



RECOMMENDATIONS OF THE AD HOC WORKGROUP TO ASSURE STRONG WATER DATA AND SCIENCE IN A CONSTRAINED/SHRINKING BUDGET

JULY 19, 2013 **DRAFT**

The U.S. Geological Survey (USGS) has dealt with budget limitations for some time. In an age where more science is needed for decision-making, the challenge has been to find funds to develop and apply our water science more efficiently to serve a wide variety of purposes. Long-term water quantity and quality data collection, especially in critical watersheds, aquifers, and water-short areas (where water is essential for development), is crucial for the economic strength of the Nation.

Management and protection of water resources in the United States requires coordination on many levels. The USGS capability to develop data and analyses enables the Nation to make challenging decisions for the allocation, protection, and treatment of water to maximize economic opportunities and public safety in a changing world. Water is a multi-jurisdictional issue critical to the long-term sustainability of ecosystems, communities, and economies. As such, it is a federal responsibility, in conjunction with many partners, for the USGS to lead the Nation in collecting long-term data, synthesizing the data, and providing projections of future conditions and needs.

Budget decisions should support the USGS water resources mission to provide the reliable, impartial, and timely information needed to understand the Nation's water resources, and to actively promote the use of this information by decision-makers to –

- Minimize the loss of life and property as a result of water-related natural hazards such as floods, droughts, and land movement,
- Effectively manage groundwater and surface-water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses,
- Protect and enhance water resources for human health, aquatic health, and environmental quality, and
- Contribute to wise physical and economic development of the Nation's resources for the benefit of present and future generations.

The Task at Hand. In July 2012, the Advisory Committee on Water Information (ACWI) formed an *ad hoc* Workgroup to assure strong water data and science in an environment of constrained or shrinking budgets; ACWI asked the Workgroup to provide advice and recommendations to the Department of the Interior (DOI) and the USGS on approaches and options that might help sustain and enhance water monitoring and related science in the face of

Federal funding constraints in the coming years. Ideally, these options should have minimum adverse impacts on the USGS mission and on the many other public and private programs, projects, policies, and plans that depend upon USGS leadership and participation.

(PLACEHOLDER: we are in the process of drafting a short synopsis of the AS/WS Nov6 letter, the scope and timeframe, and a synopsis of our meeting presentations, discussions, participation.)

Federal Funding is Warranted by Federal Responsibilities and National Benefits. Congress has made clear that federal responsibilities and national benefits require the enhancement or development of a national streamflow information program and a systematic groundwater monitoring program for each major aquifer system in the United States¹. The Workgroup is cognizant of the specific federal responsibilities and national benefits that warrant federal funding.

Federal responsibility is based on many factors, including negotiation and compliance with international water treaties, interstate water compacts and tribal water settlement agreements, the development and enforcement of federal regulatory standards, and the science needed to support federally funded programs (for example, establishing and enforcing regulatory standards under the Clean Water Act and Safe Drinking Water Act; consultations and recovery plans under the Endangered Species Act; federal land management plans; design and operation of reservoirs, flood levees and other infrastructure; WaterSMART planning grants and Title XVI projects; development and monitoring of effective federal policies concerning agriculture and energy development; and plans for restoring and managing major ecosystems, including the Everglades, Chesapeake Bay, Long Island Sound, Great Lakes, Sacramento-San Joaquin Bay-Delta, Puget Sound, Colorado River, Mississippi River, and Gulf of Mexico).

National benefits result from USGS leadership as a federal science agency in initiatives that transcend specific regional or local levels. These include, for example, the monitoring, modeling, and assessment required to forecast flooding; providing safe and sustainable water supply; protecting and restoring ecosystems; understanding the sustainability of intergovernmental water allocation agreements; investing in the Nation's water infrastructure; enhancing the value of data collected by others; and generally helping officials, leaders, and the public understand and utilize the science associated with climate, flooding, droughts, sea level rise, water pollution, endangered species, and ecosystems. National benefits are also developed through open public deliberation and by the opportunities for innovation created by USGS scientists working directly with water managers to meet local, state, regional, and national needs.

Finally, America's water resources support billions of dollars in commerce, provide safe drinking water for millions of Americans, supply needed habitat for fish and wildlife, affect public safety, and provide a variety of other important benefits, including recreation, irrigation, power generation, and manufacturing. Each of these benefits has national economic implications, and USGS leadership in water science is essential in the national effort to maximize sustainable economic development.

¹ Public Law 111-11, Sections 9507(a) and (b).

GUIDING PRINCIPLES

To fulfill its mission, the Workgroup identified the following set of six principles to guide decisions affecting the USGS water program budget. The goal is to ensure that such decisions safeguard the ability of the USGS to provide the reliable, impartial, and timely information needed by other federal agencies, non-federal agencies, businesses, universities, and the general public to understand and manage the Nation's water resources. The Workgroup believes that these six principles, when applied as a package, will help USGS and DOI leaders make budget decisions that will not impair this overarching goal:

- Water Data and Science Should Inform Decisions,
- Water Science Should Address the Whole Water Cycle,
- Water Science Requires Continuity of Water Data,
- Reducing Uncertainty and Risk Should be Weighed Against Costs and Benefits,
- Research Should Strengthen Water Science, and
- Collaboration Should Leverage Ideas and Resources.

WATER DATA AND SCIENCE SHOULD INFORM DECISIONS: Water data is the foundation of water science, and water science³ is the basis of sustainable water management⁴. The USGS must continue to provide the timely, high quality, and unbiased water data and science necessary for informed decision making.

America needs the USGS to lead its water science efforts. The USGS must continue providing essential “backbone” elements of the Nation’s water data collection and delivery system and serve as an objective analytical expert for other federal agencies and for interstate, state, tribal, and local agencies with responsibility for public health and for managing water and related resources throughout the United States.

WATER SCIENCE SHOULD ADDRESS THE WHOLE WATER CYCLE: The elements of the water cycle are inextricably linked. The Nation must understand the entirety of the water cycle, including both quantity and quality, if it is to manage, use, and protect its water resources intelligently. The USGS must continue serving a leadership role in developing and supporting the necessary science.

The Nation’s water data network must be able to clearly characterize each element of the water cycle if the Nation is to understand the hydrologic system and manage water sustainably.

³ The term “water science” is used in this report to refer to analysis, interpretation, research, and application of water monitoring needed to support water management; this support is provided in the form of maps, models and other decision support products. The term “water data” is used in this report to refer to water data collection, management, and delivery.

⁴ The term “water management” is used in this report to include the full spectrum of protection and utilization activities to support all existing and future needs.

Research has repeatedly shown that these components must be considered together for effective water resources management. The Nation depends on the USGS to anchor the collection and assessment of water cycle information and support the development of interpretive and forecasting tools that depend on good measurements.

WATER SCIENCE REQUIRES CONTINUITY OF WATER DATA: Understanding the Nation's water resources and the threats to them requires a sustained commitment to research, data collection, and assessment across short and long spatial and temporal scales. The USGS provides a national perspective and expertise, unencumbered by regulatory or resource management responsibilities, and applies the consistent methods necessary to meet these demands and to lead America's water science community.

Understanding relationships, trends, and variations over the long term is a prerequisite for predicting effects on water resources and providing the information that is crucial to land and water managers. Long-term monitoring is needed to distinguish short-term variation from long-term drivers, such as land use and climate variability. Existing long-term records provide important information on trends of water quality and water availability that are used for future projections. Continuing the development of these irreplaceable records will provide valuable information about the impacts of current and future water withdrawals and use, climate impacts, and land use changes.

The USGS application of consistent monitoring methods across hydrogeologic and ecological regions at various appropriate scales provides important and comparable information on quality trends, impaired waters, water use, ecosystem impacts and management alternatives.

REDUCING UNCERTAINTY AND RISK SHOULD BE WEIGHED AGAINST COSTS AND BENEFITS: Understanding water resources requires an understanding of the uncertainty that is inherent in measurement, analysis, and assessment. Risks associated with those uncertainties in our water science must be weighed against the costs and benefits of reducing or eliminating uncertainty.

The USGS should invest resources to reduce uncertainty where risks are high and reduction of uncertainty is cost effective. The goal is to balance the desired level of confidence with the cost to attain it. Where the risk to existing and future communities from the use of less certain information is low, less rigorous efforts to reduce uncertainty may be appropriate.

RESEARCH SHOULD STRENGTHEN WATER SCIENCE: Research defines, develops, and refreshes the Nation's understanding of water resources and the programs designed to manage these resources. Research conducted by the USGS provides a valuable feedback mechanism to help optimize data collection and science.

Research that supports the national scientific mission, including applied research that directly supports the operational parts of USGS water science, has the most immediate benefit. In the short term, the greatest emphasis should be placed on research with the strongest relation to the most immediate water management challenges, provided the interruption of promising in-progress basic research can be minimized.

COLLABORATION SHOULD LEVERAGE IDEAS AND RESOURCES: Collaboration builds partnerships and enhances opportunities for collecting data and understanding water science, draws attention and resources to immediate management challenges, builds support for water management activities, and leverages private, local, state and federal dollars, ideas, experience, and capabilities.

Collaboration is needed to support integrated science in concert with partners in other disciplines, mission areas, and agencies. Collaboration is a natural outcome of the goal of being responsive to a wide range of decision-makers. Important science activities in which integration occurs are ecology, energy, public health, and natural hazards.

RECOMMENDATIONS

The USGS reputation for delivering solid, unbiased information and science is its greatest asset. This reputation for reliability is grounded in decades of high quality performance. In considering ways to address the challenges of monitoring in a shrinking budget environment, every caution should be taken to avoid actions that put this reputation, or the record of performance that underlies it, at risk. Within these constraints, the Workgroup has identified recommendations that may be useful, if the shrinking budget concerns make this necessary, while preserving the USGS capability to carry out its vital mission.

- 1) **Sustain the national monitoring network** for surface water, groundwater and water quality and extend coverage to address any significant gaps in the network which interfere with the fulfillment of federal responsibilities or the maintenance of national benefits. This includes capturing efficiencies already planned in national monitoring network operations, which can be achieved in line with the guiding principles identified above.
- 2) **Defer less critical grants, interpretive investigations, analytical studies and research** (new projects first, but ongoing efforts if necessary; including any monitoring that is needed primarily for these projects), to the extent necessary to sustain the USGS monitoring network and in a manner that will minimize immediate and long-term adverse consequences for water resource management decisions. The USGS Senior Staff are best positioned to evaluate which grants, studies, analyses and research can be deferred with the least adverse impact to water management decisions.
- 3) **Sustain funding to continue cost-shared investigations, studies and research**, to the extent that identified, national or regional needs can be served.
- 4) **Continue providing incentives for projects and programs that build partnerships and leverage additional resources for water data and science.** A flexible approach should be designed to support these partnerships and where possible, increase the funding support from partners that directly benefit from USGS activities.
- 5) **Develop and promote a better understanding of the uncertainty** associated with water data collection and use in various analytical and interpretive applications as the basis to

evaluate and refine the USGS calibration and data management practices. For example, it may be possible to reduce the effort invested in updating the rating curves for certain streamgages, but the consequential effect on the estimation of flow and ungaged sites and the validation of remote sensing data should be clearly understood first.

- 6) Encourage WSCs to **collaborate on monitoring site maintenance** responsibilities (among themselves and with other agencies) to reduce travel time and expenses.
- 7) USGS provides **standards and training for data collection**. If those standards and training are more strongly promoted, along with an increased role for other agencies, organizations and monitoring councils there may be the potential to offset a portion of budget reductions without a loss of data through greater collaborative effort. It would be useful for USGS to list the situations in which other agencies have taken responsibility for significant elements of the USGS monitoring network and to summarize the successful and unsuccessful aspects of the recent experience; if possible, the analysis should identify the circumstances that increase the likelihood of successful collaboration.
- 8) **Redesign the NSIP** for the “budget constrained world” and to anchor other monitoring efforts (including LANDSAT) by USGS, other federal agencies and others, while meeting same 5 national needs for water science and take better advantage of remote sensing and other new technologies.
- 9) The WSCs should convene regular meetings with the state agencies responsible for water monitoring and prepare reports to the Assistant Secretary [or to the Associate Director for Water?] regarding the distribution of monitoring responsibilities, what the shared priorities are, and where there are significant **opportunities to increase efficiency and reliability** in case of further budget cuts.
- 10) Use the 2004 Government Accountability Office report (Better Coordination of Data Collection Efforts Needed to Support Key Decisions, GAO-04-382) as the basis for **designating USGS as the lead federal agency** to coordinate data collection, processing and delivery and to promote consistency among data collection and management protocols nationwide. The **water data portal** concept developed for groundwater and water quality data would fit nicely into this role and should be extended to surface water measurements, although it requires new or reallocated funding.
- 11) Develop & maintain a clear description **monitoring network design strategy** for each of the three networks. Include network maps & implementation progress assessment in an annual update. The surface water, water quality and groundwater monitoring network initiatives seem like a patchwork, rather than an efficient and deliberate design. Without a clear, strategic design, it appears that USGS operates disparate networks based on various plans and authorities, and it is more difficult to assure that USGS is making the most strategic investment of the available resources.
- 12) Integrate the **surface water and water quality monitoring** responsibilities/staffing? Is there a more efficient allocation of the OSW, CWP, NSIP and surface water quality monitoring program responsibilities?

- 13) The Groundwater Resources Program and the National Water Quality Assessment Program should develop recommendations for groundwater quality monitoring, building off of the concepts in the updated national groundwater monitoring framework document on **monitoring parameters and frequency**.
- 14) USGS staff should assess the benefits (including cost efficiencies, potential for encouraging collaboration, appropriate circumstances for use of each) of the **USGS-EPA model** and the **NGWMN portal model** and recommend further opportunities to extend these benefits.
- 15) The USGS should lead a national initiative to **characterize and promote better understanding of the uncertainty** inherent in all water monitoring and science applications, with the goal of providing a scientific framework for improving the national (and other) investments in our monitoring networks and their strategic design.
- 16) In a constrained budget environment, there could be a trade-off between the size of the monitoring networks and the **level-of-effort going into quality assurance**. In the near-term, we are persuaded that the actual measurements that USGS collects are so sparse (relative to the national and regional context) that quality should not be compromised. However, if the monitoring network design strategies and implementation are clear and strong, the consequences reducing the calibration frequency by 20-30% at some of the monitoring sites should be assessed in terms of the uncertainties of the resulting measurements, estimates and models, and the implication for various types of decisions.
- 17) The USGS Water SMART initiatives should **focus on the interpretive science and modeling tools** that advance water managers' understanding of the water cycle, and support the development of site-specific watershed applications by other agencies (federal, state, tribal, interstate and local).
- 18) Establish a **Research, Development and Innovation Subcommittee (RDIS)** of the ACWI to identify and propose initiatives that produce innovations that can be used to reduce costs and maintain adequate data quality for stream gage and groundwater level monitoring by through: 1) The use of new technologies; 2) Enhancement in monitoring processes; 3) Increasing efficiencies in approaches to work; and 4) Improvements in personnel management. The assessment of the opportunity for innovation may have historically been hindered by the lack of applicable innovations that could be beneficial to short-term budget priorities. RDIS will complete its work under the context that identifying short-term innovation opportunities to address the anticipated reductions in water monitoring networks is ideal but may not be achievable. Nevertheless, its work must initiate now and continue to be ongoing to support the monitoring networks maintained federal agencies as fiscal uncertainty will continue to persist into the future. RDIS should evaluate innovation opportunities in the context of economic, technical benefits and cost. Recommendations made by RDIS relative to monitoring innovations shall either improve existing methods of managing water monitoring networks by reducing costs or by producing higher quality data for the same cost. (more detailed description in Appendix __)
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THE ACWI WORKGROUP

The participants (PLACEHOLDER FOR A DESCRIPTION)

The information and deliberation process (PLACEHOLDER FOR A DESCRIPTION)

FINDINGS AND CONCLUSIONS

Benefits

1. USGS collection, analysis and dissemination of water data provides the nation with information essential to its wise growth and development.
2. While the benefits of this service may be hard to quantify, the returns on the nation's investment in USGS monitoring and research are considered a significant factor in the capture of what has been estimated to be billions of dollars in water's value to the nation's commerce, drinking water, habitat, and public safety.
3. The USGS role in long-term water quantity and quality data collection, especially in critical watersheds, aquifers and water-short areas where water is essential for development, is crucial for the economic strength of the nation.
4. Management and protection of water resources in the United States requires coordination on many levels. The USGS capability to develop data and analyses enables the nation to make some of the most challenging decisions for the allocation, protection and treatment of water to maximize economic opportunities and public safety in a changing world.
5. Providing reliable, impartial and timely information to understand the Nation's water resources is essential if the nation is to minimize loss of life and property, wisely manage ground-water and surface-water resources, protect and enhance water resources, and develop the Nation's resources for the benefit of present and future generations. The USGS is the nation's leader for carrying out this mission.
6. National benefits result from federal agency leadership in initiatives that transcend specific regional or local levels, including, for example, the monitoring, modeling and assessment required to forecast flooding; to provide safe and sustainable water supply; to protect and restore ecosystems; to understand the sustainability of intergovernmental water allocation agreements; to invest in the nation's water infrastructure; to enhance the value of data collected by others; and, in general, to help all officials, leaders and the general public understand and utilize the complex science associated with flooding, droughts, sea level rise, water pollution, endangered species, ecosystems and recreation. National benefits also develop through open public deliberation and by the opportunities for innovation created by USGS scientists working directly with water managers to meet local, state, regional and national needs.

Authority

7. Congress has made clear that federal responsibilities and national benefits require the enhancement or development of a national stream flow information program and a systematic

groundwater monitoring program for each major aquifer system in the United States. (Public Law 111-11, Sections 9507(a) and (b)) Federal responsibility is based on many factors, including negotiation and compliance with international water treaties, interstate water compacts and tribal water settlement agreements, the development and enforcement of federal regulatory standards, and the science needed to support federally funded programs (e.g., establishing and enforcing regulatory standards under the Clean Water Act and Safe Drinking Water Act, FWS and NMFS consultations and recovery plans under the Endangered Species Act; USFS, BLM & NPS resource management plans; Water SMART planning grants & Title XVI projects; development and monitoring of effective federal policies concerning agriculture and energy development; and the plans for restoring and managing major ecosystems, including the Everglades, Chesapeake Bay, Long Island Sound, Great Lakes, Sacramento-San Joaquin Bay-Delta, Puget Sound, Colorado River, Mississippi River and Gulf of Mexico).

Imperatives

8. America needs USGS to lead its water science efforts. USGS must continue providing essential “backbone” elements of the nation’s water data collection and delivery system and serve as an objective expert for other federal agencies and for interstate, state, tribal, and local agencies with responsibility for public health and managing water and related resources throughout the United States.
9. The nation’s water data system must clearly characterize each element of the water cycle to describe the hydrologic system and for water management to be sustainable. The nation depends on USGS to anchor the collection and assessment of water cycle information.
10. USGS has the national perspective and expertise, unaffected by regulatory or resource management responsibilities, necessary to address the nation's water data and science needs and to lead America’s water science community.

Cautions

11. USGS should not spend resources to reduce uncertainty for its own sake, but rather target resources specifically where risks are high and reduction of uncertainty is cost effective.
12. Research drives and supports the national scientific mission, including applied research that directly supports the operational parts of USGS water science, and basic research that propels the scientific mission forward. Greater emphasis must be placed on research for which results may be more tangible, provided the interruption of promising in-progress basic research can be avoided.
13. USGS water data and science functions provide information essential to other national areas of priority, including ecology, energy, public health and natural hazards.
14. The USGS reputation for delivering solid, unbiased information and science is its greatest asset. Its reputation for reliability is grounded in decades of high quality performance. In considering ways to address the monitoring challenges of a shrinking budget environment, every caution should be taken to avoid actions that put at risk this reputation, or the record of performance that underlies it.