Written Testimony

Testimony Submitted by
American Geosciences Institute
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To the United States House Committee on Natural Resources
Subcommittee on Energy and Mineral Resources

Regarding the Legislative Hearing on Sinkhole Mapping, 4 Other Bills
September 19, 2019

Chairman Lowenthal, Ranking Member Gosar, and Members of the Subcommittee:

Thank you for the opportunity to provide remarks on behalf of the American Geosciences Institute (AGI) regarding the role and importance of critical geosciences initiatives to the nation. I appreciate the opportunity to contribute our thoughts today on the important work that you are undertaking in this legislative hearing. My name is Allyson Anderson Book, and I am the Executive Director of AGI.

AGI is a nonprofit federation of 52 member societies that represents more than 260,000 geoscientists across the nation. Geoscientists study all aspects of the Earth system, including resource exploration and development, environmental geology, weather, and natural hazards, and they work at various levels in industry, academia, government, and K-12 education. Founded in 1948, AGI provides scholarly information services to geoscientists, serves as a voice of shared interests in our profession, plays a major role in strengthening geoscience education, and strives to increase public awareness of the vital role the geosciences play in society's use of resources, resilience to natural hazards, and the health of the environment.

My testimony today is meant to highlight the tangible, societal impacts of your support for the programs and subjects being discussed at today's hearing: geologic hazards mapping, preservation of geological and geophysical data, and geothermal energy exploration. These topics yield societal impacts far beyond the stated scope of each bill and I will speak to the importance and impacts of each topic in the remainder of my testimony.

Geologic Hazards Mapping

The American Geosciences Institute, on behalf of itself and members, supports H.R. 496 and thanks Representative Soto for introducing the bill. We do, however, seek to expand the

mapping program to include other geologic hazards, such as coastal erosion, drinking water recharge[1], landslides[23], salt-water intrusion of freshwater systems[4], and more. A comprehensive approach to mapping all types of geologic hazards will assist in highlighting the most vulnerable areas in the U.S., as there are some geographic areas that are particularly vulnerable to a range of geohazards.

This type of mapping work takes resources, including experienced experts and financial resources. H.R.496 does not provide any additional authorizations for funding this initiative and we feel that this will require additional funding to the U.S. Geological Survey to adequately assess sinkhole prone areas beyond the work that they are already conducting related to this topic[5] and even more to consider the full range of geologic hazards.

While we are incredibly supportive of the skilled assessment work that the USGS conducts on behalf of the U.S public, we do note that there are other organizations with information and expertise than can assist in a mapping and assessment project like this. This includes state geological surveys and other research organizations such as the National Cave and Karst Research Institute (NCKRI). The National Cave and Karst Research Institute[6] has a three-part research program that focuses exclusively on cave and karst systems, which includes: cave and karst studies at the Cave and Karst Studies Program at New Mexico Tech; research into the principles of how caves, karst, and their components are created, changed, organized, and distributed (how caves and karst work; and research to solve, manage, or prevent problems associated with caves and karst, and to develop or improve methods for using cave and karst resources.

I would like to highlight two examples of the time sensitive, critical safety-related work that is done at state and local levels by geoscientific organizations like NCKRI and the New Mexico Bureau of Geology and Mineral Resources.

The state of New Mexico is home to many types of geologic hazards, including cave and karst related hazards that are both natural and manmade. A significant number of sinkholes and other karst phenomena exist in southeastern New Mexico that originate with solution mining of salt beds in the area. This area is the site of ongoing joint research between the two named organizations[7].

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[1] https://www.usgs.gov/centers/ny-water/science/groundwater-sustainability-long-island-aquifer-system?qt-science_center_objects=0#qt-science_center_objects

[2] https://authors.library.caltech.edu/96521/

[3] https://www.usgs.gov/natural-hazards/landslide-hazards/science/potential-landslide-paths-and-implications-tsunami-hazards?qt-science_center_objects=0#qt-science_center_objects

[4] Saltwater intrusion in the Floridan aquifer system near downtown Brunswick, Georgia, 1957–2015 (2017)

[5] https://pubs.usgs.gov/of/2014/1156/pdf/of2014-1156.pdf

[6] http://www.nckri.org/research/nckri_research_intro.htm

[7] https://geoinfo.nmt.edu/publications/periodicals/nmg/34/n4/nmg_v34_n4_p117.pdf

On July 16, 2008, a brine well cavity in Eddy County, New Mexico, abruptly collapsed. The resulting sinkhole engulfed the well that was being used to mine the salt below the surface and ultimately spanned 111meters in diameter with a depth of approximately 45 meters. The two organizations worked to map the extent of the damage and assess the potential risk to ongoing brine mining in the area. They identified more underground cavities that extend into residential areas and under major roadways.

Following flooding in September 2013, several areas near the community of Lakewood in northern Eddy County, New Mexico, were damaged by multiple sinkhole collapses. NCKRI was asked to conduct electrical resistivity surveys to assess the footprint of the cavities (sinkholes) that would be used to guide road repairs for major roads that were impacted by sinkhole collapse[8].

NCKRI agreed to conduct this research to assist in solving a threat to public safety in addition to collecting additional geophysical data related to sinkholes and karst terrain. The sinkholes in that area form by the piping of soil and alluvium into underlying karstic cavities. Their position along the two roads is the result of drainage channels along either side of each road, which have promoted groundwater recharge in these linear areas for many years. The flood of September 2013 focused substantially greater flow down into the soil in the channels until the subsurface cavities became sufficiently large and unstable, which led to collapse and breach the surface.

In the time since these episodes, the two organizations, working with other state and city officials have worked to set up an early warning system in the town of Carlsbad that would provide notification should the surface above the underground cavities (Figure 1) start to expand or experience surface collapse. This remains a major threat to human safety in the areas around Carlsbad and throughout Eddy County[9].

[8] http://www.nckri.org/about_nckri/investigations/NCKRI_RI6.pdf
[9] https://phys.org/news/2018-01-experts-sinkhole-popular-mexico-area.html

Figure 1. Image[10] showing the intersection of major roadways in the Carlsbad area that would be impacted by the formation of a sinkhole. The potential collapse zone underlies a mobile home park and poses a threat to the residents in that area (red line).

In summary, we support this legislation, but would like to see further authorizations to support a more comprehensive approach to mapping a broad array of geologic hazards mapping throughout the U.S., in addition to areas of that are at risk for sinkhole formation.

Geologic and Geophysical Data Preservation

The "Data Preservation Act of 2019" seeks to reauthorize the National Geological and Geophysical Data Preservation Program Act of 2005 through 2024. We are fully supportive of this reauthorization, but request that further consideration be given in the Congress to more fully fund this important federal program. While the authorization has been historically $30 million per year, the actual funding for geological and geophysical data preservation has been much smaller. This work has been funded through the U.S. Geological Survey so that state geological surveys can conduct the data preservation activities. The scale of the project in each state far exceeds the annual funding that state surveys receive for these activities. Our concern is that this places a funding strain on the U.S. Geological Survey and that funding of these projects could undermine other critical research programs that they conduct (and vice versa). We encourage the members of this committee to work with their appropriations colleagues to more fully fund this work.

[10] https://www.kob.com/new-mexico-news/nm-senate-house-approve-funding-to-stabilize-giant-sinkhole-in-waiting/4785612/

One personal example of the importance of geologic and geophysical data preservation relates to work that I conducted as part of a larger geologic project at the Kansas Geological Survey (KGS).

On the morning of January 17, 2001, a natural gas explosion occurred in downtown Hutchinson, KS. Later that day, gas geysers erupted two miles to the east along the edge of the town. These events coincided with a major gas leak that occurred at the Yaggy gas storage facility located approximately seven miles northwest of Hutchinson. The work that our team conducted related to determining the origin and pathways of the natural gas as it migrated to the town of Hutchinson, KS. My role was to review historical geologic cores and analog wellbore data from the areas around Hutchinson, with a particular focus on the Lyons Salt member. I personally scanned and digitized many old electric wireline logs that became a part of the larger digital geologic data set that the KGS has been working to build. While some of those historical records have been digitized, a large analog data set still requires conversion and storage in a digital archive for future use. Additionally, core preservation is not a one-time activity – it requires ongoing funding to ensure that cores are properly maintained and stored to prevent deterioration and degradation.

We encourage the members of this committee to reauthorize the program and to work with colleagues to dedicate increased funding to this critical program.

Geothermal Energy Development

Geothermal energy is one of the only truly sustainable and renewable energy resources on this planet, though it is less recognized for renewable energy production, behind solar and wind power. There are many advantages to geothermal energy, including continuous baseload power, its low emissions profile, and limited impacts to the Earth's surface.

Geothermal power uses natural steam or very hot water trapped in deep rock formations. Extraction wells – often more than a mile deep – are drilled into hot rocks, allowing the steam or hot water to flow up to the surface[11]. Private firms and public utilities then utilize the steam for electricity generation. Both conventional geothermal systems and enhanced or engineered geothermal systems have the potential to power tens of millions of American homes and businesses.

Currently there is ~3.6 gigawatts of installed conventional geothermal energy production, with another 1.2 gigawatts under development. The Department of Energy in a recent 2019 study[12] estimated that geothermal electricity generation could increase to 60 gigawatts of installed capacity by 2050 under an accelerated development schedule and with technologic improvements to today's production capabilities. The current geothermal power production

[11] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. 2011 Geothermal Basics.
[12] https://www.energy.gov/eere/geothermal/downloads/geovision-harnessing-heat-beneath-our-feet

comprises approximately 2.3% of the total U.S. renewable power generation and 0.4% of all utility scale generation[13].

To meet the 2050 renewable goal stated above, far more exploration and development of this important energy resource must be done. The proposed language in H.R. 4026 "Enhancing Geothermal Production on Federal Lands Act" is aimed at increasing geothermal development on federal lands. There are a lot of very positive aspects of the proposed bill, including language that would allow for the ability to coproduce geothermal energy from existing oil and gas leases. There are wells in parts of the U.S. that produce wastewater and waste heat that could be utilized for energy production.

The bill does, however, appear to alter the standard environmental siting practices required of other domestic energy projects. The American Geosciences Institute is very supportive of the development of geothermal energy resources. However, we seek to emphasize the importance of robust environmental impact analysis prior to the leasing and development of a new project on federal lands, especially in the test phase prior to development. Any deviation from established citing practices, could erode the public trust in any geothermal project that is developed on federal lands. The programmatic environmental impact study required in this bill could provide a robust review of the potential impacts of geothermal production in a given area, however it is important that this review be completed prior to holding a lease sale or issuing a permit to ensure that any impacts from geothermal drilling activities can be mitigated prior to the start of the project.

Another aspect of the bill that is unclear, is the definition of a qualified geothermal professional as "an individual who is an engineer or geoscientist in good professional standing with at least 5 years of experience…" In many geoscientific positions, licensing or professional certification is a requirement. Is it the intention with this definition to require that qualification level? If not, what are the qualifications that meet the "good professional standing requirement"?

Although we, as a society, may face many uncertainties about future energy supplies in the world, we have the potential to tap into the Earth's abundant, natural heat in our backyard to benefit mankind in the 21st century and beyond. We support the robust analysis of scientific data in all facets of energy projects, from exploration and production to the assessment of environmental impacts. Fact-based analyses support well-informed decision making by community, corporate, and government participants and stakeholders.

To conclude, I want to thank you for inviting the American Geosciences Institute to weigh in on these important topics and legislation. We appreciate the work that you are doing on behalf of your constituents and our stakeholders and member organizations.

[13] Based on 2017 Energy Information Administration data.