

STATEMENT FOR THE RECORD  
U.S. DEPARTMENT OF THE INTERIOR  
BEFORE THE  
HOUSE COMMITTEE ON NATURAL RESOURCES  
SUBCOMMITTEE ON ENERGY AND MINERAL RESOURCES  
REGARDING  
H.R. 3479, THE NATURAL HAZARDS RISK REDUCTION ACT

December 13, 2011

Chairman Lamborn, Congressman Holt, Members of the Subcommittee, thank you for providing the Department of the Interior the opportunity to submit this statement for the record for today's hearing on the reauthorization of the National Earthquake Hazards Reduction Program (NEHRP). The United States Geological Survey (USGS) is proud to be a partner in NEHRP, which is led by the National Institute of Standards and Technology (NIST) and also includes the Federal Emergency Management Agency (FEMA) and the National Science Foundation (NSF). We greatly appreciate the opportunity to comment on H.R. 3479 to reauthorize NEHRP, a successful inter-agency endeavor that continues to make valuable contributions to the Nation's resilience to earthquakes and other hazards.

Carrying out its role within NEHRP, the USGS strives to deliver the information and tools that engineering and design professionals, emergency managers, public officials and citizens need to prevent earthquake hazards from becoming earthquake disasters. With its partners, the USGS reports on earthquake size, location, shaking intensity, and potential impacts; develops regional and national hazard assessment maps and related products; supports targeted research to improve our monitoring and assessment capabilities; and builds public awareness of earthquake hazards. In what follows I discuss the current status of these activities.

### **Status of NEHRP**

NEHRP is predicated on the belief that while earthquakes are inevitable, their consequences are not, and there is much that we can do as a Nation to improve public safety and our resilience to earthquakes and other natural hazards. The heart of this partnership is a broadly shared commitment to translate research results into implementation actions that can reduce earthquake losses. That commitment involves collaboration that goes beyond the four agencies to include other Federal partners, plus State, Tribal and local governments, universities, and the private sector.

The USGS commends NIST for its leadership of the NEHRP partnership. During the last seven years, the NEHRP Secretariat within NIST has brought enthusiasm, hard work, and a cooperative spirit to the task of supporting and joining the various management elements within NEHRP so that their work is smoothly carried out and the results of their efforts are compatible and

mutually reinforcing. The principal management elements of NEHRP are the high-level Interagency Coordination Committee, the independent Advisory Committee on Earthquake Hazard Reduction, and a working-level coordination group. A single NEHRP strategic plan binds these management elements and the NEHRP agencies together toward common goals and objectives. NEHRP annual reports document our activities and our progress toward advancing earthquake safety nationwide.

## **USGS NEHRP Activities**

Earthquake Monitoring - Delivering Rapid Information for Emergency Response. In addition to its responsibilities authorized under NEHRP, the USGS has the lead Federal responsibility delegated by FEMA under the Stafford Act (P.L. 93-288) to provide notifications – including forecasts and warnings where possible – for earthquakes, volcanoes and landslides. To carry out these statutory roles, the USGS provides rapid reports of potentially damaging earthquakes to the White House; the Departments of Defense, Homeland Security (including FEMA), Transportation, Energy, Commerce, and the Interior; State, Tribal, and local emergency managers; numerous public and private infrastructure management centers (for example railroads and pipelines); the news media; and the public. These earthquake notifications are also delivered as e-mails and text messages to over 300,000 users. The suite of information products available through the USGS Earthquake Hazards Program website receives tens of millions of hits in the wake of damaging earthquakes. The technical foundation that allows the USGS to deliver these products is the Advanced National Seismic System (ANSS).

The 2000 reauthorization of NEHRP established the ANSS to modernize and expand the Nation's seismic monitoring infrastructure in order to improve the delivery of earthquake information to those who need it most. The ANSS consists of a national backbone network, regional networks operated by State and university partners, the USGS National Earthquake Information Center (NEIC), and ground- and structure-based instruments concentrated in high-hazard urban areas. Funding for ANSS, currently \$8.3 million in fiscal year (FY) 2012, has resulted in more than 2,100 new and upgraded stations out of a total of 7,100 identified in ANSS plans for full implementation of the system (USGS Circular 1188). It has also resulted in considerable modernization of network operations, the initiation of 24/7 on-site operations at NEIC, and new product development. These investments have greatly improved the information available for emergency responders, engineering performance studies, and long-term earthquake hazard assessments. The ANSS has been carefully planned and executed, as reflected by its repeatedly being the highest-rated information technology major capital investment in the Department of the Interior. A report by the National Research Council on the costs and benefits of seismic monitoring found that the benefits of fully deploying ANSS outweigh the costs many times over.

A substantial increase in the quality and number of ANSS stations and in data processing and product generation capabilities was realized in 2010 and 2011 as a result of economic stimulus funding. The USGS allocated \$19 million of the \$140 million dollars it received under the American Recovery and Reinvestment Act (ARRA) to the modernization component of ANSS. Outdated equipment at hundreds of legacy seismic stations has been replaced with modern digital equipment. ARRA funding was allocated to 13 cooperating State and university partners that performed the station and network upgrades. In addition to station modernization, ARRA funds were used to upgrade communications and processing software and also to develop critical software. At the conclusion of the ARRA-funded upgrades, ANSS was approximately 25 percent complete.

In California, the ARRA upgrades replaced many of the older recording instruments that had slow data transmission rates. The modern replacements will allow existing systems to provide much more timely earthquake alerting and will support development of a prototype capability to deliver automated warnings after an earthquake occurs but before strong ground shaking arrives at sites away from the epicenter. Even a few seconds of advanced warnings may be useful for schoolchildren to seek refuge under their desks; for utilities to rebalance electricity distribution and possibly shut off gas lines; for hospitals to initiate auxiliary power systems; for public transit systems to reduce speeds; for fire stations to open their doors; and for other targeted uses. For the past three years, the USGS has been working with the consortium of universities that operates the ANSS California Integrated Seismic Network to test early-warning algorithms, and we recently began the second phase of this partnership to build a prototype statewide earthquake alerting system. This development will be accelerated in the next three years with a recent grant from the Gordon and Betty Moore Foundation of \$6 million over three years to three West Coast universities (\$2 million to each) to work with the USGS toward a prototype early warning system. Any developments in earthquake warning coming from ANSS investments in California will be expanded nationwide as ANSS is more fully realized.

Assessing the Nation's Earthquake Hazards. Earthquakes are a national challenge with 75 million people living in moderate to high hazard areas stretched across 39 States. Recent earthquakes in Colorado, Oklahoma, and Virginia have underscored the national nature of earthquake risk. One of the most important achievements that NEHRP has made is the translation of research into models of the location and expected severity of earthquake shaking nationwide within specified time periods. These models are used to generate maps that are incorporated into the seismic safety elements of model building codes and for other purposes. The maps are the culmination of a multi-year process to incorporate the best available science, including geologic information about faults, evidence of prehistoric earthquakes, instrumental and historical earthquake catalogs generated by seismic monitoring, and ground deformation measurements. In 2008, the USGS released the latest update of the National Seismic Hazard

Maps; the USGS is currently in the process of revising this product in the light of new research and data.

The delivery of the updated seismic hazard maps is timed to fit into the development of the next generation of building codes, a process that involves close cooperation among the USGS, FEMA, the Building Seismic Safety Council, the American Society of Civil Engineers, the International Code Council, and many other organizations. Earlier versions of the USGS maps are the basis for seismic design maps in the International Building Code and the International Residential Code, which have been adopted in almost all States. The maps are also used by insurance companies to set rates for properties in various areas of the country, by civil engineers to estimate the stability and landslide potential of hillsides, by the U.S. Environmental Protection Agency to set construction standards that ensure the safety of waste-disposal facilities, and by FEMA to plan the allocation of assistance funds for earthquake education and preparedness. The USGS also works closely with the U.S. Nuclear Regulatory Commission on seismic safety of nuclear power plants, including review of seismic hazard assessments in license applications.

Complementing the national maps, urban seismic hazard maps combine state-of-the-art modeling techniques and detailed information about near-surface materials that affect shaking strength to provide more detailed information on local site conditions for use in engineering and planning. Urban seismic hazard maps have been released for Memphis and Seattle and are near completion for the St. Louis and Evansville (Indiana) areas. Those maps show how forecasted earthquake shaking levels vary, at scales useful for urban planning, earthquake response planning, engineering guidance for major structures, and public education. Such maps require detailed mapping of surficial geology and knowledge of subsurface geology in order to incorporate the local effects into estimates of shaking. Developing these maps would not be possible without significant involvement of local and regional scientists, engineers, emergency managers, and the business community.

Targeted Research. Both USGS assessment and monitoring activities depend on the targeted geoscience research that is the third major USGS responsibility within the NEHRP partnership. External research supported by the USGS through grants to and cooperative agreements with universities, state geological surveys, and geotechnical consultants augments the USGS' internal research capabilities. Proposals for this work are submitted in response to an annual solicitation that identifies the scientific problems on which the USGS seeks assistance and progress. Each proposal is subjected to a rigorous peer-review process. This targeted research is awarded on the basis of merit and provides a bridge from the NSF's investments in fundamental research to generate critical advances in understanding that underpin development of the national and urban seismic hazard maps and rapid earthquake response products. Ongoing collaboration with the academic community is one of the great strengths of the USGS with regard to earthquake research. Two particular examples are the jointly USGS-NSF supported Southern California

Earthquake Center (SCEC) and our important research partnership with the NSF's EarthScope facility.

Using Earthquake Outreach and Education to Better Prepare. The USGS works to make earthquake hazards understood through education and outreach products developed in concert with NEHRP, university, and local government partners, including the FEMA-supported regional earthquake consortia; the NSF-supported IRIS consortium; and the SCEC university and government consortium. Millions of copies of earthquake preparedness handbooks have been distributed in California, Alaska, Tennessee, and many other states. As part of an effort to reach underserved populations, both the southern California and Bay Area versions of *Putting Down Roots in Earthquake Country* have been translated into Spanish, and a shortened version of the Bay Area *Putting Down Roots* has been translated into a number of Asian languages and distributed through Asian-language newspapers. Additional versions of *Putting Down Roots* have been developed for Utah and Idaho, and most recently a version for the Central United States was published for the bicentennial commemoration of the New Madrid sequence of earthquakes that struck the heartland in the winter of 1811-12.

Scenarios have proven to be powerful tools for making earthquake hazards real to people ahead of a disaster. In 2008, the USGS and its partners developed a scenario for a major rupture of the San Andreas Fault that formed the basis for the Great Southern California ShakeOut earthquake safety drill and associated preparedness activities, involving over 5 million people. The ShakeOut became an annual statewide drill in 2009. Through the efforts of SCEC and others, the ShakeOut approach has been adopted by multiple states. This past October, over 9 million people participated across the Western United States and in April over 3 million people participated in ShakeOut drills throughout eleven Central and Eastern States as part of the lead-up to FEMA's National Level Exercise 2011. The ShakeOuts have led to a number of positive outcomes, including efforts to reduce lifeline vulnerability, retrofit critical structures, improve monitoring systems, and educate residents.

### **Post-earthquake coordination and investigations**

The responsibility for post-earthquake scientific and engineering investigations has arisen in various recent discussions of and proposals for NEHRP reauthorization. The 2004 authorization of NEHRP (P.L. 108-360) tasks the USGS with responsibility for post-earthquake investigations. The legislation requires the following at a minimum

1. Analysis by NSF and USGS of the causes of the earthquake and the nature of the resulting ground motion;
2. Analysis by NSF and NIST of the behavior of structures and lifelines, both damaged and undamaged, and

3. Analysis by each program agency of the effectiveness of the earthquake hazards mitigation programs and actions relating to its area of responsibility under the Program, and of how those programs and actions could be strengthened

The USGS carries out its coordination responsibility using the guidelines established in USGS Circular 1242, *The Plan to Coordinate NEHRP Post-Earthquake Investigations*, which was developed by the NEHRP agencies and other partners and released in 2003. Since I last reported to this Committee in January 2010, the USGS has responded to and coordinated the national scientific and technical response for the following events:

- **Haiti** - January 12, 2010. Magnitude 7.0; over 100,000 killed, major damage in Port-au Prince and environs.
- **Chile** - February 27, 2010. Magnitude 8.8; 500 killed, 370,000 buildings damaged, 500 mile aftershock zone from north of Santiago to south of Concepcion.
- **New Zealand** - February 21, 2011. Magnitude 6.1; 181 killed, 100,000 buildings damaged in Christchurch.
- **Baja California** - April 4, 2010. Magnitude 7.2; 200 mile aftershock zone, damage to irrigation systems in southern California.
- **Japan** - March 11, 2011. Magnitude 9.0; 15,700 killed, the massive earthquake triggered a devastating tsunami, 330,000 buildings destroyed, major damage to infrastructure, nuclear power plant heavily damaged.
- **Arkansas** - February 28, 2011. Magnitude 4.7; part of an earthquake swarm near Greenbriar.
- **Colorado** – August 23, 2011. Magnitude 5.3; part of an earthquake swarm near Trinidad.
- **Virginia** – August 23, 2011. Magnitude 5.8; minor damage in central Virginia and Washington DC area, nuclear power plant shut down in Virginia, felt by 30 million persons in eastern North America.
- **Turkey** – October 23, 2011. Magnitude 7.1; 536 killed, 15,000 buildings damaged, widely felt in Middle East.

- **Oklahoma**, November 6, 2011. Magnitude 5.6; near Shawnee, widely felt throughout the central United States, minor damage in epicentral area.

The earthquakes in Haiti, Chile, and Japan were some of the largest and most disastrous in recorded history. Each of the events listed above required immediate attention by USGS staff, most of whom were diverted from other work, often for weeks. Immediate demands included briefings for government officials and responses to the media in the form of assessments and interviews. Within hours or days the USGS organized community-wide conference calls to coordinate the scientific and engineering response by Federal, State, university, and other institutional interests. All of the geospatial data collection was coordinated by the USGS. For each of the domestic earthquakes, the USGS deployed either portable seismometers to record aftershocks or teams of geologists to conduct field studies, or both. In the cases of the larger foreign earthquakes, NEHRP agencies sent reconnaissance teams to Haiti, Chile, Japan, and New Zealand. In some cases, these were followed by more substantial deployments of USGS/USAID Earthquake Disaster Assistance Teams with portable seismometers and geologic expertise as well as NSF-supported engineering teams to determine the causes of building and ground failures.

### **General Authorization levels of H. R. 3479 for the USGS**

Section 105 of H.R. 3479 authorizes \$57,700,000 to be appropriated to the USGS for each of the fiscal years 2012, 2013, and 2014 to carry out the purposes of NEHRP, which is lower than the amounts previously authorized. In addition, although the last reauthorization of NEHRP in Public Law 108-360 included specific authorization levels for the Advanced National Seismic Research and Monitoring System, (referred to above as ANSS), H.R. 3479 does not include any specific authorization amounts for that system. As described above, ANSS represents a cooperative commitment by many separate entities: universities, States, and the USGS and its partners which have made significant progress toward fully deploying ANSS in order to provide state of the art seismic information nationwide. The USGS does not interpret the lack of separate authorization levels for ANSS as a decrease of its authority to implement the ANSS pursuant to the original authorization from 2000 but is concerned that different statutory language may suggest lack of support for the ANSS system.

The Administration's 2012 budget request includes funding for ANSS. State partners also provide support for regional networks. Continued support for USGS ANSS work is particularly important because state funding for regional network operations and development at partner agencies has been cut or are threatened. For example, the California Emergency Management Agency experienced a 20 percent cut in funding, which affected three key ANSS partners – the University of California at Berkeley, California Institute of Technology, and the California

Geological Survey. These cuts will erode the progress we have made developing ANSS in the past decade and will likely result in degradation in service from that provided currently in the California-Nevada region.

## **Conclusion**

The Department strongly supports reauthorization of NEHRP. It has proven to be a successful partnership that continues to make valuable contributions to the Nation's resilience to earthquakes and other hazards. The organizational structure established by the 2004 reauthorization has worked well with NIST as the lead agency.

Thank you, Chairman Lamborn, for the opportunity to provide the Committee with the Department's views on H.R. 3479. The Department would be pleased to answer any questions the Subcommittee may have.

## **For More Information**

Holzer, T.L., et al., 2003, *The Plan to Coordinate NEHRP Post-Earthquake Investigations*: U.S. Geological Survey Circular 1242, 20 p. (<http://geopubs.wr.usgs.gov/circular/c1242/>)

National Research Council, 2009, *Improved Seismic Monitoring - Improved Decision-Making: Assessing the Value of Reduced Uncertainty* [http://books.nap.edu/catalog.php?record\\_id=11327](http://books.nap.edu/catalog.php?record_id=11327))

U.S. Geological Survey, 1999, *An Assessment of Seismic Monitoring in the United States: Requirement for an Advanced National Seismic System*: U.S. Geological Survey Circular 1188 (<http://pubs.usgs.gov/circ/1999/c1188/>)