Senate Committee on Energy and Natural Resources
Dr. David Applegate Nomination Hearing
April 28, 2022

Questions from Ranking Member Barrasso

Question 1: USGS has the important role of publishing a list of critical minerals at least once every three years. In February, it updated the critical minerals list. A fact sheet accompanying the updated list says – *"the 2022 list of critical minerals is based on data through the year 2018."* **How can USGS accurately evaluate minerals if it is relying on data that is four years old?**

Response: I recognize the importance of using the most up-to-date data possible. The data that are used in the development of the critical minerals list come from a variety of sources, not just USGS data, some of which are prepared on different time cycles. The analysis published in 2022 reflects the most recent complete set of data available at the time the analysis was conducted. For example, the United States Census Bureau's 2018 Annual Survey of Manufacturers (ASM) was released on June 25, 2020, and the results from the 2019 ASM weren't released until February 18, 2021, at which time our analysis was complete and the draft methodology for the list of critical minerals was already being submitted for peer review. That said, the critical minerals list is not primarily meant to identify short-term issues (which may change before either federal policy or private sector action would take effect) but to highlight critical mineral trends, which may prompt a long-term response. If confirmed it will be a priority for me not only to implement the critical minerals list objectively according to the law but also to support the USGS efforts to supply policy makers with as much timely, nonpartisan, and sound scientific information as possible on important mineral resources matters.

Question 2: The President's fiscal year 2023 budget requests $147 million for Energy and Mineral Resources programs. It requests increases for wind, solar, and geologic energy, critical minerals, and research into greenhouse gas emissions and sinks on federal land.

a. **What increases has the President requested to support conventional oil, gas, and coal – and what work will the USGS do to facilitate the continued use of these energy resources in the future?**

Response: Oil and gas research and assessments will continue to be important components of the Energy Resources Program portfolio and are foundational to much of our other work. Fossil energy sources are a significant part of our current energy mix and are expected to continue to be so for many years. I believe that the USGS's work to assess these resources both domestically and around the world is important, and if confirmed would work to ensure that USGS continues to produce strong, technically sound information on all resources, including fossil energy resources. In addition, as discussed at my hearing, our research on CO_2-enhanced oil recovery relies on our oil and gas work. And the Scenario Analysis Tools for Greenhouse Gas Reduction on Federal Lands increase proposed in the FY 2023 President's Budget Request is directly tied to energy resources and would support sustainable uses of federal lands by providing decision-makers and land managers with the tools to analyze tradeoffs among energy development scenarios including oil, gas, coal, and renewable energy generation and storage. Finally, our petroleum and coal expertise are providing essential support to implementation of the Bipartisan Infrastructure Law remediation funding.

Our committee held two important hearings on the need for domestic mineral production earlier this month.

b. What work will USGS conduct on critical mineral supply chains?

Response: The USGS will continue to collect, analyze, and publish the information required to evaluate mineral criticality to identify risks of supply disruption and work across the federal government to prioritize and advise on options for mitigation of strategic vulnerabilities. The USGS will also continue to provide technical assistance to federal agencies that invest in critical mineral supply chains, for example by participating on investment review panels for the Department of Defense, the Department of Energy, and the Export-Import Bank.

We are also working to implement recent Congressional directions. The Energy Act of 2020 directed the USGS to increase its emphasis on quantifying the Nation's domestic critical mineral resource base and on analyzing and forecasting mineral supply chains essential to the Nation's economy and national defense. The FY 2023 President's Budget includes increases for forecasting related to critical minerals, which would allow the USGS to leverage its experience providing interagency technical assistance to launch an automated analytical capability for critical minerals supply risk and economic impact forecasting. One specific focus of those increases is on supply chains for energy technologies, which would help the USGS build on recently published analyses of the mineral dependencies of current and emerging energy generation and storage technologies to increase the provision of data and technical assistance to other federal agencies, including the interagency Federal Consortium on Advanced Batteries.

If confirmed, I would endeavor to lead the USGS to pursuing these missions efficiently and effectively, developing strong science and working in continued partnership with Congress.

Question 3: USGS, rather than the United States Fish and Wildlife Service (USFWS), has emerged as the authoritative source for sage grouse science and policy. **Please explain how this came about.**

Response: The USGS provides science support to various Department of the Interior bureaus and other agencies based on their requests and articulated needs. The USGS is a world leader in sage-grouse-related science but does not develop or advocate for or against specific policy. USGS scientists coordinate with our partners to ensure that the products they develop support and inform partner needs for making policy and management-related decisions.

USGS has provided science support regarding the sage-grouse going back to before 2015, including information that was utilized in the development of the Bureau of Land Management (BLM) and USDA Forest Service Land Use Plan Amendments and the U.S. Department of the Interior Integrated Rangeland Fire Management Strategy. The USGS is continuing to build on that foundation to inform science-based decisions to help support local economies and the continued conservation, management, and restoration of the sagebrush ecosystem.

USGS science support has focused not only on sage grouse population but landscape-scale ecosystem and habitat issues across a very large area, including the impacts of wildlife. If confirmed, I would work to ensure that the USGS continues to produce independent quality science for sage brush ecosystems to benefit federal agencies, states, Tribes and the public.

Question 4: USGS prides itself on creation of peer reviewed science.

a. **Please explain the peer review process. Who selects the reviewers?**

Response: The USGS has an extensive peer review process as part of its internal Fundamental Science Practices (FSP), which are defined in policy in the organization's Survey Manual (Chapters 502.1-502.10). Peer reviewers are asked to evaluate the clarity of hypotheses, the validity of the research design, the quality of data collection procedures, the robustness of the methods employed, the appropriateness of the methods for the hypotheses being tested, the extent to which the conclusions follow from the analysis, and the strengths and limitations of the overall product. Most USGS science publications appear in peer-reviewed journals for which the editors typically select these reviewers. Under FSP, the USGS requires one or more additional peer reviews with the reviewers selected by the author's supervisor who will seek qualified and independent experts.

b. **Does the review panel include individuals who are known to disagree with the analytical approach adopted by USGS?**

Response: Peer review of USGS manuscripts is intended to ensure the accuracy of data, the scientific validity of interpretations, and the consideration of alternative interpretations. As I noted in the previous response, most USGS science publications appear in peer-reviewed journals with editors selecting the reviewers. USGS science publications are required to have at least one additional peer review. Also, independent scientists in the USGS Office of Science Quality and Integrity ensure that USGS standards for scientific quality and peer review are followed by reading publications, associated peer reviews, and written reconciliation of peer-review comments before approving interpretive science products for release. If confirmed, I will endeavor to lead the USGS as it engages in the peer-review process in a manner that continues its scientific independence and credibility.

Question 5: USGS's 2022 Minerals Commodity Summary for helium states that the United States imported 7 percent of its helium from "Portugal." It is my understanding that Portugal does not produce any meaningful quantities of helium. **What exactly is the 7 percent figure referring to?**

Response: The reported number for imports from Portugal does benefit from additional context. Importantly, the United States is a net exporter of helium, and United States total imports of helium are very small relative to domestic production, consumption, and exports. The data reported in the Mineral Commodity Summaries are averages over the period from 2017-2020. One of those years (2017) reported imports from Portugal (7% of imports, or less than 0.5% of United States annual consumption), but our USGS mineral commodity experts think it is most likely that "imported" helium was originally domestic helium that was exported abroad and then "re-exported" back to the United States via Portugal. Going forward, reported volumes from Portugal have virtually ceased since 2017 and thus USGS expects that this source will likely drop out of the statistics in the next cycle. USGS's survey reports imports and exports as they are recorded and appreciates the opportunity to clarify or provide additional context in situations like this. If confirmed, I would work to continue USGS practice of open and transparent communication with Congress on such matters.

Question 6: On February 8, 2022, Gasworld published an article titled "Helium markets now experiencing 'Helium Shortage 4.0.'" The article discusses Russia's Amur helium plant. Specifically, it says that "the natural gas processing plants that produce feed gas for the first of three helium plants experienced a fire on 8th October and a second explosion/fire on 5th January that will delay Amur's helium production until at least Q3 of 2022."

It goes on to say: "How long it will take to restart helium production from Amur remains to be seen, with speculation ranging from the most optimistic late Q3 to more pessimistic predictions that Amur will produce little, if any, helium before 2023." The article concludes with: "The helium market in 2022 is going to look very different than most knowledgeable observers…would have predicted little over one month ago."

On March 16, 2022, Chemical and Engineering News published an article titled, "War in Ukraine makes helium shortage more dire." It explains that the Arzew plant in Algeria - which is among the world's largest helium producers - has shutdown helium production. Specifically:

> *"The helium shutdown in Arzew is a result of high natural gas demand in Europe, due in large part to Russia's invasion of Ukraine. Helium is found alongside natural gas in conventional wells. Algeria normally compresses natural gas into liquid form at Arzew for global transport by ship. During that process, it's economical to extract helium because it liquefies at much higher pressures and lower temperatures than natural gas…But now, much of Algeria's natural gas is being sent to Spain via pipeline, making separation impractical. The industrial and rare-gas advisory firm Edelgas Group estimates that liquefied natural gas production in key regions is down 30% from January, leading to a 10% drop in global helium supply."*

On March 29, 2022, the National Weather Service announced that it "is reducing the frequency of weather balloon launches at several upper air locations in the United States due to a global supply chain disruption of helium." On April 4, 2022, Physics Today published an article that explained that scientists at the Department of Energy's Pacific Northwest National Laboratory (PNNL) "had deactivated two NMRs [nuclear magnetic resonance spectrometers] and scheduled another to be mothballed in May." It states that "The shutdowns have been forced by successive cuts to PNNL's helium allocation from Messer, its supplier, from a preshortage average of 2400 liters per month to 940 liters in March." The article goes on to say that "Of the five major helium suppliers—Air Products and Chemicals, Air Liquide, Linde, Matheson, and Messer—all but Air Products have declared force majeure and are now rationing their customers to 45–60% of their contracted amounts." It says, "Noncontractual users who buy helium through purchase orders are having the hardest time acquiring it; spot prices have doubled in the last several months."

a. **Does USGS recognize that helium is a global market? Does it recognize that U.S. end users, including end users with long-term contracts for helium, may not be able to acquire sufficient supplies of helium if helium production is reduced or shutdown elsewhere in the world?**

Response: As a practical matter, I appreciate that helium, like many commodities, is traded in a global market and it is experienced that way by end users. I also acknowledge that recent global events appear to be having significant impacts on this market. Helium was not included in the most recent critical minerals list reflecting that the United States is a net exporter of helium, possesses some of the largest recoverable volumes of helium reserves in the world, and is the world's largest producer of natural gas, from which helium is derived as a byproduct. It is my understanding that currently the United States continues to export larger quantities of helium than it consumes domestically on an annual basis, but I recognize that the situation with this commodity is dynamic for important reasons, including those raised in your question.

That said, the critical minerals list is not primarily meant to identify short-term issues (which may change before either federal policy or private sector action would take effect) but to highlight critical mineral trends,

which may prompt a long-term response. While helium was not listed on the most recent critical minerals list, I recognize that it is a very important commodity for many reasons and uses and that current events are dynamic. If confirmed, I am committed to ensuring that the USGS plays its appropriate role in the response to new events regarding this or any other commodity.

b. How can USGS maintain that "Helium's trade exposure score [is] 0 and, in turn, its supply risk score [is] 0" when the National Weather Service, another federal agency, states it is unable to obtain sufficient quantities of helium "due to a global supply chain disruption of helium" and the Department of Energy's PNNL has had its allocation of helium cut by over 60 percent?

Response: Again, as a practical matter, I appreciate that helium, like many commodities, is traded in a global market and it is experienced that way by end users, including federal agencies, and that recent global events appear to be having significant impacts on this market. For purposes of constructing the most recent critical minerals list, key factors considered for helium included the fact that the United States is a net exporter of helium, that the United States possesses some of the largest recoverable volumes of helium reserves in the world, and that the United States is the world's largest producer of natural gas, from which helium is derived as a byproduct.

It is my understanding that currently the United States continues to export larger quantities of helium than it consumes domestically on an annual basis, and that the scores referenced in this question related to the situation at the time of the production of the list, but I recognize that the situation with this commodity is dynamic for important reasons, including those raised in your question.

That said, the critical minerals list is not primarily meant to identify short-term issues (which may change before either federal policy or private sector action would take effect) but to highlight critical mineral trends, which may prompt a long-term response. While helium was not listed on the most recent critical minerals list, I recognize that it is a very important commodity for many reasons and uses and that current events are dynamic and, if confirmed, I am committed to ensuring that the USGS plays its appropriate role in the response to new events regarding this or any other commodity.

c. In light of these developments, will you issue a notice in the Federal Register giving the public an opportunity to comment on whether USGS should return helium to its list of critical minerals? If so, when will you issue that notice? If not, why will you not issue the notice?

Response: The critical minerals list is not primarily meant to identify short-term issues (which may change before either federal policy or private sector action would take effect) but to highlight critical mineral trends, which may prompt a long-term response. While helium was not listed on the most recent critical minerals list, I recognize that it is a very important commodity for many reasons and uses and that current events are dynamic and, if confirmed, I am committed to ensuring that the USGS plays its appropriate role in the response to recent events regarding this or any other commodity. When it comes to implementing the critical minerals list, I am fully committed to following the law and ensuring that USGS makes independent, scientifically sound decisions based on the best available information for policymakers and the public.

Question 7: USGS aims to provide unbiased scientific information to describe and understand the geological processes of the Earth; minimize loss of life and property from natural disasters; and support the management of

water, biological, energy, and mineral resources. The USGS is a scientific agency housed within DOI. In contrast to other DOI bureaus, it has no regulatory authority and does not manage any major federal lands. USGS also collects scientific information for long-term data sets. These data sets range from satellite imagery of land and ecosystem features to streamflow and groundwater data. Since 1879, Congress has expanded the USGS's statutory authorities to include activities related to ecosystems and natural hazards.

a. How do you see USGS's role as the primary scientific agency in DOI?

Response: The USGS has a unique role as a non-management, non-regulatory bureau within the Department of the Interior. I believe that the science USGS delivers does not determine the outcome of those management and regulatory decisions but supports and informs our federal and state partners' needs for making policy and management-related decisions, helps clarify the impacts and trade-offs of policy choices, and assists our partners with prioritizing their investments of taxpayer dollars by providing information on likely outcomes. USGS's broad scientific mission includes carrying out activities to better understand the Earth and its resources and to minimize the loss of life and property to natural disasters, like earthquakes, floods, and volcanic eruptions. If I am confirmed as Director, I will work to ensure that the USGS continues to carry out its mission in a non-partisan fashion to address the nation's scientific needs.

b. How might that role evolve under your leadership?

Response: Technology and the Earth and biological sciences continue to evolve, and the USGS must evolve along with it to meet the Nation's scientific needs. If confirmed, I will continue to meet these expectations with a focus on the highest scientific integrity. I will work to strengthen our core capabilities so that we have the expertise and data necessary to provide real-time and long-term information products. And I will seek to strengthen our partnerships with states, Tribes, academia, and with the private sector, to help improve the delivery of our science so that it reaches those who can benefit from it the most.

c. In 2021, USGS published a strategy for science to guide the agency through 2030. What aspects of the Strategy do you plan to address, and what aspects, if any, do you believe should be changed?

Response: The 21st Century Science Strategy provides the USGS with a long-term vision for how our science can be most useful to those who need it for decision-making. To make progress in addressing each of the elements of the science strategy, I believe it is important to use it as the framework for our annual science planning process. This includes a scientific focus that builds on our mission-specific capabilities and drives greater interdisciplinary integration; a focus on information technology (IT) and other technical innovations; a partnership focus to develop and strengthen relationships with a wide variety of partners; and an organizational focus to optimize interactions across the USGS, develop our workforce, and improve our facilities.

I believe that achieving the USGS mission requires a sustained commitment and attention to all of these aspects of our enterprise that reflect not only what we do, but how we do it. In addition to these four focus areas, the Science Strategy calls for development of an integrative, predictive science capability. The USGS has initiated several pilot studies for such a capability and has undertaken a cross-program, cross-mission collaborative planning process for initiatives proposed this fiscal year with an emphasis on principles such as participatory research engaging partners, a focus on scientific capacity needs, data and model interoperability, and delivery of actionable information to stakeholders. If confirmed, I will work to implement this strategy effectively, while

also paying close attention to how the strategy is working and what, if any, improvements or course corrections should be made as we move forward.

Question 8: Some stakeholders have referred to various USGS monitoring and datasets as a "gold standard" for their length of record, availability of data, widespread coverage, and calibration standards. Stakeholder confidence in USGS monitoring and data is predicated on the scientific integrity of USGS staff and the data they provide.

a. How does USGS monitoring and data compare to the growing expertise of the private sector and capabilities of state, local, and tribal governments?

Response: The USGS has had a long-standing role to provide monitoring capabilities and data sets that are long-term, national, and based upon consistent protocols, ensuring that data collected at different times and in different parts of the country are readily comparable. I take very seriously the trust and reliance that states, Tribes, local governments and the private sector place in our data and scientific integrity, and if confirmed it will be a high priority to maintain and build on that trust. The USGS follows Fundamental Science Practices and rigorous quality assurance protocols to ensure the highest quality in the monitoring, data collection, data interpretation, and reporting of results. The bureau's longstanding role as a non-regulatory, non-advocacy science provider also ensures that the data collected are recognized by all parties as impartial. This complements the role of the private sector, academia, and other state, regional, and Tribal governments, which typically produce, or contract for the production of, monitoring and datasets that address specific issues or needs. I believe in ongoing communication and collaboration with these entities so that we can benefit from ongoing feedback and mutual support.

b. How do you see the USGS interacting with these entities to meet the scientific needs of the nation?

Response: I am proud that the USGS engages in many beneficial partnerships with a wide range of external entities, allowing it to best meet the scientific needs of the Nation, and if confirmed, I would seek to foster and expand these interactions going forward. These valuable efforts include partnerships in which the USGS receives funding, partnerships in which the USGS sends funds to external partners or contractors, and agreements in which both the USGS and external partners contribute in-kind services. Other useful partnership models include: reimbursable projects from other government agencies that provide them with access to USGS's science and expertise that they are lacking, or where the USGS provides needed impartial science on contested topics; external contracts with the private sector for analytical or other services that the USGS does not have the capacity or expertise to carry out; external cooperative agreements or grants that the USGS uses to fund academic partners, such as through the Cooperative Research Units; and Cooperative Research and Development Agreements with the private sector where we work together on innovative technology development or mutually beneficial data collection. An excellent current example is the Earth Mapping Resources Initiative (Earth MRI), where the USGS is working with and sending funds to many states for basic geologic data collection, contracting with the private sector for collection of large geophysical data sets, and partnering with the private sector to access their geophysical data sets—all with the goal of understanding better where critical minerals are likely to occur geologically across the United States. These partnerships are important to the work of the USGS and, if confirmed, I will ensure that this remains a priority for the bureau.

c. How would DOI support scientific integrity of USGS work and data under your leadership?

Response: I am committed to maintaining the long-standing USGS emphasis on and respected reputation for adhering to the highest standards of Scientific Integrity and Fundamental Science Practices. The USGS is committed to work with and is supported by DOI in its adherence to Scientific Integrity and Fundamental Science Practices. I commit to taking any issues involving scientific integrity with the utmost seriousness and ensuring that other USGS leadership does the same.

The USGS Office of Science Quality and Integrity monitors and enhances the integrity, quality, and health of USGS science through executive oversight and development of strong practices, policy, and supporting programs. The USGS Science Integrity Officer provides the USGS with advice and oversight on scientific integrity matters and leads independent evaluations of any allegations of scientific misconduct or loss of scientific integrity against the USGS. The USGS Fundamental Science Practices Advisory Council is tasked to provide advice and recommendations to USGS leadership and others regarding fundamental science practices, including evaluation of current practices in need of updating or establishment of additional new practices.

If confirmed as Director, I will work to ensure that these positions and roles are carried out effectively and pay close attention to any issues or feedback so that USGS science continues to earn the nation's trust.

Question 9: USGS, through its Natural Hazards Mission Area, provides scientific information and knowledge necessary to address and mitigate the effects of natural hazards such as volcanic eruptions, earthquakes, storm surges, and landslides. Congress recently enacted hazards-related legislation such as the National Earthquake Hazards Reduction Program Reauthorization Act of 2018 (P.L. 115-307), the National Landslide Preparedness Act (P.L. 116-323), and Section 5001 of P.L. 116-9, authorizing a National Volcano Early Warning and Monitoring System. Congress has also provided funding to the USGS through emergency supplemental appropriations in FY 2018, FY 2019, and FY 2022.

a. How would you work with other federal agencies and local partners to advance hazards science and monitoring in order to save lives and property?

Response: Having spent much of my career in this area, I firmly believe that partnerships are essential to ensuring that USGS science reaches those who can use it to enable resilience in our communities. I believe in the importance of partnerships. Every program in our Natural Hazards Mission Area collaborates with other federal agencies, whether through statutory interagency bodies like those you cited or through individual agreements, as well as with state, local, and Tribal authorities. In leading the USGS, I believe it is important to assist with such coordination because our centers and programs regularly engage stakeholders. This leads to better responses to hazards, but also to better preparation, which together result in reduced risk. If confirmed, I will keep such collaboration a high priority for the USGS, looking to build off of successful models and apply them in additional circumstances where appropriate.

b. What is the USGS's role in the social science regarding natural hazards, such as understanding and improving the government and public preparation and response to hazards, if any?

Response: I have a great appreciation for the value of communicating science to the public in ways that are useful. Recognizing that social science provides critical expertise to this arena, the USGS employs a number of

social scientists across its centers and programs and partners with academic experts. Social science has made possible a number of products by the USGS and our partners, including the annual ShakeOut earthquake drill, which prepares people to respond to earthquakes, large-scale scenarios that illustrate the impacts of catastrophic natural hazard events, and the ongoing implementation of the ShakeAlert earthquake early warning system, which relies on user responses to alerts. The use of social science to inform the development and delivery of hazard information has recently been highlighted in several publications. Some examples include the Puerto Rico Landslides Guide, the State of our Nation's Coast project, the Next Generation Volcano Hazard Assessment project, and the Wildland Fire Strategic Plan. If confirmed, I will be committed to ensuring USGS hazard science reaches those who need it most in the forms that can be readily understood and acted upon.

c. How do the various hazards authorities recently enacted by Congress integrate into the current activities of the USGS?

Response: I appreciate the hazards authorities recently enacted by Congress that strengthen the programs that make up the USGS Natural Hazards Mission Area. These authorities include the National Earthquake Hazards Reduction Program Act, the National Volcano Early Warning and Monitoring Act, the National Landslides Preparedness Act, and the PROSWIFT Act, which authorizes the role of our geomagnetic observatories in characterizing the potential impacts of space weather events. Besides authorizing our programs' missions to deliver hazard science, each authority also enables robust interagency and stakeholder collaboration. The USGS cannot undertake its science alone, and these authorities reflect that. If confirmed, I look forward to working with Congress to ensure that these statutory authorities continue to serve as a framework for nationwide hazards science and resiliency.

d. Are there additional resources needed to carry out activities authorized in recently enacted legislation related to hazards science and monitoring?

Response: If I have the honor of being confirmed for this position, I look forward to working with Congress to identify opportunities to ensure that these programs operate efficiently, provide information that is timely and instructive for its intended uses, and that resources needed to carry out authorized activities are available.

Question 10: Please explain how USGS collaborates with local governments, specifically on emergency management? How will USGS continue to grow this area under your leadership?

Response: As I noted in my opening remarks, the USGS is committed to delivering unbiased science so that it reaches everyone who needs it, when they need it, in a form they can use. Partnerships are a great strength of the USGS, and emergencies are the critical moment when that information delivery must be correct so that emergency managers can make informed decisions that can truly save lives. That is why we deploy experts to local, state, or FEMA operations centers to help interpret scientific information during geologic and hydrologic hazard events. Recently, I approved expanding our emergency management function in order to better train our scientists for disaster response and improve how our products address emergency management at the local level, for example tools such as the National Water Dashboard that improve the public's ability to subscribe to flood alerts.

USGS data and products can save lives and protect property only if we respond to the needs and capacities of local decision-makers. If confirmed, it is my commitment that the USGS will continue to work hard to earn the trust of local communities and agencies on the front lines of emergency management.

Question 11: Please explain the research USGS is currently working on related to chronic wasting disease? Do you plan to prioritize research on chronic wasting disease if confirmed?

Response: I understand that this matter is of great concern to federal, state and Tribal wildlife managers, conservationists and sportsmen and women in many states. Since the early 2000s, the USGS has been working with partners to understand the biology of chronic wasting disease (CWD), assess the spread and persistence of CWD in wildlife and the environment, and develop strategies for early detection and control. Collaboration is a key element in the work that we carry out in this field, and we have worked for years with other federal agencies, with states, and with Tribes to better understand the dynamics of the disease and to develop tools to assist with monitoring the spread of CWD in order to help wildlife managers make informed management decisions. There is currently hope that a test to detect the harmful prions that appear in the brain will soon be available for use in live animals, as opposed to on post-mortem tissues. In FY 2022, the USGS has continued research on CWD early detection, ecology, decision science, human dimensions, and management; continued participating in the Department of the Interior CWD Task Force; and contributed funding for the first phase of the National Academies CWD transmission study, as called for under America's Conservation Enhancement Act. If I am confirmed as Director, the USGS will continue to prioritize engaging with other DOI bureaus, the U.S. Department of Agriculture, as well as state and Tribal partners on applied science to support a coordinated and effective response to inform the actions of land and wildlife managers.

Senate Committee on Energy and Natural Resources
Dr. David Applegate Nomination Hearing
April 28, 2022

Question from Senator Risch

Question: Though the responsibilities of the U.S. Geological Survey have since expanded, the USGS was first created by Congress in order to explore and identify the land potential of the West.

a. **What role, if any, do you expect USGS to play in compiling or creating the American Conservation and Stewardship Atlas, including providing expertise on critical mineral deposits?**

Response: The USGS is providing its technical, scientific expertise to this process. USGS has been named a co-chair, with the U.S. Department of Agriculture and the National Oceanic and Atmospheric Administration, of a committee to assemble publicly available data and information that is intended to provide an accessible and comprehensive picture of existing conservation and restoration work in America.

Our role in this process is technical in nature; policy decisions about what would qualify will be made by Administration leadership and policymakers, not by the USGS. Our scientists are working to integrate data from key stakeholders and to develop mapping and other analytical capabilities within the American Conservation and Stewardship Atlas. I understand that the intention is to have broad policy engagement with the public and am aware that a public comment period on development of the Atlas closed on March 7, 2022, and that comments are being reviewed. The goal is to release a "beta" version of that Atlas by the end of the year. If confirmed, I would be happy to keep your office updated on our progress and ensure that USGS work in this area is consistent with our mission of providing the best available, objective scientific information to inform policymakers and the public.

The Atlas is intended to integrate data from key stakeholders including key contributions from the USGS Protected Areas Database and provide map and analytical capabilities. Although the Atlas will not serve critical mineral data directly, the Atlas will support connections to critical minerals information and science to inform multiple-use lands.

Senate Committee on Energy and Natural Resources
Dr. David Applegate Nomination Hearing
April 28, 2022

Questions from Senator Cantwell

Question 1: Last winter, Washington state experienced severe storm and flooding events that caused significant flooding and damage in Northwest Washington and the Olympic Peninsula. An area that was hit hard was Whatcom County. This flooding event was the most expensive natural disaster since the area became Whatcom County.

USGS plays an important role here, conducting the science before, during and after flood events to inform decision makers on where floods are likely to happen. They also conduct monitoring and alert on potential floods, and importantly, they inform communities of how to bolster existing infrastructure and plan new infrastructure to be flood resilient.

When the flooding in Whatcom County occurred, critical stream gauges got washed away and without those gauges, there was no other way to monitor the flooding that was occurring.

a. **Can you commit to working with myself and the regions impacted by flooding in Washington state to ensure there are ample stream gauges in the system, so if one fails, communities can still get accurate flood information?**

Response: Yes, if confirmed, I am committed to working with you and others on this important issue. I understand that a short-term network has been established at strategic locations along the Washington coast where sensors can be deployed to monitor storm surge and flooding from atmospheric rivers and tsunamis. Additionally, the USGS has begun expanding our short-term network capabilities, consisting of Rapid Deployment Gages (RDGs) that are fully functional streamgages designed to be deployed quickly and temporarily to measure and transmit real-time stream water-level data in emergency situations. The speed with which RDGs can be installed allows the USGS to augment gage networks during coastal or riverine flooding by adding additional temporary locations to the network; provide situational awareness and support to emergency managers; and maintain data flow when streamgaging equipment is damaged. Our goal is to work with local emergency managers to pre-determine locations where RDGs can be deployed during floods.

b. **What does USGS need to effectively work with local community partners and Tribes along areas like the Nooksack River to address flood monitoring needs?**

Response: Partnership and coordination between USGS and local communities is critical to ensure the effectiveness of this program, which provides data to assist with flood management, with water scarcity, and with important natural resource management activities. The Federal Priority Streamgage network and Cooperative Matching Funds in the Groundwater and Streamflow Information Program are important priorities for the USGS and allow us to address flood monitoring needs with local communities, like those that were impacted in Washington State last year. If I am confirmed, I would make partnerships such as these, which are so important to manage for hazards that may impact life and property, a priority.

c. **Do you think USGS has enough resources dedicated to studying and monitoring flooding?**

Response: A priority for the USGS is to maintain the continuity of our National Streamgage Network, particularly the Federal Priority Streamgages where possible. Streamgages are funded by USGS appropriations,

Tribes, federal, state, and local agencies, and in many cases, jointly funded by both the USGS and partners. The USGS leverages these funding sources together to support as many streamgages as possible. I am committed to ensuring that the critical data and information provided by this program continues to be a priority for the bureau.

d. Can you commit to work with me to find ways to strengthen USGS' critical flood work?

Response: Yes, I commit to working with you and your colleagues to strengthen this critical work that USGS carries out.

Question 2: Washingtonians grapple with the threat of a number of natural disasters. Washington is home to five active volcanos that are considered a high or very high threat of eruption. Washington is also located on the Cascadia Subduction Zone, threatening "the Really Big One" that has the potential to devastate the Pacific Northwest.

I have worked to secure funding and pass bills to help Washingtonians prepare for natural disasters. It's critical that the USGS implement these bills and we need to educate and secure more resources to keep communities safe.

a. What is the status on fully implementing H.R. 8810, the National Landslide Preparedness Act?

Response: The USGS and the Department are organizing an Interagency Coordination Committee as called for in the statute. The USGS is also organizing a Federal Advisory Committee comprised of representatives from states, Tribes, higher education, industry standards organizations, and emergency management. In early 2021, the USGS organized a federal interagency working group to provide input to a National Strategy for Landslide Loss Reduction. The strategy is currently under review and will be delivered as a USGS report describing four main landslide risk reduction goals aligned with the intent of the National Landslide Preparedness Act: (1) Assess, (2) Coordinate, (3) Plan, and (4) Respond to landslide hazards. Each goal is supported by several strategic actions.

b. Can you commit to fully implementing this bill?

Response: The President's FY 2023 Budget proposes an additional $2.25 million that will help us to develop the capacity to provide federal landslide experts and equipment to assist in response to landslide emergencies which is an important objective of the statute. If confirmed, I look forward to working with Congress to identify the additional resources needed to complete its implementation.

Question 3: Senator Murkowski and I worked to pass into law S. 346, the National Volcano Early Warning and Monitoring System Act which would modernize USGS' volcano early warning system.

a. What steps have been taken to implement this legislation?

Response: Last year, the USGS published the 5-year management plan for the implementation of NVEWS called for by the statute (USGS Open-File Report 2021-1092). This plan describes the milestones and standards that will be needed to implement the system as envisioned. In particular, the statute calls for a 24/7 watch office

capability and a National Volcano Data Center, which the President's FY 2023 Budget proposes to undertake. The USGS is also meeting requirements of the Act to stand up the interagency committee that will bring together stakeholders from across the federal government to provide guidance on its implementation. This group is expected to meet later this year. Other improvements to our volcano monitoring system are moving the USGS toward implementation of the statute, including the establishment of an upgraded lahar detection system on Mt. Rainier, new seismic and geodetic equipment on Glacier Peak, and the re-establishment of the Hawaiian Volcano Observatory's monitoring capabilities that were damaged in the 2018 eruption of Kilauea. I look forward to fully implementing important systems such as this, if I am confirmed.

b. Is there more that Congress should do?

Response: If I am confirmed, I would look forward to working with Congress to continue support of the core research, assessment, and monitoring capabilities for volcanic hazards that are so important for the implementation of the system envisioned by the Act.

Question 4: I believe we need to talk more about seismic resiliency. We working to bolster infrastructure in the Northwest to prepare for earthquakes, but there is more work to do.

c. Can you commit to working with me to provide more resources towards becoming seismic resilient? What does USGS need to do this?

Response: Yes, if confirmed, I commit to work with you to ensure the USGS continues efforts to advance this important need. Seismic resilience is the overall objective of the entire National Earthquakes Hazards Reduction Program and requires contributions by all four NEHRP agencies.

The President's FY 2023 Budget is an important place to start, as it strengthens USGS's efforts to deliver the science that communities need to become more resilient to the most devastating natural hazard events. Subduction zones, where one of the Earth's tectonic plates is thrust over another, generate the world's largest earthquakes, volcanic eruptions, landslides, and tsunamis. Subduction zones generate hazards onshore and offshore in the Pacific Northwest (Cascadia subduction zone), southern Alaska (Alaska-Aleutians subduction zone), the Caribbean, and Pacific Island Territories, and tsunami hazards extend to Hawai'i, California, and East Coast states. Subduction zones remain poorly understood because the processes that drive the hazard lie beneath the ocean floor. The FY 2023 budget also includes a request for increased funding for the Induced Seismicity Project to assess increased seismic hazard associated with energy development, including geothermal energy and carbon sequestration, and increases funding for the modernization and hardening of IT infrastructure to ensure robust delivery of enhanced multi-hazards products improving situational awareness following a major disaster.

Question 5: Federal Advisory Committees, like the Advisory Committee on Water Information, have done important and highly valued work to leverage public and private sector resources that improve federal water information programs to meet our nation's water information needs. These committees have also served as an important resource to many state and local water scientists and professionals, including cross-sector sharing of information, best practices, and other interactions. This includes critical work by the ACWI subcommittee on Ground Water and the National Ground Monitoring Network, among others.

a. What value do you see in volunteer advisory committees of this type? Do you think advisory committees like the Advisory Committee on Water Information should play a role in USGS programs, and do you believe they should be reinstated?

Response: The USGS values information and feedback from all stakeholders and users of USGS information. Federal advisory committees, such as the Advisory Committee on Water Information, are established to foster communication between the federal and non-federal sectors and create more effective working relationships with state and local agencies, Tribes, and the private sector. The USGS is committed to working with federal, state, and county agencies, Tribes, academia, private industry, water utility associations, environmental professional and technical societies to improve federal water information programs whether through formal processes such as federal advisory committees or through informal town-hall style meetings or listening sessions as needed for idea exchange and solution development.

Senate Committee on Energy and Natural Resources
Dr. David Applegate Nomination Hearing
April 28, 2022

Questions from Senator Daines

Question 1: Dr. Applegate, critical minerals and materials play a major role in our economy, energy production, national defense, healthcare, and more. **What can USGS do to better partner with private companies to help locate and develop critical mineral deposits?**

Response: First, if I am confirmed as Director, I commit to ensuring that the USGS will continue to collect, analyze, and publish the information required to evaluate mineral criticality to identify risks of supply disruption and work across the federal government to prioritize and advise on options for mitigation of strategic vulnerabilities. The USGS will also continue to provide technical assistance to federal agencies that invest in critical mineral supply chains, for example by participating on investment review panels for the Department of Defense, the Department of Energy, and the Export-Import Bank. As we go about that work, partnerships with the private sector are of the utmost importance as are partnerships with states, Tribes, and other stakeholders. USGS has a variety of partnership approaches that we can use to support that work, and I am encouraged that the private sector is increasingly interested in working with USGS in ways that improve the amount of information and data available to benefit government, industry, academia and the public.

Second, the private sector has significant interest in our work to implement recent Congressional direction, such as those contained in the Energy Act of 2020, which directs the USGS to increase its emphasis on quantifying the Nation's domestic critical mineral resource base and on analyzing and forecasting mineral supply chains essential to the Nation's economy and national defense. The USGS's FY 2023 budget request includes increases for forecasting related to critical minerals, which would allow the USGS to leverage its experience providing interagency technical assistance to launch an automated analytical capability for critical minerals supply risk and economic impact forecasting. One specific focus of those increases is on supply chains for energy technologies, which would help the USGS build on recently published analyses of the mineral dependencies of current and emerging energy generation and storage technologies to increase the provision of data and technical assistance to other federal agencies, including the interagency Federal Consortium on Advanced Batteries.

If confirmed, I would endeavor to lead the USGS to pursuing these missions efficiently and effectively, developing strong science and working in continued partnership with Congress.

Question 2: Dr. Applegate, how can USGS better partner with state geological societies and institutions to share and highlight research and information on critical minerals?

Response: I believe that partnerships with institutions such as the state geological surveys are critical to USGS's work and will continue to be a priority if I am confirmed for this position. The USGS engages in active outreach through regular attendance at meetings, including those hosted by the state geological surveys, by professional societies, and academic institutions. With the recovery of domestic travel and the support of funding through the Bipartisan Infrastructure Law, the USGS will be ramping up its outreach and communications activities, working to connect local communities and geoscience interests with the increasing critical mineral data collection, mapping, and assessment work. The USGS will also continue to augment these in-person meetings with webinars, online data delivery, and geospatial tools for exploring new datasets and associated interpretations. Throughout my career I have been active in engaging with state geological entities and, if confirmed, that would continue to be a priority for me.

Question 3: Dr. Applegate, the United States is heavily import dependent on China for dozens of minerals, many of which can be produced here in the United States. **What do you believe are the major impediments to reducing dependence on China for minerals and materials?**

Response: I understand that critical minerals are important for our economy for a variety of important purposes including the defense industrial base, clean energy technologies, and manufacturing. As I said at my confirmation hearing, it is important not only to understand the resources that we have domestically but to understand the stock of global resources, as well. The USGS role is to ensure that the decisionmakers within government, who would address such matters, have the best available scientific information, on an objective and nonpartisan basis, that they need to set our nation's policy course on this and other important topics. The USGS Mineral Resources Program is our nation's premier provider of scientific information and research on critical mineral resources. The Earth Mapping Resources Initiative, expanded through enactment of the Bipartisan Infrastructure Law, is a critical component. If I am confirmed, I will ensure that these efforts to support and enhance our ability to forecast risks to supply chains, to better understand the resources that we have at home and abroad, and to provide quality data for decisionmakers remain a priority.

Question 4: Dr. Applegate, do you believe our dependence on China for minerals is an economic or national security risk?

Response: As I stated in the previous response, I understand that critical minerals are important for our economy and for the clean energy technology that is so important to our clean energy future. The analysis of whether China, or any other country, is a security risk to the United States is an issue that falls outside the USGS's role of providing technical and scientific expertise for policymakers to consider as they make decisions. If I am confirmed, I will ensure that USGS pursues its mission efficiently and effectively and in partnership with its stakeholders and Congress.

Question 5: Dr. Applegate, outside of traditional mining projects or recycling, where or how else can the U.S. increase domestic production of critical minerals?

Response: The Bipartisan Infrastructure Law directs the USGS to conduct above-ground mine waste research and assessment activities as a means to evaluate the resource potential of this product, and through the Earth Mapping Resources Initiative, the USGS is working with state geological surveys on sampling and characterization work, while also initiating development of a national mine waste inventory. If confirmed, I would look forward to carrying out evaluations of re-mining and pre-processing activities to determine the promise that they might hold for the future.

Question 6: Dr. Applegate, Stream gauges provide essential data on streams and rivers for landowners, agriculture, angler, conservation stakeholders, and watershed groups. However, limited resources often force USGS to stop the monitoring, use, or maintenance of gages often with little notification to affected parties. As a result, stakeholders are left scrambling to identify alternative funding. **If confirmed, how would you prioritize which gages are funded? Further, if confirmed, would you commit to establishing a consistent and transparent process for USGS to provide stakeholders with ample notice when funding is expected to be cut?**

Response: A priority for the USGS is to maintain the continuity of our National Streamgage Network, particularly the Federal Priority Streamgages, where possible. Streamgages are funded by USGS appropriations, Tribes, federal, state, and local agencies, and in many cases, jointly funded by both the USGS and partners. The USGS leverages these funding sources to collectively support as many streamgages as possible. I am committed to ensuring that the critical data and information provided by this program, important to protect life and property, continues to be a priority for the bureau. If confirmed, I would work hard to ensure that partnerships such as these, and the contributions that our partners make, are a key focus. In order to ensure transparency for stakeholders and cooperators of the at-risk nature of streamgages, the USGS Endangered Streamgages website is inclusive of all at-risk streamgages in the USGS National Streamgage Network. Streamgages are added to this site as soon as we are aware that a site is at risk of losing funding. Once an at-risk streamgage is either rescued or discontinued, it is displayed as such on the website for 6-months to increase exposure and provide more opportunities to find a new funding partner for sites that are discontinued. I am committed to taking actions like this that help ensure that informed decisions on important issues can be made rapidly and efficiently.

Question 7: Dr. Applegate, if confirmed, how will your balance and prioritize funding between both the Federal Priorities Stream gauges and the Cooperative Matching Funds for Streamgage Network?

Response: If confirmed, I will ensure that the USGS continues to execute the intent of Congress for both of these efforts. The Federal Priority Streamgages network is, as the name suggests, intended to serve as the "backbone" of the bureau's streamgage network to provide federal information needs that are funded by federal dollars and thus not vulnerable to shifting local priorities and resource pressures. Streamgages funded through the Cooperative Matching Funds for Streamgage Network are part of an important partnership that USGS has with other federal, state, Tribal, and local agencies. I am committed to working with and listening to our stakeholders and partners and will work hard to prioritize our partners' needs for better data, information, and tools that will assist with flood response and water management.

Question 8: Dr. Applegate, last year the U.S. Geological Survey published a report predicting a 50% chance that the majority of sage grouse leks will be productive in 60 years. However, the report failed to acknowledge the fact that within the past fifteen years, states and partners have invested an unprecedented amount of resources and time to reverse this trend. According to wildlife biologists, the benefits of sage grouse habitat projects typically take around 30 years to fully realize. As the listing of the sage grouse has become increasingly politicized, I worry about USGS's motivations in leaving out western states' data, analysis, and pro-active measures within this report that would have provided a more optimistic outlook. **Why did USGS decide to leave out this information and how can USGS better collaborate with state agencies on these wildlife issues?**

Response: I agree that the USGS should work on strong collaboration with state partners on matter such as this. USGS has worked to answer questions about this report for the committee staff and we will continue to do so further if requested. My understanding is that the report referenced is the result of close collaboration and coproduction with 11 western state resource agencies, the Western Association of Fish and Wildlife Agencies, the USGS, and other federal resource management agencies. I believe that it was intended to ensure that the best available data provided by state wildlife agencies were used to estimate sage-grouse population trends and identify where and when local population trends differ from regional trends. Because the effects on sage-grouse population trends vary substantially among conservation efforts, geographies, and climate patterns, the estimated trends reported implicitly incorporated benefits of some conservation actions implemented over several decades.

As noted in the report, the rate of habitat loss was found to be increasing and outpacing the rate at which the important conservation efforts referenced by your question are improving or restoring degraded or lost habitats. I agree that the USGS should continue collaborating closely with partners including the states to evaluate the influence of the conservation and restoration actions they are taking, as well as the influence of threats that are driving habitat loss and population trends. This is part of the next phase of this collaborative, which is underway using data entered into the Conservation Efforts Database by the partners referenced above. If confirmed, I am committed to directing the USGS to conduct its work in an objective way to provide the best available scientific information for policymakers, being transparent with our work including with Congress, and prioritizing production collaborations with states, Tribes and stakeholders.

Senate Committee on Energy and Natural Resources
Dr. David Applegate Nomination Hearing
April 28, 2022

Questions from Senator Lankford

Question 1: Many of the deadlines for meeting emissions reductions targets are right around the corner – for instance, this administration set a goal of procuring only zero-emissions vehicles by 2035, and aims to do this by 2027 for light-duty vehicles. There are countless others that will drive up demand for wind turbines and solar panels. That is a lot of minerals we need to secure in the next few years. We need to know where these resources are quickly if we are going to use domestic resources to support the manufacture of EVs and other renewable technologies on such a short timeframe. **Dr. Applegate, are you confident that the current pace of progress on Earth MRI enables greater use of domestic minerals in these technologies on that near-term timeline?**

Response: I believe that USGS can make great progress on Earth MRI in order to provide policy makers with timely, nonpartisan, and sound scientific information on mineral resources to inform these decisions. The Bipartisan Infrastructure Law accelerates the acquisition of geophysical, geological, and geochemical data across the U.S., and specifically for the Earth MRI program provided funding to significantly increase the size and number of mapping projects and associated analyses. The infrastructure law set initial goals for the program, and with continued funding we expect to have mapped the majority of areas believed to have subsurface critical mineral potential in a timely way, and to have developed a first-generation national mine waste inventory. These are important efforts as underscored by your question and are a critical part of the USGS mission that I will make a priority, if I am confirmed.

Question 2: Just as important as knowing where these minerals are is knowing the likelihood of getting a permit to develop the resources. In some instances, it is obvious from looking at a map that permitting in an area would be challenging, but others are less clear. Knowing in advance whether there are extenuating environmental concerns in a region could lead to a lot more certainty for project developers. **Dr. Applegate, is there any effort to work collaboratively with permitting agencies to not only identify areas that are potentially mineral-rich, but also areas that are more likely to get through the permitting process in a timely fashion? If not, is this something you would support doing?**

Response: While USGS does not have a role in decision-making related to permitting or management decisions on the public lands, I fully support close working relationships with land management agencies on studies of both mineral resource potential and the environmental impacts of past and potential future mining activities. As outlined in your question, it may make sense to prioritize the USGS work in some areas. If I am confirmed for this position, I would ensure that the USGS implementation of Earth MRI is both meeting its mission requirements and being responsive to the needs of our partner agencies and stakeholders, while ensuring that the information we are providing is objective and based on the best available strong scientific information.

Question 3: USGS' spend plan for Infrastructure Investment and Jobs Act funding made a passing reference to collaboration with private sector mining companies. Near the end of the document it stated, "Earth MRI works with mineral exploration companies to gain access to existing geophysical survey data and to help offset costs for large geophysical surveys."

a. Dr. Applegate, as the individual exercising the delegated authority of the USGS director, can you expand on what this collaboration with mineral exploration companies entails?

Response: Transparency and public data delivery are key parts of the USGS's Earth MRI effort to collaborate with federal, state, Tribal, and local stakeholders on advancing the Nation's understanding of its geology and natural resources. An increasing number of mineral exploration companies are recognizing the value of sharing data of all types (geophysical surveys, geologic observations, subsurface and surface rock samples, and geochemical measurements) with the USGS so it can be released into the public domain. The release of these data saves taxpayer dollars by avoiding duplication of data acquisition when a private company has already collected data in an area and also maximizes the information available from USGS data acquisition in areas not already covered by the private sector with modern surveys. The increasing availability of data in the public domain enriches research in the mineral resources community and provides local communities and other stakeholders with a consistent understanding of mineral resource potential, as well as the opportunity to use these datasets for other important purposes, such as water resource investigations.

b. Are there opportunities for greater collaboration with mineral exploration companies so that we can actually put all of the information you are collecting to use?

Response: Yes, based on experience with the Earth MRI program, the success of the initial collaborations with industry, state geological surveys, Tribes, and nongovernment organizations, is growing with time as the actual and potential impact of Earth MRI is recognized. If I am confirmed, I will work hard to ensure that the USGS is focused on the efficiencies of collaboration, including with the private sector, and is delivering this data to the public in more efficient and effective ways.

Senate Committee on Energy and Natural Resources
Dr. David Applegate Nomination Hearing
April 28, 2022

Questions from Senator Cassidy

Question 1: Dr. Applegate, during your nomination hearing we spoke about the potential for mining deep sea nodules from the Clarion Clipperton Zone (CCZ).

a. **Please detail what work USGS has performed with international partners to better understand this offshore region given 2019 USGS reporting on the potential for the CCZ to hold more than cobalt, nickel and rare earth minerals than all land-based resources combined.**

Response: The USGS has spent substantial effort studying marine minerals throughout the Pacific. The CCZ is one region among many in the Pacific that host or may host marine minerals, including manganese nodules.

The most substantial United States and USGS effort in the CCZ was the Deep Ocean Mining Environmental Study (DOMES) project in the 1970s. The purpose of this work was to evaluate potential environmental effects of manganese nodule mining. This work was funded by NOAA and led to USGS research on processes of manganese nodule formation and the associated open ocean environment.

Following the DOMES project, there were a series of research cruises in the late 1980s and early 1990s that were a collaboration between the Korea Ocean Research and Development Institute and the USGS. In addition to the CCZ, this work was also carried out in the Exclusive Economic Zone (EEZ) of the Marshall Islands and the Federated States of Micronesia.

Following 1991, the USGS's work on manganese nodules was opportunistic and included research throughout the Pacific Ocean, including around the Cook Islands. A summary of the state of the knowledge of marine minerals in the United States EEZ was completed in 2005. The USGS continues to work with partners on environmental questions related to the potential for manganese nodule extraction in the CCZ and elsewhere, as well as the marine processes that result in critical element enrichment, in order to help refine regions of interest.

Global estimates referenced in your question of contained metals are the broadest initial quantification of mineral resource potential. These estimates are scientifically credible, but because of limited mapping, sampling and analyses, they fall short of the assessments of technically or economically recoverable resources the USGS has provided elsewhere. I would be happy to discuss this issue further with you and ensure that the appropriate USGS experts update your office.

b. **What impediments exist in order for U.S. companies to conduct deep sea exploration in this region?**

Response: As I noted in response to a similar question at the hearing, undersea mining outside the Exclusive Economic Zone of the U.S. and other nations is an area that I understand involves the International Seabed Authority and would be covered by the Law of the Sea Treaty, through which I understand rules and guidelines associated with such activities have been developed. As a general matter, I appreciate that international cooperation is necessary outside the EEZ, but I am not familiar with the particulars of this question, and it is outside my area of expertise and the role of the USGS. If confirmed I am committed to ensuring that our scientific work informs policy makers to the best of our ability.

c. How can companies source raw materials in a way that does not cause vast disturbance to the seabed floor?

Response: I am generally aware that proposed technologies, which are associated with seafloor disturbance and sediment plumes, are in various stages of construction and testing. New technologies, such as neutrally buoyant collectors, could reduce impacts but I understand have not yet been developed to scale. If confirmed, I would work to support USGS work as it relates to this question to help support policymakers.