

## ACWI Workgroup on USGS Monitoring Challenges in a Shrinking Budget Environment

### Teleconference

23 Sept 2013

#### Attendees:

Peter Evans, ICWP	Darrell Osterhoudt, ASDWA	Mike Norris, USGS
Wendy Norton, USGS	David Wunsch, AASG	Pixie Hamilton, USGS
Ben Pratt, SRBC	John Wells, ACWI-SWRR	Steve Heiskary, NALMS
Chris Reimer, NGWA	Judy Campbell Bird, USGS	Tony Willardson, WSWC

#### Introductions and Agenda Review

Are there any changes needed to the Sept 9 meeting minutes? Hearing no changes, the minutes are approved.

Based on discussions at the Sept 9 meeting, Peter has made some additional revisions to the draft report, and those are marked in the version of the report attached to this meeting minutes document. (Some of this related to use of terms like "the nation's water resources" in order to be sensitive to issues of States' rights. We want to make sure we don't go too far in removing instances of the word "nation" and "national" since USGS has a clear national role to play.) Peter also added some clarifying and referential footnotes near the beginning of the report, including references to the Assistant Secretary's letter and references to the list of individuals who have participated in this workgroup.

Discussion today should perhaps focus on recommendations 4 and 6, and the last couple of recommendations, which we didn't have time for during the last call.

#### Review of Draft Outline for Workgroup Report & Ideas Provided from the Workgroup

##### Recommendation Number 4 –

- This recommendation deals with the idea that USGS may be checking/calibrating its measurements too often, and if they didn't recalibrate their rating curves so often, they might be able to operate more streamgages. We need clear terminology to describe the uncertainty in our data collection efforts. We need to characterize whether we're willing to live with a lower level of quality assurance. The USGS reaction to date has been "reducing the quality of our measurements is a bad idea." This workgroup needs to decide what to include in our recommendation on this particular issue, and how to word that recommendation.
- Is there any opportunity to reduce quality assurance without reducing quality? On a national basis, we probably can't do this. However we may be able to do this at some specific streamgages where conditions are very stable; in fact, there are WSCs who already do this at some sites. USGS has not done a good job of documenting when, where, and why we have done this. Also, a lot of checks are now done remotely every morning, rather than by driving out to individual streamgages so often.

- Is the trip to the streamgage done every 6 weeks? Is that a national standard? (No.) Is it necessary to visit that often, or could it be done quarterly instead? We just need to make sure we cover the range of flows each year – this requires visiting each site several times (usually six times) a year. Also, there are some changes in the stream bed that remote sensing may not pick up, making a site visit much more important.
- The fact that the gages each WSC operates and the amount of money is involved is rather small argues for letting the WSCs implement the calibration process as they see fit.
- Maybe USGS should query the WSCs to find out how many streamgages they actually have to recalibrate for their rating curves every year? How many gages do they visit each year, and could they visit some of them more often or less often? An analytical response to this question might be valuable (see the recently released gap analysis of the streamgaging network).
- Reducing the frequency of calibration would save money and help protect the existing network against the erosive effect of rising uncontrollable costs; the recommendation to reduce calibration (or other quality assurance processes) should not be pitched as a way to increase the number of streamgages.
- Does Headquarters mandate a certain frequency of streamgage site visits? No, there is no mandate. There are periodic data reviews of each WSC, but at those reviews the WSCs are permitted to explain why an especially stable site might not need to be reviewed on site as often as other sites.
- So we keep coming back to the question: do we want to keep this recommendation or not? Peter can talk with USGS and work out a different/better option for this recommendation.
- Maybe the wording needs to be more direct, rather than talking about uncertainty. For example, mention the number of times a monitoring site might be visited to ensure quality. We can talk about what the usual practice is, how that practice might be altered on a case-by-case basis, and what the impact of those alterations might be. We can state clearly that USGS cannot expand the number of monitoring sites during a time of shrinking funds, but they could relax quality assurance to help maintain the sites we already have.
- We can't lose sight of the risk that accompanies uncertainty. Is the QA standard the same regardless of geographic location (i.e., regardless of whether there is a large risk to nearby population, should the data be wrong)? Maybe there should be two or three tiers of QA, depending on the risk of uncertainty at any particular site; we could suggest a classification system for this. This is a realistic approach, and it would probably satisfy the needs of those at DOI who asked for our recommendations.

Number 6 –

- Is there some revision we can make here to avoid discouraging innovation?
- If you have any ideas, let Peter Evans know, and he will circle back with Bob Schreiber, who originally offered this concern. This may be related to our final recommendation, which would establish an ACWI subcommittee for Research, Development, and Innovation.

Number 10 –

- This one would need additional funds (like number 12). Do we need to create a new category of recommendations for this and other items that would require new or reallocated funding?

Number 12 –

- Do we want to keep this recommendation? Won't it cost money? Do we want to keep the part of the recommendation that deals with personnel management? Maybe, but it will need rewording.
- Does USGS respond to recommendations from ACWI? Yes, they do, and they take these recommendations seriously.
- Should we task an existing ACWI subcommittee with this instead of starting a new subcommittee (ACWI has 10 subcommittees already, each with numerous workgroups)? Maybe these details are something we should discuss at the full ACWI meeting.

Other issues –

- Who has the lead on developing graphics, pull boxes, etc.? That's something we'll need to discuss at the next meeting.

**Adjourn**

**Next meeting will be Monday, October 7 at 1:00 p.m. Eastern Time. THIS MAY BE OUR LAST MEETING.**



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

SEPTEMBER 19, 2013 **DRAFT**

The U.S. Geological Survey (USGS) plays an indispensable role in helping the nation maintain a reliable, high quality foundation of water information and science. This foundation supports water research, planning, management and investment by federal, regional, state, tribal and local agencies, as well as by universities and businesses. The USGS role and the foundation it supports have been put at risk by today's shrinking budget environment. USGS has dealt with budget limitations for some time. In an age where more science is needed for better decision-making, the challenge has been to find funds to develop and apply our water science to serve a wide variety of purposes more efficiently. Long-term water quantity and quality data collection, especially in critical watersheds, aquifers, and water-short areas, is crucial for the economic strength of the Nation.

Management and protection of water resources in the United States require 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 and to maximize economic opportunities, environmental quality 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 and manage water resources in the Nation, 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 water resources for the benefit of present and future generations.

**The Workgroup Task.** 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; this report and the recommendations described below are the result of the Workgroup deliberations. The Assistant Secretary of the Interior for Water and Science asked the ACWI 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<sup>1</sup>. Her request reflected the increasing need for water data and science and the likely constraints on federal resources in coming years, and expressed an intention that USGS continue and strengthen its leadership of the nation's water monitoring, assessment and research despite those constraints.

Beginning in August 2012, all members and interested followers of the ACWI were invited to participate in a series of telephone conferences to prepare recommendations for the ACWI to consider, and the Workgroup continued meeting twice each month with WebEx-supported conference calls since December 2012. USGS staff provided invaluable briefings concerning the three monitoring networks and related science programs between November 2012 and March 2013, and the meeting notes and PowerPoint files from those briefings are available on the ACWI website. By June 2013, the first draft recommendations were provided for USGS senior staff and Interior Department reaction, and the Workgroup continued meeting bimonthly throughout the summer and into the fall of 2013. Workgroup participation<sup>2</sup> was strong and consistent, and represented a broad range of the diverse stakeholder community, although several elements of the community were not able to make this commitment of time and consideration.

There is one significant element of the Assistant Secretary's request for which the Workgroup has been unable to provide helpful recommendations, namely the request to identify new or alternative funding sources. While several viable options were considered, they are unlikely to produce significant or reliable revenue, and the options for generating significant revenue seem inconsistent with the national character of these functions, their relation to federal responsibilities, the lean budget currently available and the congressional efforts to reduce the cost of government programs. However, it may be that the ACWI will want to dedicate further effort in the future to this quest.

**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 water science program to inform water resource management in the United States<sup>3</sup>. The Workgroup is cognizant of the specific federal responsibilities and national benefits that warrant federal funding.

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<sup>1</sup> The November 6, 2012 [letter from the Assistant Secretary](#) is posted on the [ACWI website](#).

<sup>2</sup> A list of the individuals who dedicated a generous portion of their time and the organizations they represent will be posted on the ACWI website.

<sup>3</sup> Public Law 111-11, Sections 9507(a) and (b) are among the most recent indications of this Congressional mandate.

**Federal responsibility** is based on many factors, including negotiation and compliance with international water treaties, interstate water compacts and tribal water agreements, the implementation, evaluation and improvement of **federally funded programs**.

**National benefits** result from USGS leadership as a federal science agency in initiatives that transcend specific state, regional or local boundaries. These include, for example, 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 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 derived from open public deliberation and from the opportunities for education and innovation created by USGS scientists working directly with water managers to meet local, state, regional, and national needs.

Finally, America's water resources support hundreds of billions of dollars in commerce, provide safe drinking water for millions of Americans, supply essential habitat for fish and wildlife, affect public safety, and provide a variety of other important benefits, including recreation, irrigation, power generation, and manufacturing<sup>4</sup>. 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.

**Comment [PHE1]:** Workgroup suggested "pullbox" to illustrate the range of important programs and projects, including 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

## 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 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.

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<sup>4</sup>The evidence of these benefits to the Nation is described in many places, and most recently in the [Principles and Requirements for Federal Investments in Water Resources](#) adopted by the President's Council on Environmental Quality in March 2013.

**WATER DATA AND SCIENCE SHOULD INFORM DECISIONS:** Water data is the foundation of water science, and water science<sup>5</sup> is the basis for sustainable water management<sup>6</sup>. 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 a national water data collection and delivery system and serve as an objective science 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 national water data network must be able to clearly characterize each element of the water cycle if the appropriate agencies are to understand the hydrologic system and manage water sustainably. 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 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, without 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.

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<sup>5</sup> 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.

<sup>6</sup> 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.

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.

**CONSIDER RISK BEFORE CUTTING ANYTHING THAT INCREASES**

**UNCERTAINTY**: Understanding water resources requires an understanding of the uncertainty that is inherent in measurement, analysis, and assessment. The USGS should invest resources to reduce uncertainty where risks are high and the cost of reducing that uncertainty is reasonable. The goal is to balance the desired level of confidence in understanding water resource management and protection options with the cost to attain it. For example, with the added uncertainty created by cutting back on the frequency of monitoring flow in a stream, comes added risk from estimating flood or low flows incorrectly. The challenge is to avoid monitoring cuts where the increased uncertainty in understanding stream flow is likely to have large consequences in designing measures to reduce flooding, provide water supply, or protect water quality. In turn, extra spending to keep uncertainty low where the risk to investments in people and ecosystems would also be low makes little sense in a shrinking budget.

**Comment [wen2]**: This heading needs to match the bullet above, at the beginning of the Guiding Principles section (and also needs to jive with the recommendation below – revisions of the recommendation (#4) have caused the recommendation to stray away from the point we tried to make here).

**RESEARCH SHOULD STRENGTHEN WATER SCIENCE**: Research defines, develops, and refreshes the understanding of water resources and the programs designed to manage these resources. Research conducted by the USGS provides an essential 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 greatest long term 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 current shrinking budget concerns make this necessary, while preserving the USGS capability to carry out its vital mission. These recommendations, like the guiding principles identified above, are not necessarily listed in order of priority.

- 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.

To the extent that USGS operation of high priority monitoring sites becomes threatened as the result of funding decisions by other federal agencies, USGS should sustain those operations through collaboration with other reliable partnerships or at its expense. USGS should continue identifying those high priority monitoring sites in collaboration with other agencies and stakeholders.

- 2) **Sustain funding to continue cost-shared investigations, studies and research**, to the extent that identified, national or regional needs will be served. **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 both 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) **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.

Comment [PHE3]: might want NGWMN as example in side bar

- 4) <sup>7</sup>USGS should characterize the uncertainty that is inherent in its current water monitoring practices in scientific terms that data users and decision makers understand (including the subsequent effect in the estimation of flow, water level or water quality at ungaged locations and the variety of interpretive and forecasting applications), with the goal of optimizing the USGS investment in its monitoring network stations (SW, GW & WQ) and the accuracy of the data collected. Using that characterization, USGS should estimate the cost savings achievable if a measure of the current quality assurance were compromised in order to invest in more monitoring stations. The USGS communication with Cooperators, other federal agencies and stakeholders should be useful in both the characterization of uncertainty and in the design of potential cost savings scenarios. The purpose of this characterization and evaluation is to inform the USGS decisions and communication with the ACWI regarding the appropriate balance between higher quality data and larger monitoring networks using

<sup>7</sup> This correlates with the 2012-2022 Strategic Directions for USGS Water Science [OFR-1066](#)

scientific methods and a national perspective. **ALTERNATIVE TEXT:** USGS should continue to characterize “uncertainty” in scientific terms that data users and decision makers understand, including uncertainty associated with water monitoring; modeled estimates for watershed and aquifer conditions at monitored and unmonitored sites; and other interpretative and forecasting applications. USGS should continue to explore cost savings in sustaining national and long-term monitoring networks, while maintaining its rigor and consistent methodology because such standards are required to address multiple needs of a myriad of stakeholders and users. [USGS should continue to educate its stakeholders about the value of high quality data and trade-offs in reducing current standards for monitoring and analysis.](#)

**Comment [PHE4]:** USGS offers this alternative and explains: USGS serves, and its stakeholders expect, data that are reliable, reproducible, and of a quality over the full range of environmental and hydrologic conditions (including extreme high and low events) that meet the needs of the highest purpose in terms of lowest uncertainty, thereby meeting all lower quality needs. The reverse is not true; less frequently collected streamflow data, for example, that represent only “middle flows” cannot be used to develop high or low-flow statistics or provide reliable flood warnings. (USGS acknowledges and respects that demand for such data exists to serve specific objectives at an individual site and can be procured from other Federal, State, and local agencies and private industry.) Loss of consistent and high quality USGS data that help to track changes in monitored and unmonitored watersheds and aquifers over time would undoubtedly result in higher costs in the long run (such as through loss of property and life, inter-jurisdictional conflicts, water planning and management inefficiencies, etc.). USGS should continue to educate its stakeholders about the value of high quality data and trade-offs in reducing current standards for monitoring and analysis

**Comment [PHE5]:** While we seem to agree that USGS should promote a high-quality set of procedures and standards to guide others, is there a significant risk of stifling innovation? Interfering with site-specific adaptation? Creating an impression that USGS is not interested in cost-effective alternative methods or standards?

- 4)5) The WSCs should convene regular meetings with the other federal and state agencies responsible for water monitoring and prepare reports 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.
- 5)6) Anticipate and support an increased role for other agencies, universities, businesses, monitoring councils, *etc.*, who may have the opportunity and capability to collect, manage and contribute useful water data. USGS should evaluate the situations in which other agencies have taken responsibility for significant elements of the USGS monitoring network and 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. USGS provides **standards and training for data collection and management**, and the water data available nationwide will be greatly enhanced if those standards are more frequently discussed and compared with the practices of other experts.
- 6)7) Evaluate the current distribution of NSIP funding over the entire streamgauge network, in lieu of a fully funded NSIP, and redistribute funds to maximize stability of the gage network and ultimately provide the “backbone” network central to the NSIP objective. To the greatest extent possible, partially funded gages should be minimized in favor of fully funded NSIP gages. Prioritization of those gages to be fully NSIP funded should be completed by USGS and consistent with the 5 criteria set forth to establish an NSIP gage. In prioritizing an eligible gage, consideration should be given to the number of criteria the gage meets as well as the population the gage serves.
- 7)8) Distribute funding of the National Ground Water Monitoring Network (NGWMN) to maximize its stability toward providing the quantity and quality monitoring capability that is central to the framework design<sup>8</sup>. Until full funding can be achieved, partial funding should be allocated by the management organization described in that framework design, which is founded on key network design principles of stakeholder involvement and partnering of the USGS with data-owners/providers.

<sup>8</sup> The framework design was developed by the ACWI Subcommittee on Ground Water and is available at [A National Framework for Ground-Water Monitoring in the United States](#), and the management function is described in pages 49-53

8)9) Encourage the USGS Water Science Centers (“WSCs”) to collaborate on monitoring site maintenance responsibilities (among the WSCs and with other agencies) to reduce travel and maintenance expenses.

9)10) Extend the **water data portal** concept developed for groundwater and water quality data to surface water measurements, although it requires new or reallocated funding.

10)11) Maintain a clear **design strategy for each of the three monitoring networks**, along with a statement explaining how they support each other. Include network maps and implementation progress assessment in an annual update. 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.

11)12) Establish a new **ACWI Subcommittee for Research, Development and Innovation (SRDI)** to identify and propose innovations that can reduce costs and maintain adequate data quality for streamgauge and groundwater monitoring through: 1) use of new technologies; 2) enhancement in monitoring processes; 3) increasing efficiencies in approaches to work; and 4) improvements in personnel management. Although the SRDI organization and function may require new or reallocated funding in the near-term, it should evaluate innovation opportunities in the context of economic, technical and cost benefits. [Alternatively, these tasks could be assigned to existing ACWI Subcommittees, some of which are already exploring new technologies.](#) (more detailed description in Appendix \_\_)

**Comment [PHE6]:** pullbox example: the Groundwater Resources Program and NAWQA could develop recommendations for monitoring groundwater quality, building off of the concepts in the updated national groundwater monitoring framework document on monitoring parameters and frequency

another possible pullbox example: 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