items we use every day, including minerals needed to ensure a swift transition toward renewable energy. Yet, simply because we designate a mineral as critical does not mean we need more mining, or mining with fewer environmental safeguards. This is particularly important given the harms and costs mining has on communities and the environment. Extracting minerals damages water quality, frequently forever. No critical minerals policy should weaken community and environmental protections.

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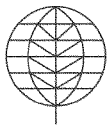
Critical Minerals Are Internationally Traded Commodities Often Owned by Foreign Companies

Securing our supply of critical minerals has little to do with domestic mining. Supply chains, refining and product manufacturing occur globally. This arrangement allows for greater efficiency, creating lower costs for consumers. A number of allied countries like Australia, Canada, Chile, and India have both available critical mineral supply and refining capacity.

Import dependence only matters when it accompanies a high risk of a supply chain disruption and no available alternatives. Yet, among the minerals the United States Geological Survey (USGS) designated as critical, our aluminum (bauxite) comes mainly from Jamaica. Our cesium, rubidium, magnesium, potash, and indium come from Canada. South Africa supplies us with chromium and platinum group metals (PGM). Mexico provides our fluorspar and Brazil provides our niobium. We mine geranium domestically and send it to Canada or Belgium for processing. Rhenium also comes from the United States and has robust global recycling. We have a helium a surplus. One Utah mine produces 85% of global beryllium.[ii]

Our laws also allow foreign companies to control our minerals, via subsidiaries, such as the Mountain Pass mine, a rare earth mine, now owned by a Chinese consortium and the Stillwater mine



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in South African ownership, the nation's only platinum and palladium mine.[iii] As a practical matter, minerals are internationally traded commodities on world markets often owned by foreign companies. Mining domestically does not guarantee the minerals stay here, usually minerals pass through many borders after extraction.

The best way to ensure a reliable supply of critical minerals is for the public and private sectors to invest in research, conservation, recycling, and substitution. The Department of Energy's research lab continues to provide valuable insights in an area still in great need of study. The Department of Defense maintains the National Defense Stockpile. This Committee has also passed legislation over the last few Congresses with provisions improving critical minerals research, recycling, workforce training, and supply chain management.

No Critical Minerals Policy Should Weaken the National Environmental Policy Act (NEPA); Securing Domestic Critical Mineral Supply Is Not About Permitting

Securing our critical mineral supply does not require any weakening of our environmental laws. Section 3(d) of the President's EO directs agencies toward "streamlining leasing and permitting processes to expedite exploration, production, reprocessing, recycling, and domestic refining of critical minerals."

Many communities affected by hardrock mining view permit "streamlining" as tantamount to removing environmental and community protections. We worry the Administration may justify limiting public comment, tribal consultation, environmental study and judicial review because critical minerals have defense or other applications. The Administration has added to these concerns with the Interior Department's critical minerals Secretarial Order[iv] and the Council of Environmental Quality's (CEQ) proposed National Environmental Policy Act (NEPA) regulations revisions. [v]

NEPA, often referred to as the environmental "Magna Carta", requires federal agencies to assess the environmental impacts of their actions.[vi] For nearly fifty years, NEPA has provided certainty and predictability through a transparent process well understood by federal regulators, permit applicants, and affected communities.

NEPA ensures that Americans can take part in the review and development of projects affecting our social, economic, and environmental health. The process provides an opportunity for communities to learn about proposed mines and offers agencies the chance to receive valuable public input. And it works. Public input has improved agency consideration of project alternatives and resulted in better environmental outcomes.

NEPA also aids permit efficiency. According to the Government Accountability Office (GAO), the average time it takes the Bureau of Land Management (BLM) to permit a mine is two years - not ten, not even seven.[vii] This period is competitive with most Western democracies with robust mining industries like Australia, Canada, Chile, and Norway. When a permit takes longer than average, often the reason is the low quality of information operators provide in their mine plans or the agencies' limited resources. Other times delays occur for perfectly legitimate reasons like changes in market conditions.

Ultimately, NEPA is a source of strength and predictability. It helps lay the foundation for a mining company's social license to operate (SLTO), which gives domestic mining a distinct competitive advantage. Other nations, like China, without this long-standing commitment to public input in mining decisions, remain relatively undesirable destinations for mining investment. NEPA lowers investment risk and reduces uncertainty as compared to jurisdictions without a similar public outreach process.

Mining companies benefit from the public participation process within NEPA. They could further benefit from joining the Initiative for Responsible Mining Assurance (IRMA), a multi-stakeholder and independently-verified responsible mining certification that improves social and environmental

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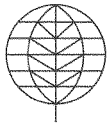

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performance and creates value for mines.[viii] When communities impacted by a proposed mine can voice their concerns, the mine can earn their SLTO.

There are some places not suitable for a mine. The proposed Pebble Mine would harm the world's largest wild salmon fishery in Bristol Bay. The Rock Creek Mine would tunnel underneath a Wilderness area and take endangered grizzly bears and bull trout. These projects are ill-advised and face steep opposition from local communities.

Mining should be balanced with other nearby land uses, which often generate longer lasting, sustainable economic activity. For instance, the outdoor economy — defined by bike, snow, trail and water sports as well as camping, fishing, hunting, motorcycling, off-roading and wildlife viewing — supports more than 7.6 million jobs and pays $124.5 billion in federal, state and local taxes. Americans spend $887 billion a year on outdoor recreation.[ix] The value of hunting, fishing, recreation, sacred sites, pristine landscapes and clean water often outweighs that of the minerals.

Any critical minerals policy must account for these issues and the communities whose water and air mineral development could harm. Securing adequate critical mineral supply need not come at great cost to the environment and Americans in mineral-rich states.

The United States of America Is Among the World's Most Attractive Destinations for Mining Investment

Any critical minerals policy should also account for the fact that, according to the mining industry, the United States of America is among the world's best places to mine. Annually, the Fraser Institute, a center-right Canadian think tank, surveys mining executives asking where they prefer to invest.

Last year, the Fraser Institute ranked 91 national and subnational jurisdictions according to their mining investment desirability, accounting for both mineral potential and policy perception.[x] For 2017 (the last year for which data is available), Nevada ranks 3rd, Arizona 9th, Alaska 10th, and Utah, 15th. China ranks 83rd.

America owes our mineral investment attractiveness to three factors:

1) The strength and certainty of our democratic institutions

2) Our rich mineral endowment

3) Our uniquely permissive mining laws and regulations

Mining is risky business and mining companies crave certainty. Attention to the rule of law, commitment to transparency, functional government, strong capital markets, all contribute to this certainty. And the 1872 Mining Law, a statute still on the books from our nation's Manifest Destiny era of Westward expansion, still governs domestic mining.[xi]

Existing Mining Laws Provide Regulatory Certainty for Permittees

The General Mining Law of 1872 considers mining the highest and best use of public lands, even where our public lands may be better suited for oil and gas drilling, coal mining, grazing, hunting, fishing, recreation, or conservation. Because of the 1872 Mining Law, mining wins. Federal land managers have limited to no discretion as to whether or not to grant a mine permit. For permit applicants seeking certainty, it does not get more certain than that. This nineteenth-century law robs twenty-first century Americans of the choice to select a different land use that competes with mining.

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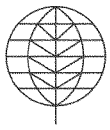

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It also grants mining companies easy access to the public's mineral wealth. To secure a mining claim, the miner needs to only discover a locatable mineral on public lands, stake a claim, and pay a one-time $212 fee plus another $155 annually. In exchange, they receive all the people's wealth below the surface without paying a dime in royalties to the taxpayer. Mining companies also receive generous tax breaks for capital investments and depleting our natural resources.

In addition to free and open access to these minerals, foreign and domestic mining companies benefit from our stable, predictable, fair, and open permitting process. Existing law provides the mining industry the certainty it needs, and NEPA provides the public outreach communities living near mines deserve. Limiting this well-established process or reducing meaningful public participation could actually undermine investment by revoking a company's SLTO.

Critical Minerals Policy Solutions Include Recycling, Reuse, Research, and Substitution

Any critical mineral policy must link with our rapid transition to 100% renewable energy. Critical minerals play an important role in our nation's emerging renewable energy industry and responsible sourcing of these minerals means clean energy can truly be clean, without some of the most harmful effects to water resources. Mining companies interested in getting in on the ground floor to make mining for renewable energy more responsible should consider seeking IRMA certification.

The voluntary IRMA process provides investors, governments, and mining impacted communities with a seal of approval that a mine follows responsible environmental, community, and sourcing practices. The standard could also be adapted not only to maximize recycling and reuse, but also to incentivize waste management practices that capture some of the byproducts on the Department of Interior's Critical Minerals List.

In addition to IRMA, the private sector can help conduct research and drive innovation. In Japan, Honda expects to recover 80 percent of rare-earth metals contained in some of their used nickel-metal-hydride car batteries. In Germany, Siemens is researching recycling rare earths from electric vehicle motors.[xii]

Congress and the Administration should also focus efforts on increasing funding for research, recycling, reuse, and alternatives. The Department of Energy leads a Critical Materials Institute with a $120 million budget to research alternatives, reduce waste, and diversify production. West Virginia University has developed a pilot project designed to harvest rare earth minerals from the waste piles generated during abandoned coal mine reclamation.

Conservation, efficiency, recycling and substitution will each do more to ensure available supply of critical minerals than policy efforts that limit community input in mining decisions that affect their water and health. The United States should embrace innovation, demand best practices, and lead the world in responsibly securing our critical mineral supply while protecting our precious water resources.

Thank you for allowing us to share our views on this important issue.

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[i] 83 Fed Reg. 23295 (May 18, 2018).
[ii] Schulz, K.J., DeYoung, J.H., Jr., Seal, R.R., II, and Bradley, D.C., eds., 2017, Critical mineral resources of the United States—Economic and environmental geology and prospects for future supply: U.S. Geological Survey Professional Paper 1802, 797 p., http://doi.org/10.3133/pp1802.

[iii] Mountain Pass sells for $20.5 million by Andrew Topf Mining.com
[iv] Secretarial Order 3359, Department of Interior, (December 21, 2017)
[v] CEQ Advanced Notice of a Proposed Rule Making (ANPRM) 40 CFR 1500-1508 Docket # CEQ-2018-0001
[vi] 42 U.S.C. 4321 et seq. (1970)
[vii] HARDROCK MINING: BLM and Forest Service Have Taken Some Actions to Expedite the Mine Plan Review Process but Could Do More GAO-16-165: Published: Jan 21, 2016. Publicly Released: Feb 22, 2016.

[viii] For more information on IRMA, please see http://www.responsiblemining.net/
[ix] Outdoor Industry Economy Report (April 25, 2017), Outdoor Industry Association
[x] Fraser Institute: Annual Survey of Mining Companies 2017

[xi] See 1872 Mining Law 101 https://earthworksaction.org/issues/1872_mining_law_101/
[xii] Van Gosen, B.S., Verplanck, P.L., Seal, R.R., II, Long, K.R., and Gambogi, Joseph, 2017, Rare-earth elements, chap. O of Schulz, K.J., DeYoung, J.H., Jr., Seal, R.R., II, and Bradley, D.C., eds., Critical mineral resources of the United States— Economic and environmental geology and prospects for future supply: U.S. Geological Survey Professional Paper 1802 p. O1–O31, https://doi.org/10.3133/pp1802O.

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The CHAIRMAN. Thank you, Mr. Mintzes.

Ms. Sayer, welcome.

STATEMENT OF LAUREL SAYER, PRESIDENT AND CEO, MIDAS GOLD IDAHO, INC.

Ms. SAYER. Chairman Murkowski and Senator Wyden and distinguished members of the Committee, my name is Laurel Sayer and I am President and CEO of Midas Gold Idaho. I appreciate the chance to come before you today to talk about our project, the Stibnite Gold Project.

Once permitted Stibnite will be a producer of both critical minerals and precious metals. We will also restore a historic mining legacy site and provide jobs in rural Idaho.

During World War II, Stibnite was essential for the war effort and produced more tungsten and antimony than any other mine in the U.S. and through on until the end of the Korean War. Both were critical minerals for defense. Ninety percent of the domestic antimony output and 40 percent of the domestic tungsten came from Stibnite, Idaho. However, operations at Stibnite did not go through the rigorous regulatory oversight and the site was left abandoned and in need of repair. This is where we come in.

Midas Gold has identified 4.5 million ounces of gold and 100 million pounds of antimony reserves remaining at Stibnite. In September of 2016 we delivered a Plan of Restoration and Operations, or PRO, to the Forest Service, our lead agency, to begin the NEPA permitting process. We designed the PRO with final closure in mind to ensure that the ESA-listed fish are reconnected to native spawning grounds that have been blocked for 80 years.

The PRO will remove, reprocess, repurpose and safely store millions of tons of spent ore and tailings left by prior operators and also repair the largest source of sedimentation in the East Fork of the South Fork of the Salmon River. The PRO laid out this radical idea that mining could be used to restore the environment.

We spent well over $20 million developing this plan right here which was summarized in a 486-page PRO and provided the regulators 21,564 pages, or 2.3 gigabytes, of data. Our initial planning was exhaustive.

The Forest Service must approve our plan of restoration and operations and review the project impacts pursuant to NEPA. And as you can see from our visual, we must receive over 50 permits and approvals before we can begin construction and operation.

My testimony is not to be misunderstood as advocacy for any weakening of environmental laws that play a part in permitting our project; however, since delivering our plan to the regulatory agencies almost two years ago, we have spent an additional $4 million paying for a Forest Service project manager and their third-party contractor. And in the last two years we spent $11 million on meeting those additional demands related to permitting.

The Committee can see from this visual, how far we have gone under NEPA and where we have left to go. Our NEPA schedule has slipped three times.

Each quarter that we fail to meet our deadline costs us $1.5 million in permitting costs payable to the Forest Service and their contractor and another $2.6 million for our personnel and consultants.

To date, we have invested $36 million in presenting our project to regulators and responding to their queries. And yet, we are still two years away from publication of a Record of Decision (ROD). At the current rate of expenditure, the amount will almost double before a ROD is issued. These are substantial costs to incur even before a shovel goes in the ground.

Neither Congress in the original Act nor courts which have reviewed NEPA challenges require perfection. The hallmark of NEPA review is that federal agency decision-makers should have before them a reasonable amount of information to make a reasonably informed decision. There are steps that can be taken to make this process work better.

The Federal Government should bring everyone around the same permitting table, including the applicant, but often this is not the case and a simple example illustrates this. Our regulators wanted us to analyze an alternative location for our tailing storage facility which request the Forest Service communicated to us. We spent considerable time and dollars internally and externally with consultants to evaluate the alternate location, prepare a written report and analysis and then submitted it to the agencies. We later found out that the original requesting regulator was talking about a different location and the whole process had to be repeated. If we are in the same room working together many unrealistic, uneconomic or technically infeasible project alternatives can be quickly eliminated saving everyone time and money.

The same holds true with ESA. The earlier project proponents and federal agencies can resolve issues before they become a problem. We are, as a Fish and Wildlife official told me, would be smart from the start.

Madam Chairman and distinguished members of this Committee, we will clean up the Stibnite site as we execute our PRO and leave this magnificent part of our state better off. It's the right thing to do because we are blessed to live and work in our beautiful home State of Idaho, and we want to keep it that way, so does our state legislature and a joint resolution supporting our project is attached to my testimony.

Again, I do not advocate for overlooking any required legal element of environmental review or reducing standards but future employment of Idahoans and environmental restoration hinges in the balance with each passing day while our project is undergoing environmental review.

Permitting can always be more efficient which is what we in the mining industry believe Congress intended in the first place through its environmental laws.

Thank you.

[The prepared statement of Ms. Sayer follows:]

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TESTIMONY OF LAUREL SAYER
PRESIDENT AND CEO OF MIDAS GOLD IDAHO, INC,
UNITED STATES SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
July 17, 2018

I. INTRODUCTION

Chairman Murkowski, Ranking Member Cantwell and distinguished members of the Committee, my name is Laurel Sayer and I am the President and CEO of Midas Gold Idaho Inc. I appreciate the chance to appear before you today to talk about our Stibnite Gold Project in Idaho. Once in production, Stibnite will be a producer of both critical minerals and precious metals, but we will also restore a historic mining legacy site while in operation.

During World War II, a small mining camp deep in the heart of Idaho grew virtually overnight to a town of 1,500 people and produced more tungsten and antimony than any other mine in the United States right through to the end of the Korean War. Both were critical minerals for defense; tungsten was needed for strengthening steel and antimony for hardening lead, manufacturing munitions and making the wooden flight decks of aircraft carriers flame resistant. In fact, ninety percent of the domestic antimony output and forty percent of the domestic tungsten came from Stibnite, Idaho. This production was so critical to the war effort that President Eisenhower sent the mine a telegram in 1943 thanking the workers for their contribution.

The wars ended and, eventually, Stibnite went largely dormant—small operations for gold occurred sporadically through the early 1980s and into the 1990s.

Stibnite was essential for the war effort and an entire town grew from the enterprise. However, unlike today, operations at Stibnite did not go through rigorous regulatory oversight nor was anyone required to reclaim the Site once the area was mined. Instead, the Site was left abandoned and, 65 years later, in need of repair.

Meanwhile, today there are no current domestic sources of antimony. China controls 76% of the global supply, followed by Russia with 7% and Tajikistan with 6%, of a mineral critical to the defense and energy sectors of the United States.

This is where we come in. Midas Gold identified over 4.5 million ounces of gold and 100 million pounds of antimony reserves remaining at Stibnite. This Project is a rare opportunity to fuel a

rural economy, to develop the sole domestic source of antimony, and to finally provide a permanent environmental remedy and restore the Site.

II. TESTIMONY

A. Stibnite and Antimony (Part of the Critical Minerals List Put Out by USGS)

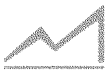
In September 2016, we delivered a Plan of Restoration and Operations (PRO) to the United States Forest Service. The PRO laid out a radical idea—that mining could be used to restore the environment. We designed our plan from the beginning with final closure in mind and to ensure that Endangered Species Act (ESA) listed fish are reconnected to native spawning grounds that have been blocked for 80 years.

We designed the plan to remove, reprocess or repurpose, and safely store millions of tons of spent ore and tailings left by prior operators and which we know have the potential to leach metals into ground and surface water. We designed the mining operations to repair the largest source of sedimentation in the East Fork of the South Fork of the Salmon River, which degrades water quality and impacts fish habitat. These things will not happen without private investment and partnership with the mining industry.

The Stibnite Gold Project also has the potential to again be the only domestic source of antimony. The term "antimony" comes from Greek, meaning "not alone" because it readily combines with other elements. It is crucial to our everyday lives and our military defense. According to USGS, in 2016, $152 million worth of antimony was consumed in the United States, but none was produced here.

Antimony trioxide is the most common industrial form of antimony, and it is almost entirely manufactured in China. Antimony is also the key ingredient in in the primer required for military grade munitions. The U.S. Department of Defense (DOD) noted the importance of antimony for defense applications in 2013, when the DOD ranked antimony #2 in the list of strategic and non-fuel defense material shortfalls (US DOD, 2013) and recommended strategic stockpiling of ~11,000 tons of antimony.

Today, antimony is used as a flame retardant in the coating around copper wires, in fabrics and in the solutions used for combatting forest fires. It is even a key ingredient to clarifying the glass in our smart phones. As the recent USGS report indicates, it plays a critical role in defense products, the energy sector as well as telecommunications and electronics. Today we rely only on limited recycled domestic sources of antimony, but most comes from imports from China. As a result, antimony was included in the USGS 2018 list of critical minerals.



B. Introduction to the Stibnite Regulatory Infrastructure

Mr. Chairman and distinguished members of the Committee, there is a myriad of Federal, State and local permits needed before our Project can proceed. Of course, the U.S. Forest Service must approve our Plan of Restoration and Operations (PRO) and review the project impacts pursuant to the National Environmental Policy Act (NEPA). That is Job One. But overall, we must receive over 50 permits and approvals before we can move forward.

However, because we are impacting and restoring certain wetlands and diverting existing streams on the Project Site in order to protect or improve water quality, we will also need a "dredge and fill" permit issued by the United States Army Corps of Engineers under Section 404 of the Clean Water Act.

And, because part of our PRO involves discharging through point sources into waters of the United States, we will need a National Pollutant Discharge Elimination System (NPDES) permit written by the State of Idaho and supported by the Environmental Protection Agency.

And very importantly, because all of this activity will take place in habitat for Endangered Species Act listed bull trout (under the jurisdiction of the United States Fish & Wildlife Service), and Chinook salmon (under the jurisdiction of NOAA Fisheries), our mine plan will require separate biological opinions from each of these Federal agencies under the ESA.

Then, all of this has to be analyzed by the Forest Service under the NEPA before our Plan of Restoration and Operations can finally be approved by the Federal government.

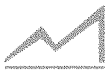
Also, because our Site is culturally significant to several Federally-recognized tribes in the State of Idaho, the Federal government is engaging in government-to-government consultation with three Tribes in Idaho as a prerequisite to approving our project.

Finally, there are many other Federal, state and local permits that must be issued as a part of the complete permitting review before we can begin construction and operations. Attached to my testimony as Exhibit 1 is a list of the permits that we need from our government in order to operate the Stibnite Gold Project.

1. NEPA Analysis

Before we delivered our plan to the US Forest Service, we spent well over $20 million collecting the baseline data needed, evaluating alternative development scenarios, and compiling the baseline reports required to present the government with the best possible plan for the Stibnite Gold Project. This plan was summarized in the 486-page PRO and the supporting baseline information provided to the regulators amounted to 25 reports totaling 21,564 pages, or 2.3 gigabytes of data. Our initial planning was exhaustive.

We delivered our plan to the regulatory agencies almost two years ago. In this time, we have spent an additional $4 million paying for the Forest Service project manager and their third-party contractor. Of course, we have our own employees and consultants that are fully



engaged in responding to the regulators' requests to help facilitate this project through the permitting process, plus we are still collecting and providing information to the permitting agencies. In the last two years we have spent $11 million on meeting these additional demands related to permitting.

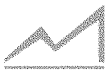
As we appear before this Committee today, our project milestones under NEPA have slipped for a third time, and each quarter that we fail to meet our deadline requires additional resources and costs us $1.5 million in permitting costs payable to the Forest Service and their contractor and $2.6 million for our personnel and consultants to address the quarterly permitting requirements. To be candid, there have been times when the delay was on our end. Yet, we have had moments of frustration where it appears this process has suffered from a lack of efficiency and effectiveness by federal agencies that has just added time. Attached to my testimony as Exhibit 2 is a flow chart of the NEPA review process and our current status.

To be clear, we understand the importance of environmental review under NEPA, and my testimony is not to be misunderstood as advocacy for any weakening of the several environmental laws that play a part in permitting our Project. As you have no doubt heard, and will hear today, equally robust permitting processes in first world countries like Canada and Australia are regularly completed in two to three years and at considerably lower cost. There is no reason that we in the United States cannot have an equally thorough, effective and efficient process that is completed in a timely manner.

Why does our process take so much longer? Often it is an inefficient process structure that is overly time consuming. For example, there is a method by which a Federal lead agency under NEPA requests additional information through an "RFAI" or Request for Additional Information. Normally, RFAIs are requested by Federal agencies when there is a data gap from the existing body of information and an RAFI is otherwise essential to continue the NEPA analysis. RFAIs are not unusual, but they are normally used as a last resort, kind of like a jury sending a note to a judge during their deliberations to clarify an evidentiary issue.

For our Project, we have received close to 100 RFAIs from our lead Federal agency. We have provided back nearly 93 responses so far comprising 25,135 pages of information that aggregates to a total of 1.5 gigabytes of information to regulators for their review under the RFAI process. This is *in addition* to the volumes of data already provided in the PRO and baseline reports. So far, the total for this NEPA review amounts to over 46,000 pages. Digesting the sheer volume of this data has likely been a significant cause for delays in advancing permitting. Regularly, the requests covered information we already provided and could have been answered through a simple conversation to point regulators to the right information rather than resorting to this overly bureaucratic process that adds weeks to the timeline.

I raise this example to help the Committee better understand that permitting and subsequent analysis under NEPA will always be inherently imperfect. The hallmark of NEPA review is that Federal agency decision makers should have before them a ***reasonable*** amount of information to make a ***reasonably*** "informed" decision.



Neither Congress in the original Act nor courts which have reviewed NEPA challenges require perfection. Instead, what is required is development of a ***reasonable*** amount of information and a meaningful and transparent public process so that the best decision can be made from the best information available. I fear that for many projects, a quest for permitting perfection and the pursuit of every piece of information and analysis of multiple scenarios may unduly delay putting good people to work, defer capital investment and, in our case, delay restoring the Site.

C. Recommendations on Permitting Efficiencies

I emphasize again, for the record, that Midas Gold does not support cutting corners or lowering environmental review standards for mining in the United States. Mining deserves appropriate review and reasonable financial assurances to protect water, wildlife and the environment.

We are here to tell you that mining will not be a viable industry in this Nation if we don't find a solution to manage the permitting process with more efficiency. The current regulatory process is an enormous deterrent to investment, from its uncertainty, time and cost. To date, we have invested $36 million in collecting, compiling, presenting our Project to regulators and responding to their queries, and yet we are still two years away from publication of a record of decision. At the current rate of expenditure, this amount will almost double before a ROD is issued. These are substantial costs to incur even before a shovel goes in the ground.

There are concrete steps that the government can take that will maintain the potency of our environmental protections and move viable projects forward more expeditiously and cost effectively, and all while losing none of the protections.

1. Working Better with the Project Applicant

The Federal government should bring everyone around the same permitting table, including the applicant, but often this is not the case. Nothing under the law should prevent those who know the most about the project from working closely and together with the Federal permitting agencies. The key is that we, as project advocates, understand that we cannot invade the province of Federal decision-making because that is not our role in the permitting process. When it comes time to deliberate, we will simply be excused and leave that to the Federal government and other regulators, which is as it should be.

However, if we were more able to work directly with the Federal and other agencies to respond to their questions, information needs and requests, a process that sometimes takes weeks could be turned into days and perhaps without the need to resort to formal information requests. In many of our cases, the answers are already contained within the PRO and baseline data we have already submitted to the regulators and it is just matter of pointing to the information already provided. But the formal written RFAI process makes even these simple responses time consuming. Closer collaboration with our Federal partners would ensure that

project proponents such as Midas Gold need not spend inordinate amounts of time and dollars on RFAIs and their responses, which the regulators then have to review.

A simple example illustrates the point. The regulators met and wanted us to analyze an alternative location for our tailings storage facility, which request the Forest Service communicated to us. We clarified, in a meeting and in writing with the Forest Service, the specific location requested, spent considerable time and dollars internally and externally with consultants to evaluate the alternative location, prepared a written report and analysis and submitted it to the agencies, only to find that the original requesting regulator was talking about a different location, and the whole process had to be repeated. If we had all been in the room together, we could have avoided significant delays and costs. This is a matter common sense.

2. Allow for Informal ESA Consultation in Parallel with NEPA and Resolve CERCLA Issues Early

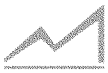
As we work through NEPA, there are specific issues regarding the Endangered Species Act and CERCLA that would be advantageous to all parties to work out in parallel to the NEPA process rather than waiting until the end, when it is too late to modify an approved plan.

With regards to the ESA, we are firm believers that listed species and the habitat on which they depend are always better off the earlier project proponents and the Federal agencies can get together to resolve issues before they become a problem.

Under the ESA, there is a process known as "informal" consultation. This is where project proponents (such as Midas Gold) get together with Fish & Wildlife Services and NOAA Fisheries, along with the other Federal action agencies, and informally work through project design issues before formal consultation begins under Section 7 and the clock starts ticking. If informal consultation is executed appropriately, we are all, as one senior Fish & Wildlife Service official tells me, "smart from the start."

If this process works as it should, potential project impacts can be addressed early and potentially redesigned more favorably to protect listed species and habitat instead of mid-stream during a NEPA process designed to select a preferred alternative. Important time may be lost because the process has to go backwards and reevaluate the impacts of the redesign due to input from the Services under the ESA. We know from first-hand experience that the Services prefer this approach, and we are great proponents of any reforms that get project applicants together with Fish & Wildlife Service and NOAA Fisheries as soon as possible.

With regards to CERCLA, the Stibnite Project Site is in an area subject to previous Superfund actions – hence it is a "Brownfields" site. In order to fulfill the vision of putting Idahoans to work and mining precious metals and critical minerals such as antimony as well as fixing the legacy impacts that remain at Site, we must have certainty under the Federal Superfund law before we disturb these areas on the Project Site. Undoubtedly, there are many other abandoned mining projects that are in similar circumstances but are avoided due to the



uncertainty created by their Brownfields status. Implementing improved certainty for Brownfields sites would enhance the potential for such sites to be remediated at industry cost, as opposed to being left abandoned or becoming a government problem.

3. Efficiency in Developing Alternatives Analysis

Addressing development of alternatives, which is the "heart" of NEPA, I concur with the voices of some in the regulated community that the best NEPA analysis should not be measured by the development of any **and all** possible alternatives for review. Hundreds of pages written to explain alternatives that do not address the original purpose and need of the NEPA review in the first place is not a successful process.

The better approach is development of elements of a proposed action that makes technological and economic sense for the underlying project so that the important discussions on project design are reserved for project elements that have a reasonable chance of later being implemented. With respect to our Stibnite Gold Project, we early on evaluated and eliminated project alternatives that made no sense to the Project operations, as a matter of environmental protection, technical feasibility and economics, and we explained why in our PRO.

NEPA could be better served by exploring potential efficiencies to reasoned decision making. The most important efficiency involves a fundamental understanding that a project proponent is the best source of information on the project's impact on the environment. Both the Federal government and the economic opportunity embodied in reaching a conclusion on environmental review is best served when – no surprise here - project applicants and Federal government are in the same room, working together, to address concerns, resolve problems and come to solutions. Many unrealistic, uneconomic or technically infeasible alternatives could be quickly eliminated by a roundtable discussion, saving time and money.

As this Committee discusses statutory reform, Congress should consider putting mandatory timelines for decision making in the NEPA process so that for the regulated community and the regulators, there is certainty that we will finish what we start.

4. Should there be a Priority for Projects that Improve the Environment and Can be Linked to Strategic Minerals?

Mr. Chairman and distinguished members of this Committee, I don't know of another mining project that fulfills the vision of providing economic hope and opportunity in rural America - in this instance, my home state of Idaho - while fulfilling goals of laudable environmental stewardship and proving a source of domestic critical minerals than the Stibnite Gold Project.

We will clean up the Stibnite Site as we execute our PRO and leave this beautiful part of our State better off, not only because it is the right thing to do, but because as fiercely proud Idahoans, we want to continue to live and work in one of the most beautiful places in the United States.

Given these commitments, where environmental remediation is a key component of any natural resources business model, we believe our Project is one that should receive priority attention from the Federal government. Particularly where Stibnite will soon become the only domestic source of the designated critical mineral antimony, and here, where Site restoration is an essential component of the Plan **of Restoration and** Operations, such projects should be permitted with all due speed by the Federal government and with no lesser thoroughness or reduction in standards. These very same goals were reiterated in a resolution passed and supported by the leadership of both parties in both houses of the Idaho State Legislature and delivered to the President, the Federal Agencies and the Idaho delegation of this Federal Congress, which I am attaching to my testimony as Exhibit 3.

III. CONCLUSION

In closing, I greatly appreciate the opportunity to appear before this Committee and discuss the Stibnite Gold Project in Idaho. It is a Plan of Restoration and Operations that should be approved by the Federal government as efficiently and timely as possible. Future employment of Idahoans and environmental restoration hinges in the balance with each passing day while our Project is undergoing environmental review.

And to reiterate for one last time, I do not advocate overlooking any required legal element of environmental review or reducing standards. Rather, environmental review and permitting can always be more efficient, which is what we in the mining industry believe Congress intended in the first place through its environmental laws.

THE STIBNITE GOLD PROJECT
PERMITTING

APPROVALS & ACTIONS RELATED TO NEPA

Point of Compliance Financial Assurance
Stream Channel Alteration Mine Tailings Impoundment
Forest Plan Amendments 401: Water Quality Certification
NPDES: Water Discharges Native American Consultation
Cultural Clearance NEPA Air Quality Cyanide Permit
Power Line ROW Idaho Roadless Rule
Idaho Department of Lands Reclamation Approval
Road Use Permit Mineral Material Permit (Borrow Sources)
Endangered Species Consultation ROD Water Rights
404: Clean Water Act Detailed Mitigation Plans
Transportation Impact Study

APPROVALS & ACTIONS ANCILLARY TO NEPA

County Building Permit Solid Waste Permit FCC: Radio Licenses
Spill Prevention Control & Countermeasure Plan (SPCC)
EPA Generator ID# Planning & Zoning - Conditional Use Permit
MSGP Storm Water Pollution Prevention Plan (SWPPP) Operations
SGP SWPPP Construction Timber Sale Permit & Contract
Food Establishment ANCILLARY Potable Water
Burn Permit
Explosives Permit State & Federal Financial Assurance
MSHA Mine ID# & Saftey Plan Septic System Approval
Waste Water Treatment County Road Use Authorization

Exhibit 1

MIDAS GOLD

THE STIBNITE GOLD PROJECT
NEPA PERMITTING PROCESS

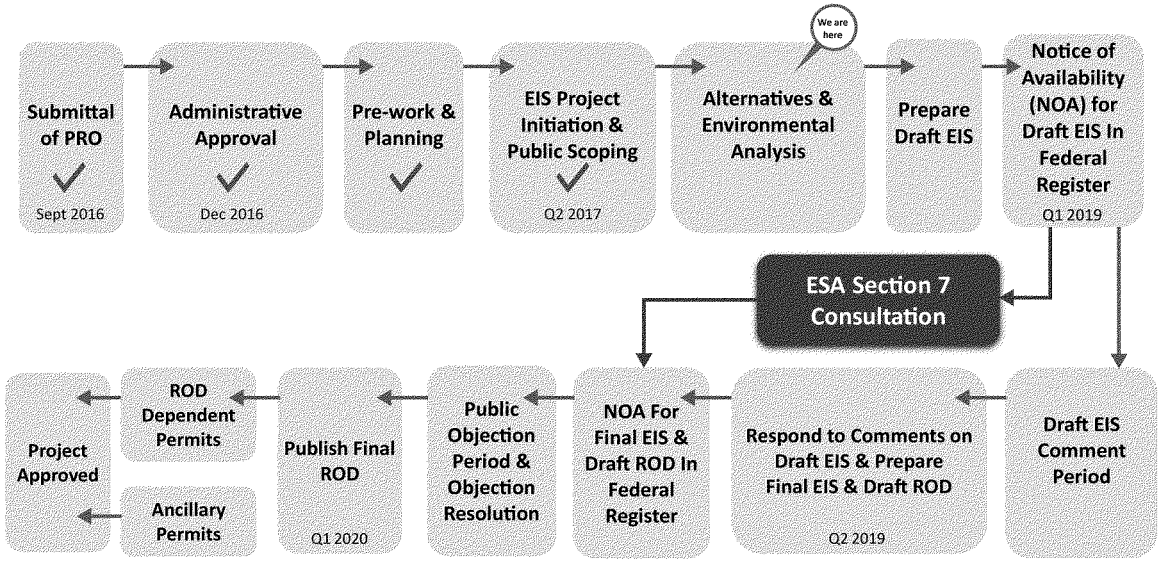


Exhibit 2

MIDAS GOLD

LEGISLATURE OF THE STATE OF IDAHO
Sixty-fourth Legislature Second Regular Session - 2018

IN THE HOUSE OF REPRESENTATIVES

HOUSE JOINT MEMORIAL NO. 10

BY RESOURCES AND CONSERVATION COMMITTEE

A JOINT MEMORIAL

TO THE PRESIDENT OF THE UNITED STATES, THE SECRETARY OF AGRICULTURE, THE SECRETARY OF THE INTERIOR, THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY AND TO THE CONGRESSIONAL DELEGATION REPRESENTING THE STATE OF IDAHO IN THE CONGRESS OF THE UNITED STATES.

We, your Memorialists, the House of Representatives and the Senate of the State of Idaho assembled in the Second Regular Session of the Sixty-fourth Idaho Legislature, do hereby respectfully represent that:

WHEREAS, mining played an integral role in the settlement of the West and Idaho in particular, hence its motto "The Gem State"; and

WHEREAS, mining activity for minerals including tungsten, antimony, gold and silver has taken place in the Stibnite Mining District in Valley County, Idaho, since 1899; and

WHEREAS, the supply of tungsten and antimony from the Stibnite Mining District was critical to the United States war efforts during World War II and the Korean War; and

WHEREAS, after decades of mining activity that largely pre-dated state and federal regulatory guidelines, standards and oversight left the Stibnite area in need of repair and a legacy of millions of tons of unlined tailings, blocked fish passage and conditions degrading water quality; and

WHEREAS, Midas Gold Idaho, Inc., has proposed to redevelop a portion of the historic Stibnite Mining District as outlined in the Stibnite Gold Project Plan of Restoration and Operations, delivered to the United States Forest Service in September 2016 for review under the National Environmental Policy Act (NEPA); and

WHEREAS, the Stibnite Gold Project is designed to clean up legacy environmental impacts before and during mining; and

WHEREAS, the United States dependency on foreign minerals has doubled in the last twenty years, and China controls 83% of the world's antimony resources. The Stibnite Gold Project would be the only domestic source of primary antimony, a critical component for flame retardants essential to the defense and energy sectors and for metal strengthening; and

WHEREAS, bureaucratic delays and redundant policies have expanded the time frame for environmental permitting to anywhere from seven to ten years, or longer, which is considerably longer than other countries with comparable environmental standards; and

WHEREAS, modern regulations require that companies set aside adequate financial assurances to cover the cost of environmental cleanup, ensuring that reclamation is completed; and

WHEREAS, once approved, the Stibnite Gold Project will provide a $1 billion investment in Idaho, including upgrades to public infrastructure such as roads and power lines in rural Idaho. The project will provide approximately 1,000 well-paying direct and indirect jobs to Idahoans, and expand

Exhibit 3

the economy with more than $40 million in direct annual payroll during operations and hundreds of millions in federal, state and local taxes over the life of the project. This will be an economic boon to the people and businesses of the great State of Idaho, where rural communities have been hard-hit over recent decades; and

WHEREAS, over the last seven years, Midas Gold Idaho's involvement in the community, commitment to building a mine that will help the community and the environment, and dedication to being a partner with local communities proves they are the right team to undertake this project.

NOW, THEREFORE, BE IT RESOLVED by the members of the Second Regular Session of the Sixty-fourth Idaho Legislature, the House of Representatives and the Senate concurring therein, that the State of Idaho supports actions by the U.S. Forest Service and other federal agencies, in partnership with agencies of the great State of Idaho and Valley County, to move forward to approve the Stibnite Gold Project in a timely and cost-effective manner to permit the redevelopment and restoration of the site.

BE IT FURTHER RESOLVED that we believe Midas Gold Idaho's commitment to mining in a way that restores and protects the environment will serve as a global template for responsible, sustainable and successful mining practices.

BE IT FURTHER RESOLVED that the federal government agencies commit adequate, experienced and knowledgeable personnel and sufficient financial resources to complete the review under NEPA and other laws and regulations as expeditiously as possible, while ensuring compliance with those laws and regulations.

BE IT FURTHER RESOLVED that the Chief Clerk of the House of Representatives be, and she is hereby authorized and directed to forward a copy of this Memorial to the President of the United States, the Secretary of Agriculture, the Secretary of the Interior, the Administrator of the Environmental Protection Agency, and to the congressional delegation representing the State of Idaho in the Congress of the United States.

The CHAIRMAN. Thank you, Ms. Sayer.

Mr. Gregory.

STATEMENT OF GREG GREGORY, PRESIDENT, MATERION NATURAL RESOURCES

Mr. GREGORY. Good morning, Chairman Murkowski, Senator Wyden and distinguished members of the Committee.

Thank you for inviting me to participate in this hearing on the Department of the Interior's Final List of Critical Minerals.

My name is Greg Gregory. I am President of Materion Natural Resources, and I work in Utah at the only domestic mine for production of beryllium.

My parent company, Materion Corporation, is a publicly traded company founded in 1931 and headquartered in Cleveland, Ohio, with 2,600 employees and 33 locations worldwide. In addition to mining and refining beryllium, Materion works with 25 of the 35 critical minerals listed by the Department of Interior.

Materion products are used in everything from delicate sensors found in medical devices and implants to the harsh environments found in mining and oil and gas exploration.

The product we're known for, beryllium, is the only mineral listed by the Department of Defense as both strategic and critical.

Materion strongly urges a whole of government policy approach to the issue of minerals and material security. We also recommend that the government encourage production from domestic sources by buying American critical minerals and components made from American critical minerals, especially in the defense and nuclear supply chains.

These policies broadly align with initiatives already approved or under consideration within the Executive Branch. Senior government officials consistently understand the need for a secure, affordable supply chain for strategic and critical minerals such as beryllium but the lack of a clear governmentwide policy concerning critical minerals has, at times, led to mistakes at the operational levels that have threatened success of the broader strategy.

Beryllium, a space-age metal that is very strong and light with unique properties, enables high-tech military sensors, nuclear devices, mammography imaging and computers to name a few.

My company operates the only mine-to-mill supply chain for beryllium in the world and is the only company that can say its beryllium products are fully made in America.

For beryllium metal or high beryllium content materials, the market is driven primarily by government-funded applications. For low beryllium content materials such as copper-beryllium alloys, the markets are driven primarily by commercial applications. The two sides of our businesses are closely related.

Materion is glad the government has taken steps to secure beryllium supplies including the creation of the Pebble Plant in Ohio.

Between 2005 and 2011, Materion partnered with the government through the Defense Production Act Title III Office to build the first beryllium metal production facility in the United States in more than 50 years. Materion continues to work with the government, especially within the Departments of Defense and Energy, to ensure that beryllium remains available for government needs.

The successful mine-to-market strategy shows how a government program can successfully identify and address a materials vulnerability and turn it into a source of strength for the American military and for American industry.

With that being said, we see several challenges in critical minerals policies, especially for beryllium. Regulatory initiatives in Europe and the U.S., such as the 2017 OSHA standard, continue to threaten Materion's ability to produce beryllium. The OSHA standard was recently revised pending final rulemaking following litigation brought by Materion and other groups, but we remain concerned until the rule is completed.

Within the Department of Defense, which generally recognizes the importance of a secure beryllium supply chain, there are individual program offices that undermine the Department's overall strategy by trying to source beryllium from non-allied, foreign sources. These regulations and procurement decisions do little or nothing to improve safety, but they will have significant effects on security for the U.S. military and the wider U.S. industrial base.

Critical minerals, such as beryllium, are key to both economic and military strength. A whole of government approach to security of supply, including a review of regulatory policies, domestic sourcing legislation, investment in critical in item uses and industrial technologies should be considered to ensure access to these minerals in the future.

Materion is glad to see that both Congress and the Administration are engaging with these concerns in a realistic and forthright manner and we look forward to supplying the U.S. Government and consumer needs for years to come.

Thank you and I look forward to your question.

[The prepared statement of Mr. Gregory follows:]

Written Statement by:
Greg Gregory
President
Materion Natural Resources

Senate Committee on Energy and Natural Resources
July 17, 2018

Good morning Chairwoman Murkowski, Ranking Member Cantwell and distinguished members of the Committee. Thank you for inviting me to participate in this timely hearing on the Department of the Interior's Final List of Critical Minerals. My name is Greg Gregory. I am President of Materion Natural Resources and work in Utah at the only domestic mine for beryllium. I am also currently a board member and past president of the Utah Mining Association and on the board of directors for the National Mining Association. My parent company, Materion Corporation, is a publicly traded company founded in 1931 and headquartered in Cleveland, Ohio, with 2600 employees and 33 locations worldwide. Materion mines beryllium ore in Juab County, Utah, and extracts the beryllium in the form of beryllium hydroxide in a mill in Millard County Utah. Materion manufactures advanced engineered products, some containing beryllium and almost all containing critical minerals. These are used in a wide variety of applications that contribute to our national defense and homeland security; diagnosis and treatment of diseases; vehicle safety and fuel efficiency; development of clean energy; space exploration and scientific discovery; and the ability to keep us connected, informed and entertained. For example, our metal alloys are used in landing gear in commercial airliners, oil and gas drilling machinery, and connectors and switches in mobile devices and appliances. Our optics, alloys and clad metals can be found in satellite technology, auto navigation systems, automatic braking systems, front and rear cameras and other sensors. Materion's inorganic chemical phosphors make LEDs more efficient and allow for better colors of light output, and also enable printing inks to change color, making it harder for money to be counterfeited worldwide. Our thin film deposition capabilities enable high accuracy and consistency — critical characteristics for medical testing devices and technology. Our unique combinations of different metals can be found in electric and hybrid cars, as well as medical implantable electronics, such as pacemakers.

The business that I run operates the only fully integrated mine to mill supplier of pure beryllium metal and beryllium-containing materials worldwide and is the only supplier of beryllium-containing materials that can say it is "Made in America." The other significant suppliers of beryllium are located in China and Kazakhstan.

Beryllium is a space-age metal with one-of-a-kind properties. Beryllium is lighter than aluminum, with a specific stiffness six times that of steel and is invisible to X-rays. Beryllium is essential in national defense and space exploration. In fact, beryllium is the <u>only</u> material deemed both strategic and critical to the United States by the Department of Defense. Beryllium was also designated by the USGS as critical on its Final List of Critical Minerals.

Beryllium, and alloys containing beryllium, are used in tactical optical systems, airborne and space surveillance systems, ballistic missile defense and strategic weapons. Due to many attributes, beryllium provides unsurpassed performance for critical applications. Beyond national defense, beryllium enables prominent life-saving end-uses including airplane electric connectors, automobile airbags and electronic braking systems, weather forecasting satellites, chemical

detection, fire suppression sprinkler systems, emergency rescue equipment, and high resolution X-ray mammography windows. In 2012 the winners of the Nobel Prize in Physics used beryllium to create the first sub-atomic computer chip with the computing power of every computer on earth. The versatility of this irreplaceable mineral showcases the linkage between the defense and commercial markets when it comes to critical minerals.

For beryllium metal or high beryllium-content materials, the market is driven primarily by government-funded applications. These include aerospace, military, nuclear test reactors, and high-energy particle physics research undertaken by particle colliders and synchrotrons. It has long been Materion's goal to diversify our high beryllium-content business with more commercially driven applications, such as the international fusion reactor ITER Project, but high-beryllium sales are still dominated by government needs.

For low beryllium-content materials, such as copper-beryllium alloys, the markets are driven primarily by commercial applications, such as electronics and telecommunications and undersea communications cables, which are complementary to that of the high beryllium-content materials.

Materion is therefore conscious of the government's roles as both customer and regulator. The government has an important interest in maintaining continuity of supply, something that Materion has assisted with whenever requested. This supports both the commercial market for low-beryllium content products and the government market for high-beryllium content systems.

There are currently multiple threats to continuing beryllium supply. In Europe, where regulatory initiatives have significant effects on U.S. beryllium production, there are two very real current examples: first, the Registration, Evaluation, Authorization and Restriction of Chemicals – Community Rolling Action Plan (REACH-CoRAP) regulatory initiative that leads to substitution of beryllium and second, technically infeasible worker exposure limits for beryllium. In the US, the Occupational Safety and Health Administration's recent final beryllium standard, which, until legally challenged, included technically and economically infeasible ancillary provisions. The rewrite of this standard remains a concern until the new related rulemaking is completed. The Air Force has tried to acquire beryllium from non-allied foreign sources with unreliable supply chains. These regulations and procurement decisions do little or nothing to improve safety, but they will have significant effects on security for the U.S. military and the wider U.S. industrial base.

The government has previously taken positive steps to ensure the availability of beryllium for defense needs. Between 2005 and 2011, Materion partnered with the government, through the Defense Production Act Title III office, to build the first beryllium metal production facility in the United States in more than 50 years. Materion continues to work with the government, especially within the Department of Defense and Department of Energy, to ensure that beryllium remains available for government needs. This successful mine-to-market strategy shows how a U.S. government program can successfully identify and address a materials vulnerability and turn it into a source of strength for the American military and American industry.

However, Materion strongly urges a whole-of-government approach to the issue of minerals and materials security. The lack of such a strategy has threatened to undo much of the good work that the government has done in the beryllium industry. For instance, individual programs within the Department of Defense have sourced material from Kazakhstan, even as the Department of Defense works with Materion to ensure a secure and robust domestic industry. Within the National Nuclear Security Administration, parochial interests have at times disrupted the development and execution of a beryllium strategy. As previously mentioned, rules lacking scientific or sound policy grounds were implemented by OSHA that, but for a legal challenge, would have threatened the ability of U.S. defense industrial base companies to continue supplying needed beryllium parts to the U.S. military.

These individual missteps should not obscure the overall success of the government's beryllium policy. Senior government officials, when they have gotten involved, have consistently understood the need for a secure, affordable supply chain for this strategic and critical mineral. But the lack of a clear, government-wide policy concerning critical minerals has, at times, led to mistakes at the operational levels that have threatened the success of the broader strategy.

The federal government's critical minerals policy must therefore be integrated across departmental and agency lines so that misguided legislative, regulatory and procurement standards do not adversely affect the supply of critical minerals. Beryllium, and other critical minerals, are needed not only for the commercial market and key industrial applications, but also for national defense requirements. A whole-of-government approach to security of supply is necessary to ensure access to these important resources. This whole-of-government approach should include a review of regulatory policies, domestic sourcing legislation, investment in critical end-item uses, and investment in industrial technologies. Materion is glad to see that both Congress and the Administration are engaging with these concerns in a realistic and forthright manner, and we look forward to supplying U.S. government and economic needs for years to come.

Thank you.

The CHAIRMAN. Thank you, Mr. Gregory, and thank you, each of you for your comments this morning. Good panel.

Dr. Fortier, let me begin with you.

You have indicated that when the list was put together that it was a cooperative collaborative. You had, obviously it is USGS, BLM, you have the interagency which, I think, is important. I further understand that there is to be a report, basically an action report, that will be delivered to the President in August. Is that correct?

Dr. FORTIER. I believe the date is now September.

The CHAIRMAN. September.

Dr. FORTIER. Yes.

The CHAIRMAN. Okay, so we are pushing the date back.

My question to you is, we now have a list.

Dr. FORTIER. Yes.

The CHAIRMAN. There are some who argue that the list isn't comprehensive enough. They did not get their mineral on. Some have generated a little bit of controversy. Uranium is clearly in that category.

But a couple questions. Is this a list that will evolve? In other words, will we see updates to the list? What can we expect out of this action report?

Because it is one thing to have a list, and I want to talk about whether or not there is an advantage to being on the list if you are designated as a critical mineral, but what is the process going forward and what might we expect in September in terms of action plan?

Dr. FORTIER. Yes. Well, to address your first question about whether the list is final. It is not our intention to put out a list that is final. It's final for this first phase, but the intention is to revisit this periodically. The mineral criticality is——

The CHAIRMAN. Like annually or——

Dr. FORTIER. We haven't decided on the exact timing yet. So, we update the NSTC screening methodology annually. The Europeans update their critical mineral list every three years. So there are different schools of thoughts about how you should approach this.

The CHAIRMAN. Yes.

Dr. FORTIER. We haven't agreed on that yet.

But this is an issue that does evolve as our import reliance changes, as country concentration changes. We need to take those factors into account as well as additional, new applications. So it's not a static process. It will be renewed periodically.

You know, in terms of the next steps and what is to come out of this effort. The Department of Commerce is leading the effort to develop a full report to comply with the different directives in the Executive Order that will address all the different aspects of critical mineral issues and strategies, including trade with reliable partners, options for substitution, needs for improved recycling, the improvement of the U.S. mapping of the geology and geophysics and topography of the United States, as well as addressing permitting issues. So the report is intended to lay out options for the Administration to consider to address these perceived strategic vulnerabilities that are at risk.

The CHAIRMAN. Let me ask then about that and recognizing that it is not just identifying the minerals, it is looking to those technologies that can allow for a level of reuse or alternatives. It is the whole package.

The Critical Minerals Institute that Dr. Eggert is involved with, do you derive good benefit from the research that comes from them?

Dr. FORTIER. Yes, they clearly are focused on a different part of the supply chain than the USGS is. We're more focused on mining and mineral processing, but it's complementary.

The CHAIRMAN. And that is, I mean, looking at what the mission and Dr. Eggert, what you have outlined, it seems that within DOI there is a clear understanding. We have a vulnerability when it comes to our critical minerals. We need to identify them. We need to have an action plan. We need to work on certain aspects of permitting and you have that view.

Within the Department of Energy, here is a very real role, and yet I understand that in the 2019 budget request the Administration intends to eliminate the funding and ultimately close the Critical Minerals Institute at DOE. Do we have a disconnect between what is going on in DOI and DOE, Dr. Eggert?

Dr. EGGERT. There are competing proposals, I think it's fair to say.

As I understand it, as you say, the President's request zeros out the Critical Materials Institute but my understanding also is that both versions of the Energy et cetera minibus, both the House and the Senate, include another year of funding for the Critical Materials Institute——

The CHAIRMAN. I appreciate that. It sounds like a very politically correct answer.

But I guess I want to know that we are doing this on all fronts because as we develop this strategy and really a whole of government approach, which I think is the right approach, involve everybody because it goes across agencies. Ms. Sayer has indicated the issues that she has working with Forest Service. Mr. Gregory, you are with the Department of Defense. We all have to be in this together.

Senator Wyden is very concerned on the trade in the commerce side of it. But it seems to me that we clearly have an application for the research and development that will go on. We will not be able to produce everything on our own. So, how we can reuse, how we can just be smarter with that, I think, is something that we should focus on.

Let me turn to Senator Wyden.

Senator WYDEN. Thank you very much, Madam Chair.

Dr. Eggert, let me start with you.

As I indicated, a few years ago, Senator Murkowski and I had a bipartisan bill and it was good for industry, it was good for companies as it related to supply, and it didn't unravel, for example, protection for water and communities and places that would get hurt by reckless policies. Right now, the Administration is looking at policies that move us away from both of those objectives, particularly on the issue of tariffs.

What I have always said is they ought to be part of the trade tool kit, but they have to make sense. It seems to me the President now is embarking on shooting American manufacturers in the foot by arbitrarily imposing tariffs on the raw materials that our companies need. For example, this month the Administration proposed $200 billion in tariffs on China, including virtually all critical materials. In your view, what kind of effect would that have on the ability of our companies to get access to the materials they need to be in the manufacturing business?

Dr. EGGERT. Clearly, imposing tariffs on imported intermediate products containing critical materials will increase costs for U.S. manufacturers which, for those that compete in international markets, will reduce their competitiveness.

Senator WYDEN. So it would be your view, having looked at this, and you are an economist so you do this for a living, that the Trump approach is going to harm the ability of American manufacturers to compete against others around the world who do not have tariffs imposed on their raw materials?

Dr. EGGERT. As I've testified previously and again today, I'm a strong proponent of undistorted international trade and multilateral approaches toward reducing tariffs.

Senator WYDEN. So, is that a yes?

I mean, I am talking about being able to tell an American company, and I have consistently been for trade. One out of five jobs in my state revolves around trade. The trade jobs often pay better.

But I am not for ill-advised policies. I think these tariffs are. Yes or no, will these tariffs hurt the ability of our U.S. companies to compete with people around the world who do not have tariffs imposed on their raw materials? I think that is a yes or no.

Dr. EGGERT. Well, the answer is yes.

Senator WYDEN. Okay, thank you.

Let me ask you one other question with respect to Chinese market manipulation of the market for rare earths, because this has already been shown to wreak havoc on our production.

Mountain Pass, a rare earth mine in California with the potential to reinvigorate U.S. rare earth production, had to declare bankruptcy in 2015 and they were basically put out of business because of Chinese market manipulation. This was a mine that was relicensed. It met the Murkowski-Wyden objective, our lodestar. It met the U.S. environmental standards, and we showed production and environmental protection are not mutually exclusive. Now Mountain Pass has been bought by a Chinese company which is going to control production.

What effect would a mine like Mountain Pass have on U.S. domestic production if it really got to operate in a free and undistorted market?

Dr. EGGERT. Two quick responses.

One, Mountain Pass could be an important starting point to reestablishing a U.S., or at least North American, supply chain for rare earths.

Second, I think it's incorrect to say that it was purchased by a Chinese company. That Chinese company has, I think, eight or nine percent ownership of the equity in the company, but it's a non-voting——

Senator WYDEN. So who is going to control production?

Dr. EGGERT. It will be the owners overall, the vast majority of which is non-Chinese.

Senator WYDEN. Alright.

So you think Mountain Pass though, from the standpoint of the U.S. domestic market, really could make a difference in terms of rejuvenating a free and undistorted market?

That is my basic, kind of——

Dr. EGGERT. It could be a very important starting point, yes, for an extensive supply chain of rare earths.

Senator WYDEN. Well, I want it understood that I also consider Chinese market manipulation to be a serious problem, and I will look forward to continuing that discussion with you.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Wyden.

Senator Daines.

Senator DAINES. Chair Murkowski, Senator Wyden, thank you for holding this hearing.

I am going to start this conversation by showing you my iPhone. Many of the minerals that we are talking about here today can be found in everyday devices like an iPhone. In fact, many of them we are 100 percent dependent on.

For example, manganese, tantalum, vanadium, gallium, all 100 percent dependent on imports; bismuth, 96 percent; tungsten, 50 percent. The point is these minerals are critical for our consumer economy. They are also critical for our defense industry. I will talk about that more later.

In fact, when we talk about renewable energy, we often forget what it takes to develop energy storage for renewables. Critical minerals in battery storage technology: manganese, 100 percent dependent on imports; indium, 100 percent; cobalt, 72 percent; aluminum even, 61 percent.

We talk in this Committee a lot about reducing our dependence and our allies' dependence on Russia and other countries for oil and natural gas, but I believe we are not focusing enough on our dependence on critical minerals.

I gave the examples of my phone and energy storage, but it also affects our defense infrastructure. In fact, missile defense, aircraft, communications technology, even ammunition, all contain these critical minerals. It is important that we do not have to rely on Russia and on China for minerals and materials, that we can produce them right here in the United States, including my home State of Montana.

This is not only a major national security issue but also has environmental consequences. Many states in the U.S., like Montana, have tough, and rightfully so, environmental standards leading to the cleanest and safest mining industry in the world. However, other countries do not have these same standards. I lived in China for five and a half years working for Proctor and Gamble. I saw it firsthand. These countries are not known for their regard for the environment. In fact, I have a chart right here that shows globally-sourced mineral commodities used in the Navy Seal gear. Whether it is night vision goggles or there are global positioning systems, whether it is their M4 carbine, they are all right here. In fact, it

takes me back to my days studying as a chemical engineer. It gives you the periodic charts here again. It is kind of nice.

Let me start by asking Mr. Sims a question.

Do you agree the U.S. has better mining practices than countries like China, India, Rwanda, Russia and South Africa?

Mr. SIMS. Senator, I haven't done mineral development in any of those countries. I focus my efforts here in the states. I think it would be hard to argue, however, that the U.S. generally does not have stricter environmental laws, stricter environmental practices and processes that we have to go through to get permits.

And it's also important, as I mentioned in my testimony, to have support from the local community in which you intend to operate. If you don't have, sometimes we call it a social license to operate, if you don't have that, you've got a lot of problems.

So I think the U.S. is the best place in the world to do mineral development in terms of the resources we have. It is difficult and it does take probably longer to go through the permitting processes for some mines. It's not the case for us, but for many it is.

There's another side of that coin and that is that you have to go to a really high level in order to earn those permits. That's probably a good thing.

Senator DAINES. So we are going to talk about the other side of that coin here next.

I have a question of Ms. Sayer.

As you describe, the lengthy permitting battle your company is going through, it reminds of projects in Montana like Rock Creek and Mountain Ore that have invested millions of dollars, a decade of work and are still are not approved to begin mining. These are locally supported. I can't tell you how much the local community is pleading for this permitting to be over with. This is up in the northwest corner of my state.

In fact, I had dinner with a family several years ago that said, Steve, this is poverty with a view. It is beautiful country, but we lack the jobs. High unemployment rates, lost our tax base, can't fund our teachers, schools and infrastructure. These are locally supported, scientifically driven, and would bring huge economic benefits while also making the United States more secure. However, we are seeing huge delays. And even when the permits are given, we have to deal with lengthy litigation from these fringe, extreme environmental groups.

Ms. Sayer, what could Congress or the Administration do today to speed up safe, locally supported mining projects?

Ms. SAYER. Thank you, Senator.

Yes, I believe that the single most thing that we could do would be to let the applicant proponent in the room.

I testified earlier that we have gone through mountains and piles of money as we have one, as we have stood outside the door and slipped notes underneath the door to our federal agencies answering their questions, where if we could be in the room, if we could, if they could give us a phone call, if we could discuss issues and we could sit around a table and discuss the issues, answer their questions, we would be much, it would move the process forward much quicker.

We have gone through a process of RFAIs, which is Requests For Additional Information. We have—the Forest Service has sent us requests, over 100 of them. I have a whole list of them right here. They have sent us these requests. They send it. It takes a week to get the request in writing. We respond and then they say, no, that really isn't the question we asked. Could you answer it this way or this way? And then we respond. Where if we were in the same room, instead of outside the door, and we could be there and talk directly with them and answer the questions. We're not asking for a decision. We're not asking for collusion or anything like that. We just need to answer the questions. We're the ones that have invested the $20 million in the project, we have gone and analyzed every possible alternative we could, so we're the experts on our project. So being able to be in the room because we, as well in Idaho, have a strong social license.

Senator DAINES. That sounds like a pretty reasonable ask, Ms. Sayer.

Thank you.

The CHAIRMAN. Thank you.

Senator Manchin.

Senator MANCHIN. Thank you, Madam Chairman, and thanks to all of you for being here today.

I was very pleased to see last December when President Trump issued Executive Order 13817, which is a federal strategy to secure monopoly supplies of critical minerals. The fact that China maintains a near monopoly on the critical components needed for our defense system is beyond comprehension, and the ramifications of their dominance of this industry could have widespread implications.

Let me give you a few figures that I have and see if you all have any comments on them.

The nation experienced the danger of such extensive foreign dependence when China began reducing its exports in 2006. The average cost of rare earth imports from China rose 2,432 percent from 2002 to 2011 and by 723 percent in 2011 alone, and demand is still increasing. In 2017, the value of rare earth compounds and metals imported by the United States increased by 27 percent.

What I am getting to is that we have been, for the last seven, eight years at WVU, NETL, the National Energy Technology Lab, have been—we have already mined the coal. We already have the waste products and all the responsibilities we have environmentally to clean this up. Knowing that we can extract these rare earth minerals from something we have already done is what they have been testing.

Today or tomorrow, they are going to host a ribbon cutting ceremony to commission its pilot scale separation plant for rare earth elements from coal and coal byproducts such as acid mine drainage from the Appalachian Basin.

There is so much more that we can be doing and, speaking hypothetically, can you describe for the Committee what we could expect to happen should the Chinese decide to place a choke hold, not even wanting to sell it to us, just basically through these so-called trade wars we might be entering into, how that would impact

everyday consumers across the country and in my State of West Virginia?

Whoever wants to start can start, and we will chime right in.

Dr. Eggert.

Dr. EGGERT. A trade war would be unfortunate to say the least.

Senator MANCHIN. I mean, they have a big chunk of a bargaining tool right now if they want to use it. Correct?

Dr. EGGERT. Absolutely.

Senator MANCHIN. What does it do to the tax?

Dr. EGGERT. More tariffs or a cutoff would have significant negative consequences for U.S. users. One hopes that U.S. users have working inventories that appropriately reflect the supply chain risks that they face at the moment.

In the private sector, there would be negative——

Senator MANCHIN. Would it be devastating to our defense, for our Defense Department? We rely on so much of this.

Dr. EGGERT. Clearly, there could be implications for our military and essential civilian needs. I know there is a portion, there are people within DoD, that focus on raw material security and I have to say, I don't know the details.

Senator MANCHIN. Okay. Dr. Eggert, maybe, Mr. Gregory, I am sorry.

Mr. GREGORY. Thank you for the opportunity. You could see me sit up.

I come from a family with a long history of military service and, in fact, I have family members in the service today. Since the conflict started in Afghanistan and Iran, I can't remember a time when we didn't have family members on the ground.

I feel very passionately that those soldiers that are representing us overseas and protecting us, who deserve the best systems possible, and when the ability to provide those systems to our soldiers is jeopardized, that's a travesty. We need to secure the supply of critical minerals so our soldiers have the best systems available to keep them out of harm's way.

Thank you.

Senator MANCHIN. Mr. Mintzes, is it Mintzes?

We might not always agree on a lot of things coming from our backgrounds.

[Laughter.]

But with that——

Mr. MINTZES. We might agree on one thing.

Senator MANCHIN. Yes, I am sure.

But with that being said, since we mined the coal, we have the deposits. We have the ability to clean up the environment.

Would you all be supportive of doing everything that we can to utilize this to try to produce our own minerals, our own rare earth minerals?

Mr. MINTZES. Thank you for that question, Mr. Manchin.

So I want to be agnostic about any particular kind of—on a case-by-case analysis.

Senator MANCHIN. Sure.

Mr. MINTZES. But the principle that you talk about, absolutely.

I'd like to just make a quick distinction because in the coal context the statute of the government's coal, this SMCRA, has a dedicated funding stream that provides resources for Reclamation.

We don't have that in the hard rock mining industry. The 1872 mining law has no Reclamation fee.

And so, we in principle without——

Senator MANCHIN. Western states were better at lobbying than we were.

[Laughter.]

Mr. MINTZES. I can imagine that.

So my point is that we, in principle and on a case-by-case basis, the idea that we could use, for example, SMCRA funds in partnership with DOE and come up with these public-private partnerships that we've been discussing in order to reclaim some of the rare earth minerals or critical minerals from the coal is——

Senator MANCHIN. The environmental community would be open to trying to work in collaboration?

Mr. MINTZES. I want to be very careful, and it's possible, yes. We can work together on this.

Senator MANCHIN. That is a positive.

Thank you, sir.

The CHAIRMAN. I think you have a possible there. There you go.

Senator Lee.

Senator LEE. Thank you very much, Madam Chair. Thanks to all of you for being here.

Mr. Gregory, it is good to see you. I want to thank you for all you do in Delta, Utah, where you provide the only domestic source of beryllium which is important for so many different reasons and so many different applications.

It seems to me that there are so many minerals on the list, not just beryllium but including beryllium, that happen to be found disproportionately in rural areas of the country. But we have seen intense regulation from Washington suffocating many of these same rural communities where a lot of these minerals are found. And we have seen a lot of industries, including mining, including logging, that depend on federal land, being hurt.

Can you explain the impact of your operation in Delta and on the surrounding communities and how they have come to depend on you?

Mr. GREGORY. Thank you.

The leverage of mining and job creation in small rural communities is truly amazing.

Our mine in Delta is a small mine. It provides 80 full-time jobs, good-paying jobs with good benefits, that are very important to a rural community such as those found in Millard and Judd Counties where we operate.

On top of that, depending on the development effort going on at the mine, we may have as many as 100 additional contractors working. So you're talking 180 contractors.

The material we mine is shipped to our plant in Ohio, another plant with 600 employees that converts that to additional materials. Materials from that plant support plants in Arizona, in Pennsylvania, California and multiple other locations, eventually supporting 2,500 jobs within our company.

We have partners that we work with that have capabilities or help us to expand our capacity which easily doubles that number to, now you're talking 5,000 people. We have our customers, and our customers take that material, convert them to parts. We're third tier suppliers, so our material goes to an additional customer who makes a part. Again, you're doubling that number. And then, that number goes to a final manufacturer who is going to assemble that. If a person, if a company, is going to buy material sourced outside of the United States, they're not going to import that mineral and produce it in the United States. They're going to buy the finished product from overseas. And so all those jobs would be outside the United States.

Thank you.

Senator LEE. Right.

So there may be more than meets the eye, a lot more than meets the eye, in this case and so many like it.

Mr. GREGORY. Yeah, right.

Senator LEE. Is there a type of regulatory reform that you would like to see that would help to facilitate the exploration, development, and mining of things like beryllium to provide sustainable economic opportunities for communities like yours?

Mr. GREGORY. Yeah, we are very fortunate in Materion that we own our own property. We were able to obtain that property through a mutually beneficial land swap with the Federal Government, the state and we own our surface rights.

We also, the state maintains the mineral rights. We pay royalties that go to the state investment land trust which basically ends up in the school systems and education in Utah. Married to a teacher, that's very important to me.

A fair and stable permitting process is all the mining industry really asks for. The difficulty we have as an industry is when the rules keep changing. And so, that would be my main request is a fair, stable process.

Senator LEE. So you don't have a moving target. That doesn't seem like too much to ask.

Dr. Fortier, at a hearing before this Committee in March of last year, Dr. Murray Hitzman from USGS testified that much of the United States has not been mapped to a scale that is useful for potential mineral development. The President's Executive Order specifically tasks agencies to develop a plan to improve geologic mapping of the U.S. to support mineral exploration. Can you give us a progress report on that?

Dr. FORTIER. Yes, the Mineral Resources Program at USGS has written a report for Secretary Zinke and submitted that to the Department.

That plan would detail the process by which we would implement the plan to improve our topographic, geologic, and geophysical survey of the United States at the appropriate scale that would support the exploration for critical minerals as well as the development of other important natural resources such as groundwater and energy and other societal needs.

So that plan is well advanced and has gotten interagency input from the agencies involved in offshore resources and is also part of

the report that will be submitted in response to the Executive Order of which it is an important piece.

Senator LEE. Thank you.

I see my time has expired. Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Lee.

Senator King.

Senator KING. Thank you, Madam Chair.

Mr. Fortier, how did we get here?

In 1978, we had 7 critical minerals that we were totally dependent upon other sources and now we are at 21. What forces made that change over the last 40 years–50 years? 40 years?

Dr. FORTIER. I'm not sure I can comment directly on the societal forces that resulted in this. Our role at USGS is simply to document this process, and we have been doing that for more than 100 years.

USGS——

Senator KING. Perhaps I should direct the question to Dr. Eggert then.

What made us triple the number of 100 percent dependent minerals? Do you have any ideas?

Dr. EGGERT. Well clearly, multiple forces are at work. There's no single explanation.

A significant factor is simply globalization and increase in demand for many of these materials, often significant increases in demand and significant demand in many parts of the world and opportunities outside of the United States that would have been off limits previously, became attractive because of changing political circumstances——

Senator KING. So there is no single factor.

It is interesting you haven't mentioned regulation in the United States as one of the factors.

Let me follow up. Your testimony said something, and I think it is very important—and I apologize for missing the beginning of the meeting. I don't know if it has come up. You make a distinction between imports from any source and risky sources. Expand on that.

In other words, it is not imports that are necessarily the problem. It is imports from places that are at some risk of either price gouging or cutting off our supply. Is that correct?

Dr. EGGERT. That's absolutely correct.

And I didn't talk about it in my oral remarks, but in my written comments I make the statement, something like, import dependence by itself is an incomplete, and many times, misleading or sometimes misleading indicator of vulnerability.

Senator KING. So if we are talking about legislative solutions to this problem, we should really narrow the focus to those minerals, not all import dependent materials, minerals, but those minerals that come from a source that is at risk for some reason. Is that correct?

Dr. EGGERT. If I were able to dictate policy, yes, I'd have a narrower focus and import dependence would be one of several factors I would consider.

Senator KING. Thank you.

Mr. Mintzes, we have not talked about mining recyclables. Isn't that an opportunity here? All these materials that we are talking

about are in objects that end up in the waste stream at some point. Is this an opportunity to, in effect, mine the materials that were already here in the country?

Mr. MINTZES. Thank you, Mr. King for that question.

Yes, we believe that one of the main solutions to this is not necessarily more mining, but really is reusing or recycling or substituting for many of the materials we already have.

Senator KING. So that is an opportunity that also has to be considered as we are looking for options here.

Ms. Sayer, you were talking about regulatory impediments like time and money. I agree with that, having been a developer myself in a former life. On the other hand, if we are going to relieve regulatory burdens in the case of particular minerals, it should be narrowly focused, should it not?

In other words, I think that what some folks are concerned about is that this will be, kind of, a Trojan horse for opening up regulation of mining, generally, of any mineral, not necessarily a critical mineral. I just see from your testimony a way to narrow this (a) from risky sources—that eliminates a significant portion—and then (b) those that are truly critical, that we can't get from other sources. Your thoughts on that?

Ms. SAYER. You know, I can only speak to what we do on our project here in Idaho.

I think, I mentioned several times in my testimony that we are not seeking to change any regulatory reform and in the NEPA process than what it is today.

I think the biggest concern is that the interpretation and the inefficiencies with federal agencies and their inconsistencies on how they interpret NEPA and how they allow, as they go through the process, are entirely different from forest to forest, from project to project and to have a consistency in how the interpretation is and how to implement it would be valuable.

Senator KING. I think that is a very important point.

I used to say, when I was Governor of Maine, I wanted Maine to have the most stringent environmental laws in the country and the most predictable and timely environmental process. And I think that is what you're saying.

Ms. SAYER. Exactly.

Senator KING. It is not the rules you are talking about, it is the process.

Ms. SAYER. Yes. And there's an extremely, a very large problem of interpretation.

Senator KING. That would vary—if you had a different mine in a different area of the country, you would have different——

Ms. SAYER. Absolutely, in a different forest.

Senator KING. Fine.

Ms. SAYER. And management that way.

I could be in the same State of Idaho, and it could be in a different forest and it would be looked at differently.

Senator KING. Thank you.

Thank you, Madam Chair.

The CHAIRMAN. We hear that a lot. Thank you.

Senator Capito.

Senator CAPITO. Thank you.

I would like to thank the Chair for this panel, and I want to thank the panel. It has been very interesting.

I, too, am from the State of West Virginia so I am going to pivot off a little bit of what Senator Manchin was talking about in terms of coal waste and coal slag and the potential for this capturing of rare earth minerals from our acid mine drainage.

We have Dr. "Z" at WVU. He has already been mentioned. He is opening, they are having a ribbon cutting tomorrow, as Senator Manchin mentioned, for its rare earth extraction facility.

You can imagine in the State of West Virginia who has done a lot of coal mining in our time, we have a lot of refuse left over, a lot has been done with AML, but there is still work to be done and the potential to have something of value and have the added benefit of an environmental cleanup is very attractive to us.

So, Dr. Eggert and Dr. Fortier, I would like to ask you if you could share your views on the opportunities and challenges of extracting rare earth elements from something like acid mine drainage as opposed to, you know, free out mining where you are actually getting the element directly.

Dr. FORTIER. Certainly there is a lot of potential for mining waste streams and then, I think, part of the directive in the Executive Order does require us to focus on that issue.

Senator CAPITO. Right.

Dr. FORTIER. It's one of a number of solutions that we should, can and should be pursuing.

Any individual opportunity that way always comes down to economics.

Senator CAPITO. Right.

Dr. FORTIER. That's the nature of mining.

I really can't comment on whether the process to extract from coal would be more economic than at some other process but certainly it is something we need to look at.

Senator CAPITO. Thank you.

Dr. Eggert, do you have thoughts on that?

Dr. EGGERT. I would simply echo the sentiment of your question and Dr. Fortier's comment, namely that there are significant unexploited opportunities for recovering minor metals from the production waste streams and leftover waste streams from not just coal, but phosphates, rock and fertilizer production, metallic mining in the western United States, even produced water from oil and gas production.

Senator CAPITO. Do you see these processes as complementary or competitive in the future or is it still hard to predict because we do not really know the economic model?

Dr. FORTIER. I think it's quite likely that the answer to these issues is going to require some combination of approaches. Domestic mining, recycling, substitution, mining legacy streams, all of these things are part of the Executive Order and we are now required to respond with a whole of government approach to suggest strategies with each of these in mind.

Senator CAPITO. Did you have an additional comment?

Ms. Sayer, let me ask you this.

The way I am understanding your particular mine site, you have a legacy mine, correct?

Ms. SAYER. Correct.

Senator CAPITO. That was unused for several years.

Are you looking at the recyclable or are you or not recyclable but retaining it from some of the waste or are you doing the original mining for these rare earth minerals?

Ms. SAYER. In every one of our areas that we will go in and mine. First of all, we will take ten million tons of unrestrained tailings and we're going to reprocess those and reuse them and we will get minerals and metals from those.

We also will, each of the other two areas that we will be mining, we will be going into areas that have already been mined before. We'll just be doing it with modern mining. And that's what is so unique about modern mining today is today we are able to with, using modern mining, we're able to go in to areas that we've already mined before, go deeper, be able to re-mine those areas.

Senator CAPITO. Good. Good.

You know, it is interesting. I first heard of this topic at a Rotary Club. A professor from West Virginia University came down. I happened to be at the local Rotary Club. And he had this very same chart that was included in our briefing materials which is from USGS which shows the amount of the mineral and how much of it is imported.

[The information referred to follows:]

Commodity	Percent	Major import sources (2013–16)[2]
ARSENIC (trioxide)	100	Morocco, China, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Canada
FLUORSPAR	100	Mexico, China, South Africa, Vietnam
GALLIUM	100	China, Germany, United Kingdom, Ukraine
GRAPHITE (natural)	100	China, Mexico, Canada, Brazil
INDIUM	100	Canada, China, France, Republic of Korea
MANGANESE	100	South Africa, Gabon, Australia, Georgia
MICA, sheet (natural)	100	China, Brazil, Belgium, Austria
NEPHELINE SYENITE	100	Canada
NIOBIUM (columbium)	100	Brazil, Canada, Russia
QUARTZ CRYSTAL (industrial)	100	China, Japan, Romania, United Kingdom
RARE EARTHS	100	China, Estonia, France, Japan
RUBIDIUM	100	Canada
SCANDIUM	100	China
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	Brazil, Rwanda, Australia, Canada
THALLIUM	100	Russia, Germany
THORIUM	100	India, United Kingdom
VANADIUM	100	Czechia, Austria, Canada, Republic of Korea
YTTRIUM	100	China, Estonia, Japan, Germany
GEMSTONES	99	Israel, India, Belgium, South Africa
BISMUTH	96	China, Belgium, Peru
POTASH	92	Canada, Russia, Israel, Chile
TITANIUM MINERAL CONCENTRATES	91	South Africa, Australia, Canada, Mozambique
ANTIMONY (oxide)	85	China, Belgium, Bolivia
ZINC	85	Canada, Mexico, Peru, Australia
STONE, dimension	83	China, Brazil, Italy, Turkey
RHENIUM	80	Chile, Belgium, Germany, Poland
ABRASIVES, fused aluminum oxide (crude)	>75	China, Canada, France
ABRASIVES, silicon carbide (crude)	>75	China, Netherlands, South Africa, Romania
BARITE	>75	China, India, Mexico, Morocco
BAUXITE	>75	Jamaica, Brazil, Guinea, Guyana
TELLURIUM	>75	Canada, China, Belgium, Philippines
TIN	75	Peru, Indonesia, Malaysia, Bolivia
COBALT	72	Norway, China, Japan, Finland
PEAT	71	Canada
DIAMOND (dust, grit, and powder)	70	China, Ireland, Russia, Romania
CHROMIUM	69	South Africa, Kazakhstan, Russia
PLATINUM	68	South Africa, Germany, United Kingdom, Russia
SILVER	62	Mexico, Canada, Peru, Poland
ALUMINUM	61	Canada, Russia, United Arab Emirates, China
NICKEL	59	Canada, Norway, Australia, Russia
TITANIUM (sponge)	53	Japan, China, Kazakhstan, Ukraine
GERMANIUM	>50	China, Belgium, Russia, Germany
IODINE	>50	Chile, Japan
IRON OXIDE PIGMENTS (natural)	>50	Cyprus, Spain, France, Austria
IRON OXIDE PIGMENTS (synthetic)	>50	China, Germany, Canada, Brazil
LITHIUM	>50	Chile, Argentina, China
TUNGSTEN	>50	China, Canada, Bolivia, Germany
BROMINE	<50	Israel, China, Jordan
ZIRCONIUM MINERAL CONCENTRATES	<50	South Africa, Australia, Senegal
ZIRCONIUM	<50	China, Germany, Japan
MAGNESIUM COMPOUNDS	47	China, Canada, Australia, Brazil
GARNET (industrial)	46	Australia, India, South Africa, China
PALLADIUM	45	South Africa, Russia, Italy, United Kingdom
MICA, scrap and flake (natural)	42	Canada, China, India, Finland
LEAD	40	Canada, Republic of Korea, Mexico, India
ALUMINA	37	Australia, Suriname, Brazil, Jamaica
SILICON	35	Russia, Brazil, Canada, China
COPPER	33	Chile, Canada, Mexico
VERMICULITE	30	Brazil, South Africa, China, Zimbabwe
PUMICE	27	Greece, Iceland, Mexico
FELDSPAR	26	Turkey, Mexico, Spain

Figure 1. 2017 U.S. net import reliance[2], expressed as a percentage of apparent consumption. (Source: USGS Mineral Commodity Summaries 2018.)

[2] In descending order of import share.

Senator CAPITO. And you go down about the first 20 and 100 percent of these minerals are imported and it says the major importer, and in most cases it is China in the top one or two or three.

I think it was, sort of, jaw-dropping to all of us as we sit here with all of our devices and the different things that we realize are essential to our lives, to realize how dependent we are.

So I guess my question would be along the lines of looking historically where we mined these materials before, did the economic model just drop out from under us to where it was no longer profitable for us and it was less expensive for us to import? I mean, how did we lose this buoyancy to our market and begin to turn into 100 percent of this imported of the 20 top minerals? Does anybody have an insight on to that?

Dr. FORTIER. I would say one thing about that.

A lot of the materials we are most concerned about now that are on the critical minerals list, really weren't being used in the same amounts or in the same ways. It really, advances in technology and material science have opened up an entirely new realm of applications for these things.

Senator CAPITO. Right. That makes sense.

Dr. FORTIER. So the mining of those has developed in fairly recent history.

Senator CAPITO. Anybody else have perspective?

Ms. SAYER. In the Stibnite Gold project, antimony, we get 76 percent of the antimony we get is from China, 7 percent from Russia, 6 percent from Kazakhstan and I, we, were mining that.

We use it in strategic. We use it in military grade munitions. It's being used. We're just getting it somewhere else. And one of the reasons I think is because, to be honest, how difficult it is for permitting and investment in the states because of permitting.

Senator CAPITO. Thank you.

Thank you, Madam Chair.

The CHAIRMAN. Thank you.

Senator Risch.

Senator RISCH. Thank you, Madam Chairman. Thank you for holding this hearing.

Anybody who thinks this is not important just needs to look back some years ago when the Chinese and the Japanese had a spat and the Chinese just flat cut off Japan's access to this material. It just flat shut things down there and particularly in some very critical industries for them. So it is important that we do focus on this and see what we can do about it.

Mr. Mintzes, I noticed you, kind of, smirked when you talked about the westward expansion development of America. You know, in Idaho we take this very seriously. We do not smirk about it. Mining is an extremely important industry for Idaho.

Let me tell you about the Great Seal of the State of Idaho. There are two people on it. Depicted on the left is a woman who represents agriculture and justice and education and a number of other things. Featured prominently in the middle are our mountains and our streams which we cherish deeply. And on the right-hand side is a man who is featured, the same stature as those others, he carries a shovel and a pick. That tells you how important this is to the great State of Idaho.

Our development was closely tied to mining. Indeed, we had one governor assassinated and it was a result of a mining dispute. Mining has played a prominent role in this.

I hope you listened carefully to what Ms. Sayer talked about trying to permit this mine at Stibnite. She is ably supported by Michael Bogart who is sitting behind her. Michael is General Counsel to one of the best governors that Idaho ever had.

[Laughter.]

And he had a distinguished career here in Washington, DC, also.

Thank you for what you do. I think probably one thing that really ought to come to everyone's, the front of everyone's, mind here after listening to what Ms. Sayer said is this is not a poor people's sport. Trying to do this in America today takes tremendous amount of capital assets and not only does it take that, it takes a board of directors and officers who will stick with something like this because it is demoralizing.

Those of us who practiced law represented a lot of people trying to do this in Idaho. We have legacy sites. We have new sites. And to try to do it, you lose a lot of sleep at night.

Ms. Sayer, how much has your company recognized in revenue as a result of all your expenditures so far?

Ms. SAYER. Well the total amount we spent, $20 million doing this. We've already gone over and above on $11 million additional into what we have paid the Forest Service which the—and the third-party contractor which was over $5 million. So in total, I think we're around, I think the number was $86 million we will have invested, plus this is a billion-dollar project to build. We will invest $1 billion once we get the record of decision to build this project. So, it's a very large——

Senator RISCH. What does the other side of the ledger look like? How much have you taken in so far?

Ms. SAYER. Oh, I'm, probably——

Senator RISCH. Probably close to zero isn't it?

Ms. SAYER. Oh, for the production. Oh, yeah, this has all been investor money. We have not had, I hear where you're going with that question.

Senator RISCH. Yes, that is my point exactly.

Ms. SAYER. Yes, we have not——

Senator RISCH. What kind of stamina it takes to get this done.

Ms. SAYER. We don't have any profit at all, exactly.

Senator RISCH. I want to assure Mr. Mintzes that although all of us who have worked in this recognize and desperately need streamlining, there is nobody trying to degrade the environment. There is nobody more committed to the environment than the people in Valley County who are promoting this. The legislature that has passed a memorial in this session promoting this, all of us, value our mountains and our streams greatly. Valley County is probably one of the prettiest places in America, and those people that live there really value that tremendously.

I can also assure you that in Idaho we have an umbrella organization called the Idaho Conservation League, and the Idaho Conservation League is going to look over these people's shoulder very, very carefully.

I know this is going to be hard for you to believe coming from Washington, DC, but they actually know Idaho better than you do and they are going to very, very carefully monitor this. They have been so far. I think the project is to be commended for keeping them in the loop as much as they have.

So, with that, I wanted to go into a little bit about how important this is, but I think there is plenty of literature and most people are well aware of it.

Madam Chairman, thank you for holding this hearing.

The CHAIRMAN. Thank you, Senator.

I will just note for the record that the great State of Alaska has on its seal a pick and a gold pan recognizing the contributions that mining has brought to our state as well, so.

Senator Hoeven from the great State of North Dakota.

Senator HOEVEN. Thank you, Madam Chairman.

We don't do a whole lot of mining other than for lignite coal, although we do a lot as you know of drilling for oil and gas, as do you.

But this is a very timely hearing. Thank you for doing it.

I want to start with—do you pronounce it Dr. Fortier or——

Dr. FORTIER. Fortier.

Senator HOEVEN. Okay.

I understand there are 21 rare earth minerals where we import 100 percent of what we use. Why? Is that because we just don't have them or we just don't produce them?

Dr. FORTIER. I think for——

Senator HOEVEN. I know we get a lot of them from China.

Dr. FORTIER. Most of the minerals that are on our import reliance chart which Senator Capito had earlier, which we publish every year, are available and are in the U.S. We have reserves or resources in the U.S. They are not mined typically for economic reasons in the U.S.

Senator HOEVEN. Alright.

Are there things then that we should be doing from a policy standpoint to promote mining those minerals here rather than importing our entire use, you know, recycling the materials they are in, encouraging mining? What would make sense in your opinion?

Dr. FORTIER. I think there are a number of things that are outlined in the Executive Order that the President issued in December that are part of the response to the report responding to that order, they are exactly the kinds of things that you just mentioned.

USGS' role is to identify and inform those policy decisions, not make them ourselves. So we are contributing to that report by ensuring that the information that people are using to make policy recommendations is, in fact, scientifically accurate and sound.

Senator HOEVEN. For example, mapping is helpful, those kinds of things?

Dr. FORTIER. Mapping is an important part of the response to the Executive Order.

Senator HOEVEN. Regulatory burden?

Dr. FORTIER. The USGS is not a regulatory agency, so I can't address that.

Senator HOEVEN. I know, but we are asking for your recommendations.

Dr. FORTIER. I really can't speak to that as a representative of an agency that does not do permitting.

Senator HOEVEN. Alright then, Dr. Eggert, how do we develop more public-private support for development of some of these, production of some of these minerals? Should we and how should we?

Dr. EGGERT. I think the Federal Government plays an important role even though we rely primarily on the private sector to develop the commercial activities throughout the material supply chain. There are a range of policies, many of which have been contained in legislation that the Chairman has worked with other members on in the past, and they include more efficient permitting that has appropriate environmental protections. They include information and strategic analysis in places like the USGS. Clearly geologic mapping that underpins precompetitive types of research and development, as well as education, the workforce and professionals necessary for a minerals and materials industry. All of these are important roles for the Federal Government.

Senator HOEVEN. Mr. Sims, you have a big project going, or you are working on a big project, I understand, in Nebraska and Elk Creek. What are the minerals? This could be as much as a billion-dollar capital investment. What is it you are after? Why there? And how is it going in terms of local, state and Federal Government as far as permitting that type of enterprise?

Mr. SIMS. Thank you, Senator.

We're looking to produce three critical minerals, niobium, scandium and titanium, all of them have uses in a variety of commercial——

Senator HOEVEN. Titanium, of course, I know about. What are the other two for?

Mr. SIMS. The two, they're on your periodic table and I know you remember these from your high school chemistry class.

Senator HOEVEN. That's good. I look at it all the time.

Mr. SIMS. But they're both metals and niobium goes into steel, predominately. It makes a high strength steel, so it's used increasingly in bridges and infrastructure projects. It lets bridges last in excess of 100 years instead of, say, 30 to 50. It's used in virtually all steel chassis automobiles today on the planet. You put a little bit of niobium, very small amount in steel and it creates a really, really strong steel. It also then lightens the applications. So, it makes cars lighter in mass, therefore, more fuel efficient. Therefore, they have less emissions.

Scandium is also a metal that does for aluminum what niobium does for steel.

Senator HOEVEN. Okay.

Mr. SIMS. Add in a very small amount, it makes aluminum extremely strong, much more corrosion resistant. It's also used, interestingly, not in its metal form, in a, I would say, a higher efficiency, clean energy technology called solid oxide fuel cells. It's a natural gas fuel technology but it's very, very highly efficient, much lower emissions profile and very highly dependent electricity.

So those are the two, in addition to titanium, those are the two we're looking to produce.

Senator HOEVEN. So are you advancing this project and how is it going and what are the regulatory barriers or is it going well?

Mr. SIMS. We're going well. We're going great.

We have a feasibility study done which is about a $35 million plus effort over the last four years. We're now in the process of focusing 24/7/365 on raising that up-front capital required to go to construction. That's going well.

And as I mentioned in my testimony, we have been fortunate in that we were able to make some changes on the front end at the design stage of this process to avoid and, in some cases, eliminate what we anticipated were environmental impacts on the front end. We've engineered a lot of those out so our permitting process, we still have dozens and dozens of permits to get to go forward. Most of those now, virtually all of those, are governed by the state and in terms of a federal permitting burden or risk, as you would look at it, it's very, very low now. So we're moving ahead.

Senator HOEVEN. Very good.

Thank you.

The CHAIRMAN. Thank you, Senator Hoeven.

Senator Cantwell, we have had a great hearing this morning. It is now your turn.

Senator CANTWELL. Thank you so much, Madam Chair, and I appreciate my colleague, Senator Wyden, being here earlier.

One of the questions that my colleague was getting at: When you think about how we protect ourselves writ large, the Strategic Petroleum Reserve is a good example. We make sure that we don't have a short supply.

In the global market, tight supplies can sometimes push the innovation we were just discussing.

And so, what, I think Mr. Eggert—and I apologize, your name plate there, it doesn't quite show your name as forcefully there.

Anyway, the point is, on global supply chains and shortages, the notion is that recycling can help us, particularly with alternative minerals. What should we be doing to fortify that for the future?

Dr. EGGERT. Recycling, to me at least, obviously is part of the solution. It's not the entire solution.

There's already significant recycling of many of the major metals, aluminum, copper, iron and steel. There's much less recycling of the specialty metals, the rare earths, the lithiums, the niobiums of the world.

It will be some time before recycling can be an important meeter of demand because many of the products into which these materials are going have only recently been purchased and have lifetimes of 5, 10, 15, 20 years. A period of time in which demand will be growing.

But now's the time to put the, to be thinking about collection systems, sorting systems and processing technologies that will be then available when the quantities of materials are sufficiently large that recycling can play a larger role.

Senator CANTWELL. As I mentioned, the Strategic Petroleum Reserve is our interest in making sure that we don't get caught short. Why not take the same approach?

For example, we are working on recycling of carbon fiber. Obviously it made a big play in aerospace, carbon fiber, but is still very expensive for smaller entities to make those kinds of investments.

We are going to have a lot of carbon fiber, so we are recycling it so that smaller entities can use it in a cost-effective way.

This is a DOE program. Why not have a similar DOE program on some critical minerals? So instead of waiting for the market to play that role, let us get started in playing that role. I think, what we are trying to evaluate as it relates to carbon fiber is, what are all those other small businesses that are going to develop once they see that you can successfully do the recycling of carbon fiber?

It is just so new, right? But the one thing that we have as a nation, the strength of the United States from a competitive perspective, is our R&D and our ability to take that R&D and show a scalable solution.

I see a bunch of people nodding. If somebody else wants to jump on this point?

Dr. EGGERT. Let me just say, I agree absolutely.

The consortium that I'm involved with, the Critical Materials Institute, is in fact this DOE, a DOE consortium of public-private partnership, if you will, where we helped develop a process for recycling yttrium and thermal barrier coatings. And so, yes, there is activity in that area that potentially could be more important, more broadly than within DOE and it's——

Senator CANTWELL. Are there several other minerals that you would recommend right now for that same kind of recycling?

Dr. EGGERT. I don't have specific recommendations, really any of the minor metals that have important uses in military applications.

Senator CANTWELL. Okay.

Anybody else? Just a bunch—yes, go ahead.

Mr. SIMS. Senator, obviously we're going to be producing scandium in Nebraska when we're up and running. We're going to produce 100 tons per year of scandium which, by the way, sounds like a lot. It's not.

There is a market for scandium, certainly in the U.S. and globally of, at a minimum, several hundred tons per year. So even when we're up and running, we're going to be the largest producer, the U.S. will be the largest producer by far of scandium. But it's not going to be enough. We'll be able to sell our scandium, we believe, but perhaps other development and potentially someday, some recycling may be necessary to meet that growing demand. You need both, I think.

Senator CANTWELL. I am a big fan of reforming the 1872 Mining Law and getting a fair deal for taxpayers and making sure that we update the reclamation standards. What about that? Getting product from the mining waste that we are not doing today?

Mr. MINTZES. Thank you, Senator.

So one of the great features in reforming the 1872 Mining Law is that it would help create that dedicated funding source for Reclamation that we already see in the context for coal.

And so, as the West Virginia senators were mentioning earlier, the notion that you could, in principle, carefully, on a case-by-case basis, look at projects whereby that Reclamation Fund pays for these kinds of activities that the researchers and the private-public—the DOE is doing right now is possible.

Senator CANTWELL. Thank you.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Cantwell.

Just a few final questions here. We have a vote that has just been called, so it is good timing here.

Ms. Sayer, you have indicated that you are operating on Forest Service land. I detected a fair amount of frustration from you in saying that if it was a different Forest Service you might be subject to different interpretation or different issues that might be presented.

Explain to me—it seems that almost without exception we have issues that are brought before this Committee and whether it is mining or whether it is grazing or whether it is harvesting trees, whether it is oil and gas permitting, it seems invariably it is harder and more complicated to do it on federal land.

So your comments about what you are dealing with is, again, consistent with everything that we have heard. The fact that we are seeking to access these minerals that have been identified by our own Federal Government as important. They are critical. They are important for us to have. Does that give you, as a company that is looking to develop on public land, on our Forest Service land, does that give you any advantages?

I will ask Mr. Gregory the same question. You have noted that beryllium provides significant advantages to the Department of Defense. It has been identified as not only strategic but also critical. Because it has been designated so and the Department of Defense needs this, are there any advantages?

We are going to a lot of trouble to put minerals on a list. But if it is just put on a list and we are still making it just as complicated and difficult to gain access to it in this country, I guess I am asking a somewhat rhetorical question is why do we put it on the list? Your comments? And Mr. Sims, you can join us in this discussion.

Ms. SAYER. So my first thoughts of that would be the advantages for the business model and the investment of it attracting investors and help with the business model to have, to be listed on there.

It would, it also provides, it's benefited us in a social license aspect with our communities. We have committed citizens of Idaho that want to contribute to supporting the critical minerals and this particularly antimony basically because there is a history. It's surprising to see the grandfathers of the people that still live in the community who used to work at the mine during the war years. So, social license, business investment, those are all real and that is, that does attract.

The CHAIRMAN. Those are both very, very key.

Ms. SAYER. Yes.

But the—it would be, what would be the most helpful as the tax reforms have been put into place and how that has been attractive. If we could have the permitting to match that tax reform and those other benefits that have come. We need to get the expertise in the permitting across the board that is efficient and that is consistent and the rules are there, the regs are there. There is just the interpretations are inconsistent across the board.

The CHAIRMAN. Mr. Gregory.

Mr. GREGORY. Materion is—there ought to be a long-term reliable partner and supplier to both the Department of Defense and

the Department of Energy, starting with the Manhattan Project and we have always supplied in a competitive environment.

The area where being a strategic and critical mineral comes into play though is both departments frequently issue requests for proposals on ways to improve technology, to reduce cost, to secure supply and, you know, we respond to those requests. It gives us a seat at the table and our ideas are judged based on merit and where we have a good idea, you know, maybe we get a hearing that we might have not otherwise.

So to me, that is an advantage is getting a seat at the table when we're looking at improving these resources.

The CHAIRMAN. Mr. Sims.

Mr. SIMS. Madam Chair, I think one of the biggest outcomes of this process, besides what may happen with government relation permitting is just helping Americans understand the extraordinarily number, large number and complexity of the supply chains that make this iPhone and everything else.

I'm still trying to get my three kids, Noah, Ella, and Hannah, to understand just how hard it is to make one of these. In the 1960s it took about 12 elements on the periodic table to make a computer chip. It now takes more than 60.

So helping Americans understand that we need these and we need more than we used to will help them, I think, bring to the table more support for developing these minerals whether they're mined or whether they're recycled or in the cases where we have to import them.

The CHAIRMAN. I appreciate that.

Dr. Eggert, I asked about the role of the Critical Minerals Institute and all that they do. Your testimony describes the advanced materials and the chemical separation technologies.

Are you familiar with the molecular recognition technology that Ucore is looking at? It is an effort to do the rare earth separation. This is up in Alaska. This is something that we have been in discussion with them on for some time. I am wondering if you are familiar with it and if this is something that CMI is perhaps involved with or reviewing?

Dr. EGGERT. I am familiar with, know of the molecular recognition technology that Ucore is developing. It's one of several potentially very revolutionary techniques in terms of rare earth separations, one of the key challenges in rare earths. CMI is aware of this. We are not actively engaged with Ucore, but that certainly is a possibility in the future.

The CHAIRMAN. Yes.

And one of the things that we have not discussed here this morning, we have been talking about the resources themselves, but our reality is that we are not doing any of the processing. That is all going to China too. That is another level of vulnerability.

When we talk about this full supply chain and what it is really going to mean in terms of vulnerability, if we are able to extract it safely here, good for us, but if the next step is always going to be China for the processing, guess what, we are back in the same opportunity for more strangleholds here. So I put that out there.

I know you all think about it, but particularly when we are talking about the role that China plays with these critical minerals, we have to be thinking about it full stream.

The other issue that really didn't come up. I think, Dr. Eggert, you mentioned it somewhat briefly and maybe Dr. Fortier in your written testimony, and that is the issue of developing a workforce here.

I know that in Alaska we have great mines, great mining opportunity, but to develop the men and women to go into this industry, these critical industries that supply this whole supply chain. I am worried about that end of it as well.

It is one thing to have the resource. It is another thing to be able to extract it efficiently and in a manner that allows for a process that is fair, that is environmentally sound, but you have to have the men and women and it is more than just the extraction.

So I feel like, again, this is yet one more year that we focus on this as an issue. We are shining a spotlight that is important.

I appreciate, again, what the Administration has done with the focus with the Executive Order. I think that was necessary, but there is so much, much more that needs to be done and it takes everybody here.

I see some folks from the mining industry that are part of this discussion. They know that it is more than just about taking it out of the ground. It is how we do it and making sure that we are attractive from a regulatory perspective, but also from that investment perspective.

Mr. Mintzes, I think you mentioned in your written testimony that you felt that this country was a pretty good place for investment among one of the world's most attractive destinations for mining investments. I am sure not hearing that from folks.

That is another aspect of what it is that we need to do to address that. And unfortunately, until you have some regulatory certainty, until you have some clear policies here, it is tough to get investors because what you do out there is not cheap. It is not easy and it is not quick.

And that social license that you talk about, Ms. Sayer, I think we all recognize that there is a responsibility. We take that very seriously. I know the industry takes it very, very seriously. All these pieces working together will allow us to move forward.

But we are not moving fast enough in my book, and I am going to continue to sound the alarm, continue to press on the urgency because as we saw from that chart that Senator Capito shared with us, that is part of our binders here this morning. Our situation is not getting better. It is progressively getting worse and vulnerability is not a place where I want to be today.

I thank you for your time and thank you for the expertise that you have shared with the Committee.

With that, we stand adjourned.

[Whereupon, at 12:00 p.m. the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

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The Department of the Interior's Final List of Critical Minerals for 2018 and Opportunities to Strengthen the United States' Mineral Security
Questions for the Record Submitted to Dr. Steven Fortier

Questions from Senator Mike Lee

Question 1: China dominates global rare earth element production and the US is 100% import-dependent on those elements. In addition to traditional REE deposits in the US, tell us what you think about opportunities to recover/extract rare earths from waste piles/historic tailings in the US? What would it take to develop this source of supply? What are the most common obstacles to development?

Response: Rare earth elements occur in many types of deposits, including tailings from mining operations and other waste streams. Research to understand the concentrations at different sites, the mineral phases in which the materials reside, and how to extract and concentrate them is needed to evaluate the economic viability of any particular source. Obstacles include low concentrations, the costs of extraction and concentration, and the lack of technologies that can economically extract critical metals from mine wastes, mine waters, and mill tailings.

Question 2: I'm curious about electronic, or "eWaste," as a source of critical minerals, especially as our society becomes increasingly dependent on technology. What will it take to develop this source of critical minerals?

Response: Increased focus is needed on recycling technologies and processes like extraction, concentration, and economic feasibility, but an even more fundamental issue is the lack of effective programs for the collection of end-of-life electronics so they can be recycled. Other countries such as Japan and China are much further along in the development of technologies and processes to recover critical metals from electronic waste. However, at least one western company, Belgium-based Umicore, is successfully demonstrating the economic viability of recovering critical metals from eWaste, today.

Questions from Senator Joe Manchin III

Question 1: Why is the USGS listing Scandium separately from the rare earth element group in the list of 35 mineral commodities?

Response: Scandium, along with yttrium, is often included with the lanthanide elements as rare earth elements (REE's), but scandium does not always behave the same way in natural systems as the other REE's. There are deposits at various stages of development that contain scandium in economic quantities, but not other REEs. Also, it is worth noting that an important use of scandium is as an alloy with aluminum, whereas the uses of REE's are primarily related to their use in electronics and in magnets.

Question 2: Does the USGS consider Yttrium to be a rare earth element?

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Response: Yes. The behavior of yttrium in natural systems is very similar to heavy rare earth elements.

Questions from Senator Catherine Cortez Masto

Question 1: The U.S. Geological Survey (USGS) updated its 1973 critical minerals report in a remarkably short period of time last year. I think it is important that USGS accurately noted that mineral deemed critical today might not be so in the future—and vice versa. Can you provide some further insight on how each of the mineral commodities were evaluated so quickly?

A. How did the Administration come to determine that thirty-five minerals were critical, when USGS originally proposed just twenty-three?

   Response: USGS Professional Paper 1802 was published in December 2017, however this publication was several years in the making. The 23 minerals included were viewed as critical to a broad range of existing and emerging technologies, renewable energy, and national security at the time USGS began the report. However, the selection of minerals was not intended to constitute an exhaustive or authoritative list of critical minerals. Each of these 23 mineral commodities is on the 2018 final list of critical minerals, except for selenium, which is important to energy-efficient windows and thin-film photovoltaic cells but did not meet the criteria for critically used in generating the list. The critical minerals list published by the Department of the Interior in April 2018 was in direct response to Executive Order 13817, which identified import reliance as a source of strategic vulnerability and provided a specific definition of a critical mineral for the purposes of developing a whole-of-government response. The Department of the Interior was able to quickly produce this list of 35 critical minerals because of the support of the interagency group operating under the auspices of the National Science and Technology Council Subcommittee on Critical Minerals. This group has been focused on the critical minerals issue for several years.

B. Essentially, what was the rationale that was used in determining what is critical, and what is not critical?

   Response: Importance to U.S. economic and national security interests and risk of disruption of supply. There were two primary quantitative criteria, the country concentration of production, and the import reliance for the United States, both of which rely on USGS data.

C. Is there a process for re-evaluating and amending the list?

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Response: The initial evaluation process included a public comment period. It is anticipated that the list will be re-evaluated and updated periodically through an objective and transparent process but the frequency has not yet been set.

Question 2: How, exactly, would the production of political minerals be increased?

A. Would a focus on critical minerals be at the determent to the domestic mining of non-critical minerals?

Response: No. A number of minerals that are not on the critical minerals list are important for the US economy and have a robust domestic mining capacity and production. There is no reason to believe that these would be impacted by an increased focus on critical minerals.

Question 3: As you are aware, the production of any mineral begins with, and is dependent on, the exploration for and discovery of that mineral. What specifically will be done to encourage exploration for new sources of minerals?

Response: Section iv. of the Executive Order report requires a plan for improving the topographic, geologic, and geophysical mapping of the United States. The USGS has developed recommendations in response to this direction. Improved topographic, geologic, and geophysical mapping can result in fundamental, baseline, regional information at a scale useful to facilitate exploration by the private sector. Such data are already available for other mining jurisdictions such as Canada and Australia, where environmental standards are comparable to those in the U.S.

Question 4: The Administration's list of recommended critical minerals included minerals beyond those that have been recommended by other scientific bodies, such as the American Physical Society and the Material Research Institute. Could a more expansive list jeopardize efforts to focus on securing truly rare and critical minerals?

Response: The critical minerals list will need to be prioritized and a strategy for how to best mitigate the strategic vulnerabilities of individual minerals developed. Each mineral has unique characteristics with regard to geologic occurrence, exploration, extraction, and processing.

A. Considering that supply is an issue with these materials, what is the rationale for some of the minerals on this list, such as aluminum or potash, have a tariff placed against it?

Response: USGS did not factor the recently imposed tariffs in the draft or final list of critical minerals.

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B. Doesn't the actions of our own country just exacerbate the existing need?

Response: USGS is a scientific organization. We collect, analyze, and publish fact-based information and research. Cause and effect implications of U.S. trade or economic policy or societal behaviors are not part of our remit.

Question 5: Mining for many of these minerals can be a time-consuming, groundwater-intensive process, especially in deserts where groundwater is a precious and nonrenewable commodity. Coupled with land subsistence concerns, along with other concerns pertaining to constrained supply and increased demand, and existing trade conflicts – should we not also be considering ways to recycle these minerals, in order to extend their use lifecycle?

Response: Recycling can be an effective mechanism for mitigating supply risk. The Executive Order specifically identifies this as an area to be addressed, along with other avenues for meeting future needs for critical minerals.

A. What recommendations would you have for R&D investments to overcome current technological constraints in mining and recycling, in particular?

Response: Development is needed of technologies to economically extract critical minerals from ores in which they are byproducts, as well as from various waste streams (e.g., mine wastes, mine waters, biosolids, post-consumer products). Obstacles to recycling include collection, low concentrations of elements in individual pieces of equipment, complex extraction and concentration requirements, and challenging economics. All of these areas need investments in order to realize the potential for resource recycling.

Question 6: A report by the National Academies of Science in 2013 found that the mining sector faces a significant workforce challenge. Approximately seventy percent of mining engineers were expected to retire within the next decade – at a time when fewer students are enrolling in mining engineering programs. Additionally, many faculty in mining engineering are also approaching retirement age. What is the industry doing to fill both these industrial and academic roles?

Response: There has also been a marked decrease over the last two decades in university curricula in the United States targeting economic geology, a fundamental earth science expertise needed to best understand the Nation's critical mineral endowment. The USGS is partnering with the Colorado School of Mines to leverage the capabilities of the Colorado School of Mines, USGS, other governmental agencies, non-profit organizations, and industry to collaborate on research of mineral resources, including economic geology, mineral economics, mining engineering, mineral extraction, and environmental geoscience. This partnership will provide an

educational environment to produce future leaders who will help meet the challenges of global exploration, mining, and sustainable development of mineral resources.

A. How should the government be involved in taking a more concerning look into this challenge, particularly at a time when this Administration is advocating for more critical mineral development?

   Response: Academic institutions are best suited to determine the curricula needs of their students, including economic geology and other fields of study that support the management of mineral resources.

Question from Senator Tina Smith

Question: Not all minerals for which we are heavily dependent on imports are equally "critical." For instance, some imports are from friendly countries and some are from rival, or even hostile, countries. Accounting for geopolitics, what are, in your opinion, the most "critical" of the critical minerals?

Response: The Executive Order specifically identifies trade with reliable partners and allies as an area requiring focus and development. The USGS has highlighted imports from countries such as Canada and Mexico as being inherently lower in risk in several of our publications. Minerals sourced from countries with high governance risk are of the greatest concern.

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Question from Senator Mazie K. Hirono

Question: President Trump's fiscal year 2019 budget proposal includes drastic cuts for the Department of Energy, including elimination of the Advanced Research Projects Agency – Energy (ARPA-E), a 66% cut for the energy efficiency and renewable energy program, and a 66% cut to the funding for Ames Laboratory. Such drastic funding cuts would harm Hawaii's efforts to accelerate the deployment of renewable energy and energy storage technology in order to meet our goal of achieving 100 percent renewable electricity by 2045. If these funding cuts are enacted, what would be the impact to Ames Laboratory's critical materials research efforts?

Eggert response:
Significant cuts in funding would (a) increase disruption risks to already vulnerable supply chains, (b) reduce the nation's ability to offer a technical response to a disruption, and (c) increase the time, cost and resources required to deliver innovations into industry.

Our national leadership in energy, industry and high technology has increasingly come to depend on innovation and access to materials, some of which are critical materials, whose unique properties deliver distinguished technical and performance capabilities over our global competitors.

While the risk of critical material disruptions may occur for a variety of reasons - increases in demand from new applications, consolidation of supply chains, shifts in geopolitics or public policy - our energy and industrial performance require an assured path to successful risk mitigation - by delivering environmentally responsible critical material and processing innovation from discovery to deployment.

The Critical Materials Institute (CMI), a consortium led by the Ames Laboratory, has built a solid portfolio of innovations, unique R&D capabilities and a collaborative network of researchers and industrial specialists across the range of technical disciplines needed to attack critical material problems. Over the next 5 years, CMI will leverage its R&D portfolio, know-how and network to secure industry validation and drive early up-take and delivery of its innovation solutions.

Questions from Senator Catherine Cortez Masto

Question 1: The Trump Administration has proposed eliminating all Department of Energy (DOE) Hubs, including the one that supports the Critical Minerals Institute. Your facility provides research into what minerals are needed and for what purposes, and how we use them. How would you reconcile the Administration's calling for more domestic production of critical minerals while at the same time recommending to eliminate a body that supports research on the same topic?

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Eggert response:
I obviously cannot speak for the Administration and also have a conflict of interest given that I receive funding through the Critical Materials Institute (CMI). But these two views are seemingly in conflict with one another and difficult to reconcile. I imagine that reconciliation would rest on the view that CMI research should be left to the private sector. This possible reconciliation ignores the important spillover benefits of research to the national economy beyond those that a private company receives from research it funds, which in turn justifies and argues for public funding research.

Question 2: A report by the National Academies of Science in 2013 found that the mining sector faces a significant workforce challenge. Approximately seventy percent of mining engineers were expected to retire within the next decade – at a time when fewer students are enrolling in mining engineering programs. Additionally, many faculty in mining engineering are also approaching retirement age. What is the industry doing to fill both these industrial and academic roles?

Eggert response:
I cannot provide a comprehensive answer to the question of what is industry doing. But the SME Foundation, the foundation of the Society for Mining, Metallurgy & Exploration (http://community.smenet.org/smefoundation/home), funds and carries out a number of activities aimed at enhancing mining education at all levels (K-12, university undergraduates and graduate students), as well as increasing public knowledge of mining. In particular, the SME Foundation has a Ph.D. fellowship program for doctoral students in mining engineering and a career-development grant program for early career faculty members in mining programs to help these new faculty members succeed in the academic world.

A. How should the government be involved in taking a more concerning look into this challenge, particularly at a time when this Administration is advocating for more critical mineral development?

   Eggert response:
   Government plays in an essential role in education. The benefits of education accrue both to private citizens and society at large.

   Government involvement, in turn, helps ensure that an appropriate level of critical mineral development, as well as technological innovation, occurs. The key disciplines are mining engineering, mineral processing, extractive metallurgy, applied geology and geophysics. Most important, in my view, is enhanced funding for basic and applied research to support graduate education, through entities such as the U.S. Geological

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Survey, National Science Foundation, Mine Safety and Health Administration, National Institute for Occupational Safety and Health, and Environmental Protection Agency, among others.

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Questions from Senator Debbie Stabenow

Questions: I would like to ask about the vital role that transportation infrastructure plays in our mineral security.

In northern Michigan, we have a lock and dam that is indispensable to the mining industry and the manufacturing supply chain. Iron ore mined in Michigan and Minnesota transits the Soo Locks to Great Lakes steel mills that effectively uphold North American steel production and manufacturing.

A report by the Department of Homeland Security concluded it was "hard to conceive" of a single piece of infrastructure more consequential in terms of impact to the economy from an unexpected and sustained breakdown. A six-month closure of the Poe Lock would halt nearly all North American production of automobiles and mining, construction, and farming equipment; result in widespread bankruptcies and unemployment; and propel the North American economies into a severe recession.

Approximately 80 million tons of iron ore and other commercial commodities pass through the Soo Locks annually, but there have been no comprehensive improvements to the facility in nearly 50 years. We are running on borrowed time.

How great of a threat does our aging transportation infrastructure pose to our mineral security? How important is it to have well-functioning locks and dams, roads, bridges, and rail to ensure these materials move through the supply chain and reach their respective markets efficiently and safely?

The example you cite, Senator, is one of the best -- and most chilling -- examples of how aging infrastructure in the U.S. threatens our mineral security and, with that, our fundamental economic and national security. In my view, cases such as the Soo Locks clearly meets the definition of 'clear and present danger.' These examples also raise serious issues with regard to soft spot targets that could easily come onto the radar screen of terrorist groups.

The U.S. appears poised to produce more of the critical minerals that we need, such as the Niobium, Scandium, and Titanium that we plan to produce in Nebraska. But without a vigorous and reliable transportation system to deliver those materials to the manufacturers that need them, we aren't truly advancing our mineral and national security. Ironically, the Niobium we plan to produce is one of the key additives to steel that makes it much stronger and highly corrosion resistant – exactly the type of high-strength steel we need in more bridges, roads, and dam locks!

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Questions from Senator Catherine Cortez Masto

Questions: A report by the National Academies of Science in 2013 found that the mining sector faces a significant workforce challenge. Approximately seventy percent of mining engineers were expected to retire within the next decade – at a time when fewer students are enrolling in mining engineering programs. Additionally, many faculty in mining engineering are also approaching retirement age. What is the industry doing to fill both these industrial and academic roles?

Excellent question, Senator, and a very real problem for the mining and mineral processing industry. In the case of our proposed mine and mineral processing facility in Nebraska, we are very much aware of the fact that the labor market is extraordinarily tight with regard to Americans with experience in underground mines and mineral processing technologies. For our part, we intend to spend a good deal of capital training a new workforce to operate our plant. Fortunately, there is a strong desire by Nebraskans in the area of our proposed mine to be trained for these positions. But for some positions – particularly those involved in underground mining, which requires some very specific skill sets – this is going to be a challenge for us. Our job training plans thus have a very high priority as we work toward bringing this facility into operation.

A. How should the government be involved in taking a more concerning look into this challenge, particularly at a time when this Administration is advocating for more critical mineral development?

This is a difficult question. Very few institutions of higher education these days are led by educational professionals who are eager to shift greater resources into academic and vocational programs aimed at mineral development. Sometimes, the exact opposite is true: university faculty and administrators today openly disparage the need for these kinds of programs, and instead encourage students to focus on curricula taught by educators who believe that mining and mineral development should be *discouraged* in the U.S.

There are a few institutions that have bucked this trend. The Colorado School of Mines is one example in my backyard of Golden, Colorado. But there are by far the exception to the rule.

As you know, when the Federal Government seeks to set minimum standards on secondary or university-level institutions, such as STEM curricula, there is typically a large pushback by the educational establishment. Incentives tend to work better, of course. But this is a challenge with no easy answer.

This is perhaps a very good issue upon which ENR could focus for a follow-on hearing…

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Question from Senator Tina Smith

Question: What is the importance of the National Defense Stockpile of critical minerals for how we should be thinking about the challenge of securing adequate access to minerals?

Very good question, and a complex one at that. I would be happy to discuss this one in more detail, as I do a lot of work with the good folks at the National Defense Stockpile (NDS) and understand the huge challenge they, and the constraints under which they operate.

In short, it all comes down to supply chain risk mitigation. The Defense Logistics Agency, which manages the stockpile, seeks to minimize the risk to materials needed for national defense and essential civilian technologies. There are a number of tools in the statutory toolbox for doing this, and purchasing relatively small amounts of critical and strategic materials for storage in the NDA is one of those tools. It is a pretty blunt force tool, however, for many reasons. There are a number of other ways to manage critical and strategic material supply chain risk. Many are already in current statute, but few know about them. I'd be happy to walk through this with you and your staff. There are a couple of opportunities I see on the near-term horizon that may not take any additional authorization or appropriations language.

Happy to discuss…

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Question from Senator Mazie K. Hirono

Question: Critical minerals are key ingredients in the renewable energy technologies, such as electric cars and solar panels, which will be part of the renewable energy transition in Hawaii and around the country. In order to ensure responsible sourcing of critical minerals, you have recommended that Congress and the administration focus on waste management and recycling of critical minerals, and supporting research on developing alternatives to critical minerals. How do the efforts of the government and industry in the United States compare to other countries, and what more could we be doing?

Thank you Senator Hirono for this question.

Our Government has two main roles to help encourage higher recycling rates, conservation, substitution, research and development to secure our critical minerals supply. The first is an overdue policy fix to the antiquated General Mining Law of 1872. Moving our domestic mining law in to the 21st century will reform waste management practices to create incentives for harvesting more critical minerals. Reclamation projects would receive a dedicated "polluter pays" funding source that, under certain circumstances, may allow some permittees to separate critical minerals from waste piles. Finally, mining law reform would create more regulatory certainty for project applicants.

The second is to shape policy that encourages public and private sector partnerships designed to spur the research and development (R&D) sorely needed for a growing critical minerals recycling sector. Some of this work is already underway at the Department of Energy's (DOE) Critical Materials Institute (CMI) in Ames, Iowa. In addition, the Defense Department maintains our National Defense Stockpile of critical minerals; and West Virginia University has partnered with DOE and other agencies to create a pilot project designed to separate critical minerals from coal waste.

Congress ought to continue funding projects like CMI that bring together consortia of government experts, academics, minerals consumers, mining companies, communities, and nongovernmental organizations. These multi-stakeholder partnerships can secure our critical minerals supply with the right combination of technological innovation, market incentives, and mining law reform.

The European Union (EU) has already taken significant strides. The United States Geological Survey (USGS) reports (See https://doi.org/10.3133/pp1802O) that a Belgian-based company, Umicorps, has partnered with France's Rhodia Rare Earth Systems to recycle critical minerals from certain kinds of car batteries. The German Government has partnered with Siemens to research extracting rare earth minerals from electric vehicle motors. In Japan, Honda plans to

recycle 80% of rare earths from some of their batteries. Hitachi is also developing recycling minerals from appliance magnets.

Questions from Senator Catherine Cortez Masto

Question 1: Aside from new mining, what can mining companies and other relevant industries do to improve the security of our critical minerals supply?

Thank you, Ms. Cortez Masto for these questions.

Mining companies often vest considerable sums in water treatment systems designed to remove arsenic, mercury, and others minerals. These are among the dozen waste byproducts USGS designated as critical. Mining companies could capture more of these byproducts and potentially sell them to market.

Another option for mining companies is to seek certification from the newly-launched Initiative for Responsible Mining Assurance (IRMA). IRMA is a multi-stakeholder mining certification that improves social and environmental performance creating value for mines. Mining, jewelry, and electronics companies joined with social and environmental nongovernmental organizations to launch an iterative standard adaptable to incentivize waste management practices that can maximize capture and recycling of critical minerals.

There is also a path forward for mining companies interested in conducting certain so-called "Good Samaritan" reclamation activities. The Environmental Protection Agency (EPA) has approved an Administrative Order on Consent (AOC) effectively granting mining companies the opportunity to apply for a "Good Samaritan" permit to conduct reclamation activities in exchange for a limited liability waiver. Mining companies could seek these permits for activities that may, under specified circumstances, include re-mining waste piles for critical minerals.

Question 2: Are there critical minerals that you believe should be added to the list?

No.

A. If so, why?

Question 3: Mining for many of these minerals can be a time-consuming, groundwater-intensive process, especially in deserts where groundwater is a precious and nonrenewable commodity.

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Coupled with land subsistence concerns, along with other concerns pertaining to constrained supply and increased demand, and existing trade conflicts – should we not also be considering ways to recycle these minerals, in order to extend their use lifecycle?

Yes, the greatest opportunity for growth in this sector is among those firms best positioned to find the technological solutions and create the infrastructure capacity to recycle and reuse these minerals.

A. What recommendations would you have for R&D investments to overcome current technological constraints in mining and recycling, in particular?

As noted above for Ms. Hirono, Congress should continue funding for DOE's Critical Materials Institute. West Virginia University has a pilot project to extract some rare earth minerals from abandoned coal mine waste. Public/private partnerships like these can encourage R&D investment and technological innovation while helping secure our critical mineral supply.

Question 4: A report by the National Academies of Science in 2013 found that the mining sector faces a significant workforce challenge. Approximately seventy percent of mining engineers were expected to retire within the next decade – at a time when fewer students are enrolling in mining engineering programs. Additionally, many faculty in mining engineering are also approaching retirement age. What is the industry doing to fill both these industrial and academic roles?

Mining employment has continued to decline due, in large measure, to increasing automation.

A. How should the government be involved in taking a more concerning look into this challenge, particularly at a time when this Administration is advocating for more critical mineral development?

This Committee, under Chairman Murkowski's leadership, has considered critical minerals legislation over the last three Congresses designed to boost mining workforce training. The transition toward renewable energy will create demand not just for minerals, but also for new jobs separating critical minerals from waste streams, during reclamation activities, and in recycling. Our Government, with mining companies and mineral consumers (i.e. electronics and jewelry companies), can lead a just transition where workforces adapt and learn skills to make them more marketable in a clean energy economy.

Question from Senator Tina Smith

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Question: What role can recycling play in reducing our need for additional import of critical minerals?

Thank you, Ms. Smith for this question.

Recycling, reuse, efficiency, and substitution are the solutions to securing our domestic supply of critical minerals. As noted above to Ms. Hirono and Ms. Cortez Masto, public/private partnerships must play an important role to provide the necessary funding, research, infrastructure, and incentives for more recycling.

Critical mineral demand is high and will continue to grow, so the potential for more recycling is promising. Our Government should vest in research, development, and workforce training, while adding partnerships with mineral manufacturers. In this way, the public and private sectors can build a supply chain that maximizes recycling and minimizes import reliance.

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Madam Chairman, as an introduction to my response to the questions for the record, it is important to recognize the personal commitment by the Acting Chief of the Forest Service, Vicki Christiansen, as to her personal time and attention related to the Stibnite Project in Idaho.

I have visited with the Acting Chief along with her senior management on several occasions and she has committed to resolving many of the issues that were raised during my testimony on July 17. I want the record to reflect the personal commitment of Chief Christiansen to permitting our very important project on United States Forest Service public lands.

QUESTION FROM SENATOR MIKE LEE

Question: Given Mr. Fortier's testimony about how little we know about the location and concentration of critical minerals in the United States—not to mention what new mineral uses, or entirely new minerals, might be discovered in the future—do you think it's wise for the Federal government to permanently withdraw large swaths of land from any future exploration?

Answer: In Idaho, we saw this recently with an effort by previous Administration to withdraw 3,961,824 acres of Federal land in an effort to provide habitat for the conservation of the Greater Sage-grouse. When it came time to undertake the appropriate NEPA analysis as justification for the withdrawal, which had been justified as necessary to address the threat of mining from Sage-grouse conservation, it was then determined that mining proved little, if any, range-wide threat for the species.

There should always be a careful balance of multiple use of our Federal public lands that includes natural resources development and habitat conservation, but it is never wise for the Federal government to withdraw lands without justification. This is particularly so in states such as Idaho and Utah which are two-thirds the property of the Federal government and home to job creators such as Midas Gold who depend on access to public lands for reasonable resources development.

QUESTIONS FROM SENATOR DEBBIE STABENOW

Questions: I would like to ask about the vital role that transportation infrastructure plays in our mineral security.

In northern Michigan, we have a lock and dam that is indispensable to the mining industry and the manufacturing supply chain. Iron ore mined in Michigan and Minnesota transits the Soo Locks to Great Lakes mills that effectively uphold North American steel production and manufacturing.

A report by the Department of Homeland Security concluded it was "hard to conceive" of a single piece of infrastructure more consequential in terms of impact to the economy from an unexpected and sustained breakdown. A six-month closure of the Poe Lock would halt nearly all North American production of automobiles and mining, construction, and farming equipment;

result in widespread bankruptcies and unemployment; and propel the North American economies into a severe recession.

Approximately 80 million tons of iron ore and other commercial commodities pass through the Soo Locks annually, but there have been no comprehensive improvements to the facility in nearly 50 years. We are running on borrowed time.

How great of a threat does our aging transportation infrastructure pose to our mineral security? How important is it to have well-functioning locks and dams, roads, bridges, and rail to ensure these materials move through the supply chain and reach their respective markets efficiently and safely?

Answer: At our project in a remote part of Idaho, being able to safely transport our human resources in order to develop our critical minerals and other natural resources is essential. We are placing tremendous focus on permitting and planning for our project on accessibility to the resource as part of our plan of operations, and we are dealing with aging transportation infrastructure as a critical element of our project design.

In addressing the importance of well-functioning infrastructure, I can comfortably attest that without it, there simply is no means by which we can ensure the safe movement of our important human resources, as well as the natural resources that we intend to develop including the critical mineral antimony.

QUESTIONS FROM SENATOR CATHERINE CORTEZ MASTO

Question 1: A report by the National Academies of Science in 2013 found that the mining sector faces a significant workforce challenge. Approximately seventy percent of mining engineers were expected to retire within the next decade – at a time when fewer students are enrolling in mining engineering programs. Additionally, many faculty in mining engineering are also approaching retirement age. What is the industry doing to fill both these industrial and academic roles?

How should the government be involved in taking a more concerning look into this challenge, particularly at a time when this Administration is advocating for more critical mineral development?

Answer: As CEO, I have a responsibility to ensure that the work force we have available to us is academically well-grounded and well-trained for the many matters of the moment at my Company. I take seriously the responsibility of making sure that the industry welcomes an academically well-grounded younger work force, so that they can afford themselves all the opportunities in our industry.

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I am never a fan of starting the discussion of solving problems with government-based solutions. My preference is that answers to the issues that you raise emerge from public–private partnerships that involve our academic institutions and the private sector, so that the cycle of academic and professional interest can be accommodated simultaneously.

In Idaho, as in Nevada, the mining industry plays a very important role in recruiting and nurturing those just entering into the work force. In Idaho, we have an academic environment that is supportive of mining as a career and provides the academic building blocks to those who are interested in making mining a career choice.

So stated, we should always be open to the mentoring possibilities for our older work force. These must include opportunities for adjunct professorships and other mentoring opportunities, particularly where there is a great tradition and an important and celebrated history of mining in the Western United States.

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Question from Senator Mike Lee

Question: Given Mr. Fortier's testimony about how little we know about the location and concentration of critical minerals in the United States—not to mention what new mineral uses, or entirely new minerals might be discovered in the future—Do you think it's wise for the federal government to permanently withdraw large swaths of land from any future exploration?

Answer: First, there are federal lands that are already appropriately off limits to mining. Our nation has many unique and special areas that deserve protection. In fact, new mining operations are already either restricted or banned on more than half of public lands.

However, we do not get to choose where critical mineral deposits are located. I agree with Mr. Fortier's assessment regarding the need for more and better information about our nation's mineral deposits. Without such data, commercial mineral deposits are elusive and discoveries simply cannot occur without widespread exploration. The ability to explore for minerals on federal lands is critical since federal lands account for as much as 86 percent of the land area in certain Western states and these same states account for 75 percent of our nation's metals production. Given the importance of a secure critical mineral supply chain, decisions on the use of federal lands should be made with the appropriate analysis, including the assessment of mineral potential, along with alternative and protective measures. We cannot afford to make these decisions in a vacuum. As mentioned in my verbal and written testimony, Materion strongly urges a whole-of-government policy approach to critical minerals.

Having grown up in South Carolina, and lived over 50 years in the East, I know better than most how hard it is for those in the East to fathom the vast, undeveloped spaces in states such as Utah and Alaska. Materion's privately owned mine property in Utah occupies 11 square miles. Less than 10% of that is developed. If you could drive 60 miles to the north and 120 miles to the south, you would see land essentially identical to the area we mine. Our mine occupies less than one thousandth of one percent of that area. And after mining, we return the land to its original state, and are fully bonded to make sure that happens. There is room for preservation, recreation, and mining to exist side by side. Companies, working with the local population, local, state, and federal agencies are committed to make that happen.

In addition, mineral withdrawals are in contradiction to the Mining and Minerals Policy Act of 1970 (MMPA), in which Congress clearly stated "that it is the continuing policy of the Federal Government in the national interest to foster and encourage private enterprise in (1) the development of economically sound and stable domestic mining, minerals, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs…" Withdrawing large swaths of land from any future exploration threatens our national security by increasing our dependence on foreign countries to supply

critical minerals. It is unwise, unnecessary, and against Congress's direction, and it places an unfair financial burden on the local population..

Questions from Senator Debbie Stabenow

Questions: I would like to ask about the vital role that transportation infrastructure plays in our mineral security.

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How great of a threat does our aging transportation infrastructure pose to our mineral security? How important is it to have well-functioning locks and dams, roads, bridges, and rail to ensure these materials move through the supply chain and reach their respective markets efficiently and safely?

Answer: There is a direct connection between infrastructure and mineral security. As a nation, we can take many steps to decrease our reliance on foreign sources of minerals but that goal will not be fully realized if we do not have the transportation infrastructure to get the minerals where they are needed. Unfortunately, our nation's infrastructure is crumbling and in a dangerous state of disrepair.

For example, our mine is located in Juab County, Utah. Our mill, where we extract beryllium from the ore, is located over 50 miles from the mine near the closest population center, Delta, in Millard County, Utah. The lifeblood of our plant is a 50 mile stretch of asphalt county road and

a 5 mile section of unpaved road connecting the mill to the mine. The road is over 40 years old. Materion has assisted the counties in maintenance of these roads, both through help in funding large roadwork projects such as chip sealing, and maintaining sections with our own people and equipment. The road is now in need of a major rebuild. We are in the process of working with Juab and Millard County to obtain a grant from the U. S. Department of Transportation (USDoT) to assist in this project. The project would be jointly funded by Materion, the Counties and the USDoT. Failure to address the issues with the road could threaten the long-term viability of our operation. This is just one example of how important it is to address issues with our aging infrastructure.

In addition to dependency on the road systems for movement of ore, as mentioned above, we are also dependent on the railroad and port system. One of our critical raw materials is received primarily by rail, and we ship a portion of our finished product by rail, as well. In addition, about one third of our product is shipped through the Port of Los Angeles. Events such as the Los Angeles longshoremen's strike and the Canadian Pacific Rail Worker's strike have the potential to severely impact our business. The importance of maintaining port access and a functional railroad system for shipments of critical minerals cannot be overstated. We do not have access to local water transportation, but having worked on the Houston ship channel in the past, I know that where it is possible, water transportation is the safest, most environmentally friendly, and effective shipping method possible.

Question from Senator Joe Manchin III

Question: It is my understanding that a series of factors ultimately put us in the vulnerable situation we find ourselves today regarding China's monopoly of rare earth elements. A combination of cheaper labor, little to no environmental safeguards, among other factors, led us to a point where our domestic industry could not compete with China's essential takeover in the production of rare earth elements, or critical minerals. However, there were also strategic decisions made by China that were advantageous to its domestic critical minerals industry and disadvantageous to other countries. I think on an issue as important and relevant as this, we must look beyond 5 or even 10 years and think 20-50 years down the road to ensure we reduce our dependency on foreign imports, but also put necessary safeguards in place so we do not make the same mistakes.

Other countries are playing the long game against us, can you please discuss what long-term options you are looking at to reduce our dependence?

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Answer: The Senator's account of the rare earth crisis largely accords with our understanding, though Materion is not a rare earth company. Materion further agrees with the Senator that foreign manipulation of the market for the strategic and critical material beryllium is a serious concern that merits a long-term strategy.

From a company standpoint, Materion has made several efforts to mitigate supply and cost risks. Materion owns its own mine in Delta, Utah, which has a 70+ year remaining life. Materion has also worked with scientists, labor unions, and regulators in an attempt to establish economic and ethical labor and environmental safety standards that will allow for the safe and effective manufacture of beryllium and beryllium-containing products for decades to come. Finally, Materion has sought to work with the U.S. government to make the Pebble Plant located in Elmore, Ohio, the most efficient beryllium metal manufacturing facility in the world.

Unfortunately, on an international level, we can see other countries taking different courses. Beryllium manufactured in Kazakhstan is done with minimal safety standards, leading to unknown effects on the workforce and environment, allowing for low-cost beryllium that competes with Materion. We expect that China will likewise minimize expenditures on safety as they expand their presence in the commercial beryllium market.

Alternatively, European regulators have sought to impose overly burdensome regulations on the processing, manufacture and use of beryllium and beryllium-containing products. These excessive regulations would have a significant effect on our U.S. beryllium production, including for military uses. Even the U.S. government's own OSHA promulgated technically and economically infeasible provisions in its beryllium safety standard in January 2017. While these regulations are pending further revision due to a legal challenge, it is a sign that the U.S. government does not yet have a whole-of-government approach to long-term security of supply for critical minerals.

Materion, therefore, believes that the government needs to take a whole-of-government approach to the issue of security of supply for beryllium. DoD and NNSA should continue partnering with Materion for the development of efficient technologies and facilities that service government-dominated or government-unique requirements. Equally important, the agencies should also require that U.S. government purchases maximize the use of those facilities by preferring or requiring domestic sourcing for U.S. government purchases involving high-purity beryllium products, for which the commercial market is dwarfed by the government and military markets. The U.S. government should also ensure that trade agreements, worker safety regulations, and environmental regulations do not threaten the ability of suppliers of critical materials, such as

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Materion, to continue working with critical minerals, such as beryllium. This could be achieved through a regular interagency process, but Materion believes that a better avenue may be to establish less formal channels of communication between departments so that DoD, NNSA, NASA and other agencies that rely on beryllium can clearly communicate their concerns about its availability to other departments and contacts within the government when necessary.

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