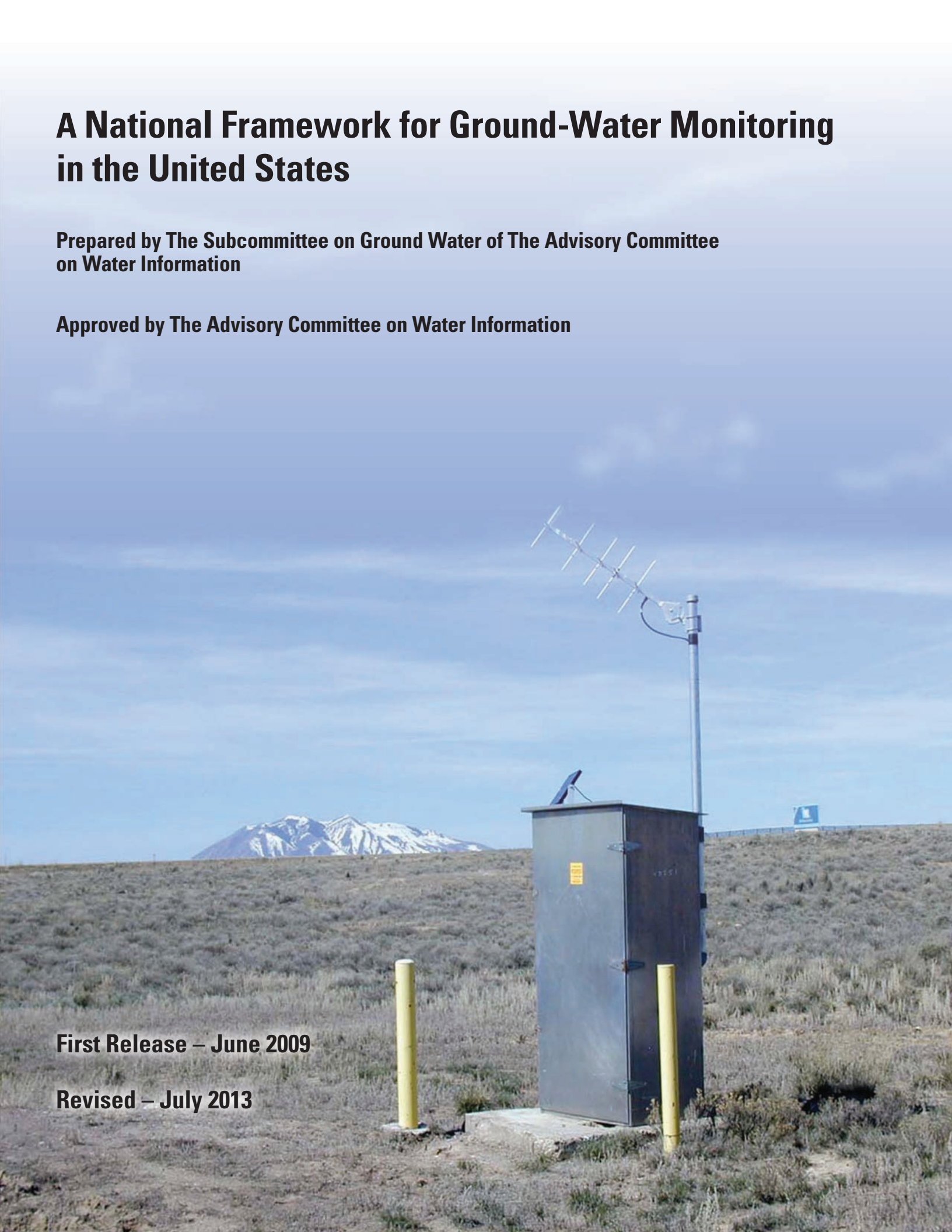
A National Framework for Ground-Water Monitoring in the United States

Prepared by The Subcommittee on Ground Water of The Advisory Committee on Water Information

Approved by The Advisory Committee on Water Information



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Chapter 7 – Network Implementation

This chapter provides a summary of important design concepts in the NGWMN, recommendations for management of the network, and a path forward for network implementation.

7.1 National Network Design

The NGWMN takes advantage of, but also seeks to enhance, existing Federal, multistate, State, and local monitoring efforts. The NGWMN is not intended to replace existing monitoring programs nor is it intended to address localized issues such as contaminated industrial sites. Rather, it is focused on assessing the overall status of major aquifers or aquifer systems and changes as they occur. The NGWMN is expected to provide an improved foundation and context at the national and regional multistate scale within which to interpret data from various data-collection efforts. The network design includes three well classification subnetworks: a Background Subnetwork, a Suspected Changes Subnetwork, and a Documented Changes Subnetwork.

The Background Subnetwork will include monitoring points that provide data from unstressed (or minimally stressed) aquifers. Ideally, this subnetwork ensures that a consistent group of wells is regularly monitored to generate water-level and water-quality data from nonpumped and uncontaminated areas. However, it is likely that total subnetwork-wide isolation from land-use and developmental pressures is not possible, so in practicality, background areas are those that either have no stress or have been minimally affected by human activities. The Suspected Change Subnetwork includes monitoring points where it is not yet clear that documented changes have occurred, but changes are suspected. The Documented Change Subnetwork will include monitoring points that provide data from aquifers that (1) are known to be heavily pumped, (2) have experienced recharge-altering land-use changes, and (3) are located in areas with managed ground-water resources (e.g., artificial recharge or enhanced storage and recovery). The Documented Change Subnetwork also will include monitoring points that are known to have degraded water quality from human activity. A subset of the trend monitoring wells within these subnetworks would be designated as the backbone wells/springs of the NGWMN. These backbone monitoring points are carefully selected core sites that would warrant full support by Federal funds. In instances where backbone sites are operated by NGWMN cooperators, Federal funding assures that data collection and delivery follow NGWMN requirements. Every consideration possible would be given to continuing the long-term record from these wells.

7.2 Incorporating Selected Wells from Existing Monitoring Programs

The NGWMN is planned as an aggregation of selected wells from multistate, State, and local ground-water monitoring networks brought together under the defining principles presented in this document. It is recognized that many wells within the various networks already in existence within the Nation can collectively produce most or all of the data required to address important questions about the availability and quality of the Nation's ground water.

7.3 Inventory of Current Monitoring

When considered together, existing Federal, State, Tribal, and other ground-water level and ground-water quality networks create a "patchwork quilt" of national ground-water monitoring. The design of these programs varies greatly among States. Some have strong ground-water level programs; some have strong ground-water quality monitoring programs. Few have both, and some have neither. Eight States have no statewide or regional intrastate ground-water level monitoring network, and 33 States have no active statewide ground-water quality network. There is a lack of written standard operating procedures for field data collection in at least 8 States with monitoring programs, and a lack of data management and storage capabilities in at least 12 States that have monitoring programs.

Water-level measurement frequencies vary significantly from a 5-year interval to real-time instrumentation. The different frequencies are a consequence, in great part, of the purpose of the individual networks. There is even less consistency in monitoring frequency among State water-quality monitoring programs. It will be a challenge to combine data from these disparate monitoring networks into a coherent national program. Some data gaps likely will result, but the amount of existing ground-water monitoring across the Nation is impressive, and with a clear sense of purpose such a network can be built.

7.4 Metrics

A large number of metrics could be developed to track the success of the NGWMN. These may include goals for participation by Federal, State, Tribal, and other organizations. The metrics could include the number of monitoring sites, length of data records at network wells, data storage, and the ability to provide the ground-water data necessary to help answer the key questions outlined in Chapter 1 of this document. The principal metrics can be summarized in three goals for the NGWMN:

1. Full participation by the principal ground-water data producers in the United States.
2. Full acceptance by these data producers of the NGWMN recommendations for data-collection techniques, data elements, and documentation of these techniques and data-storage methods.
3. Inclusion of an adequate distribution of wells and springs within the major aquifers and aquifer systems throughout the United States so meaningful interpretations can be made on the status and trends of ground-water levels and ground-water quality in these major aquifers.

A successful NGWMN is nearly assured if these three goals are met. This will enable the United States to meet the challenge for ground water cited by the Subcommittee on Water Availability and Quality to "…accurately assess the quantity and quality of its water resources..." (National Science and Technology Council, 2007). But even without fully meeting the goals, progress toward them will move the Nation closer to a fuller understanding of its ground-water resources. As the benefits of the network become apparent, additional participation is expected to be realized.

7.5 Network Products

The NGWMN is both a concept for a common monitoring approach and a mechanism for the compilation of ground-water level and ground-water quality data. The NGWMN is not designed to be an interpretive product, but rather an information tool from which coherent and systematic data can be obtained by all parties to generate myriad interpretive products at a variety of scales. Through a data portal on the Internet, the NGWMN would provide critical information necessary for the planning, management, and development of ground-water supplies to meet current and future water needs and ecosystem requirements. The information available through the NGWMN is expected to be used to assist in assessments of the quantity of U.S. ground-water resources, as constrained by ground-water quality. Interpretive products can be generated from the data provided by the NGWMN by anyone interested in ground-water resources.

The importance of the NGWMN data portal as a product should be emphasized. Many data providers do not serve their data to the public on the Internet. Some serve their data on the Internet, but the information systems and Web pages used to serve the data are not robust. The NGWMN will be constructed with a national focus, but for some data providers, the NGWMN data portal will provide a new tool for their customers to access State and local ground-water data.

7.6 Communication, Coordination, and Collaboration

The National Water Quality Monitoring Council placed great emphasis on the need for communication, coordination, and collaboration to successfully implement the National Water Quality Monitoring Network for Coastal Waters and their Tributaries work, stating that "There will need to be considerable communication, coordination, and collaboration among all members of the monitoring community to implement the Network design…" (National Water Quality Monitoring Council, 2006). Given the immense scope of the NGWMN, this concept is equally as critical.

The NGWMN should be based on a cooperative approach where Federal, regional interstate, State, Tribal, and local stakeholders can collaborate to implement ground-water monitoring programs. To be successful, all stakeholders (Federal, State, multistate, Tribal, regional cooperatives, local agencies, academic, and private sector partners) who operate monitoring networks and collect ground-water level and quality data have to be committed to the NGWMN and to their own monitoring programs by sharing data that will help serve both local needs and those of the Nation. The SOGW anticipates that a successful network will involve more than 100 data providers and stakeholders.

7.7 Recommendations for Network Management

The proposed structure of the NGWMN makes gaining and maintaining the cooperation of various entities overseeing these current networks key to successful implementation. The following are identified as necessary precursors for gaining and maintaining this cooperation and achieving an effective and efficiently operating NGWMN, as set out in this document:

- A voice in the process for stakeholders
- Incentives that recognize the contributions of data providers
- Flexibility to accommodate differences among data providers

- Clear direction, informed by stakeholder input, and authority for an entity to undertake day-to-day operations

7.7.1 Structure

A three-tiered structure (fig. 7.7.1.1) is recommended with the above precursors in mind.

1. The Subcommittee on Ground Water should continue with its current structure of public and private sector data providers and data users. The SOGW would undertake activities, such as
   - Interface with the Advisory Committee on Water Information, share information regarding NGWMN goals, achievements, and hurdles as well as identifying areas for potential cooperation and collaboration with other ACWI efforts;
   - Provide advice to the NGWMN on Federal issues and suggest directions and priorities for the NGWMN;
   - Assist in program evaluation and provide feedback to the NGWMN; and
   - Assist in program startup and outreach.
2. A Program Board or Boards should be established. The Program Board would be composed of NGWMN data providers. Because of the potential for a large number of stakeholders nationally, a two-tiered system of national and regional boards may be necessary to adequately solicit input at every level. The Program Board(s) would undertake activities, such as
   - Provide input regarding the program's scope, priorities, and overall direction;
   - Assist in the evaluation of funding proposals; and
   - Undertake outreach and communication with current and potential data providers on national issues.
3. An agency should be named to provide day-to-day management of the NGWMN as well as provide guidance to NGWMN data providers. The SOGW recommends, based on experience and mission, that the USGS be considered for this role and that within the USGS a distinct Management and Operations Group be created to
   - Implement the startup of the program, including developing a solicitation for participation and organizing stakeholders;
   - Coordinate and consult with the Program Board(s) and the SOGW;
   - Create and manage the data portal;
   - Evaluate and recommend new technologies;
   - Provide program guidance and technical advice to stakeholders;
   - Identify funding priorities, administer funding programs, and coordinate with other funding sources;
   - Disseminate data and interpretive reports as needed in an open and flexible system;
   - Assist in developing report findings, answering basic questions, promoting the program with relevant and timely technical results; and
   - Ensure that data at backbone sites are collected by allocating Federal funds if available or coordinating with other agencies to allocate Federal funds through a portfolio of funding options.

7.7.2 Funding Models

The SOGW recommends a portfolio of funding models in order to create the necessary incentives to achieve nationwide coverage in a cost-efficient manner that builds on existing efforts and leverages Federal and cooperator resources (table 7.7.2.1). The models are not exclusive of one another.

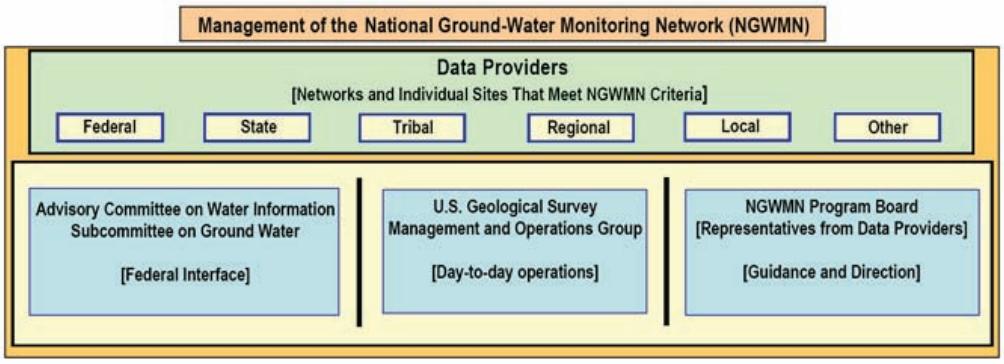

Figure 7.7.1.1 Management structure of the proposed National Ground-Water Monitoring Network.

Table 7.7.2.1 Critical cooperative agreement factors and National Ground-Water Monitoring Network funding/data gathering applicability.

Funding/data-gathering model	Data collection, storage, and transfer	Work assignment, funding flow, and cooperator support	Long-term, not issue-driven, monitoring	NGWMN applicability
Federal Programs	USGS personnel collect and manage NGWMN data. If other Federal agencies have data-collection and management capability, agreements address how these data are transferred to or accessed by USGS or NGWMN data systems.	USGS bears costs for monitoring backbone network wells. If USGS provides data-collection services to the other agency in conjunction with NGWMN monitoring, cost sharing offsets some of the cost. If another Federal agency collects data for NGWMN and their own use, that agency absorbs the monitoring cost.	Long-term monitoring could be an issue if a cooperator does not have a monitoring mission strongly aligned with the objectives of the NGWMN.	Backbone sites would be a key component of the network. Collaboration among agencies is most necessary where access to monitoring sites on Federal lands or at Federal facilities may be restricted such as military reservations or national parks.
USGS Cooperative Water Program (CWP)	Data are collected by USGS employees or cooperator staff but are managed within NWIS. If cooperators use CWP data for non-CWP purposes, the data must be retrieved from NWIS and integrated with non-CWP data.	Monitoring costs are shared between the cooperator and the USGS. Total project cost includes State share, Federal share, and Federal administrative charges. For projects where USGS personnel do the work, non-Federal funds are paid to the USGS. For projects where work is shared, the cooperator may provide in-kind services in lieu of funds.	CWP requires funds from the Federal and non-Federal partners. Project development is driven by the non-Federal agency and those interests may change, depending on local issues. Successful use of CWP for NGWMN requires non-Federal cooperators to dedicate funds to long-term ground-water monitoring.	CWP is most applicable for State agencies, Tribal governments, municipalities, and local governments that need long-term data, but do not choose to collect them. Federal CWP resource allocations depend on CWP funding and non-Federal interest and resources dedicated to long-term monitoring.
Modified STATEMAP	Data are collected by cooperators and are managed with provisions to either be transferred to the USGS management and operations group or be accessible to NGWMN. Data are available at the cooperator level without the need for retrieval from other data systems such as NWIS.	Data are collected by the cooperators. Funds for NGWMN data collection are from the USGS to the cooperator but require a 50-percent match by non-Federal funds. The cooperator share represents the value of the data to the cooperator.	Cooperators must have an aligned mission to collect ground-water data similar to that of NGWMN and the dedicated long-term funding to support the data collection.	Best application is with State agencies, Tribal governments, municipalities, and local governments that have the capability to collect and manage long-term data. Cooperators with long-term monitoring missions similar to that of the NGWMN are most desirable.
USEPA grants supporting monitoring	Data are collected by cooperators and are managed with provisions to either be transferred to the USEPA Water Quality Exchange, the USGS NWIS or otherwise be accessible to NGWMN. Data are available at the cooperator level without the need for retrieval from other data systems such as NWIS.	Data are collected by cooperators. Funds for data collection contributing to the NGWMN are from the USEPA to designated agency(s) or to cooperators through State-level direct grants. Matching funds are required at the cooperator level as defined by USEPA. State-level grants for this monitoring would create another forum where decisions about NGWMN are made.	Cooperators must have an aligned mission to collect ground-water data similar to that of NGWMN, reflecting a priority for ground-water monitoring recognized by the State cooperator agency.	USEPA-funded cooperator agency and USGS management and operations group cooperation at the agency level is essential to coordinate effort. Historically, these funds have been exclusive to water-quality monitoring.

The models provide the flexibility to tailor potential funding to the interests, capability, and long-term monitoring missions of potential NGWMN cooperators. The SOGW recognizes that all funding/data gathering models are affected by variability in Federal and non-Federal funding.

1. Various **Federal Programs** and **Federal-to-Federal collaboration** can provide for direct Federal monitoring of backbone network sites, such as those in the USGS Climate Response Network or NAWQA water-quality monitoring, or for monitoring sites at locations with restricted access, such as in national parks or military installations.

2. **USGS Cooperative Water Program** agreements are appropriate for cooperators that have funding for long-term monitoring but lack the technical expertise or personnel to collect the data.

3. A **modified STATEMAP/NGWMN** funding model is appropriate for cooperators who have no operating network or an existing long-term ground-water monitoring network but need to build or enhance their infrastructure, instrumentation, frequency of data collection, the technical expertise and personnel to successfully collect the data, and long-term ground-water monitoring funding, and who have a mission closely aligned with that of the NGWMN.

4. **USEPA funding** for NGWMN has great potential to add data-collection sites, enhance infrastructure, and provide for more frequent measurement and instrumentation. The USEPA and the USGS must coordinate closely at the agency level, however, so that duplication of effort is minimized.

7.8 Summary of Incremental Costs for State Participation in National Ground-Water Monitoring Network

In 2010 and 2011, six States participated in five pilot projects to test the NGWMN and provide guidance for full implementation. The results of these studies were documented in reports for each project: Illinois-Indiana (Wehrmann and others, 2011), Minnesota (MacDonald and Kroening, 2011), Montana (Patton and Buckley, 2011), New Jersey (Domber and others, 2011), and Texas (Hopkins and others, 2011), and the projects were documented in a summary report (Subcommittee on Ground Water, 2011). The pilot projects developed costs for the incremental activities in which they would need to engage to be part of the NGWMN based on the Framework Document of 2009 (Subcommittee on Ground Water, 2011). These costs occurred in the following monitoring categories: initial organization/participation, new additional wells, well-network installation and maintenance, field practices, data management, and monitoring program implementation. These costs also include one-time (program startup) expenses, capital costs, and operation and maintenance costs. Tables 7.8.4.1 and 7.8.4.2 provide details of costs, which are summarized in the sections below. Because the number of wells significantly affects the incremental costs, some costs vary widely from State to State, ranging from no additional wells to 245 new wells proposed.

Table 7.8.4.1 Summary of incremental State pilot project costs to participate in the National Ground-Water Monitoring Network.

Incremental Cost to Address Framework Gap

	One-Time and Capital Costs						
	IL/IN	TX	NJ	MT	MN	TOTAL	AVERAGE
State Initial Participation	$32,500	$36,275	$38,000	$35,059	$27,000	$168,834	$33,767
Monitoring Network	200,600	131,950	1,515,900	1,604,000	3,525,000	6,977,450	1,395,490
Field Practices	0	0	0	0	17,500	17,500	3,500
Data Management	13,100	21,800	121,000	5,000	17,500	178,400	35,680
Monitoring Program	0	0	0	0	15,000	15,000	3,000
Baseline Process	0	0	0	552,750	0	552,750	110,550
Total One-Time and Capital Costs	246,200	190,025	1,674,900	2,196,809	3,602,000	7,909,934	1,581,987
Operation and Maintenance Costs							
	IL/IN	TX	NJ	MT	MN	TOTAL	AVERAGE
Monitoring Network	$33,715	$0	$1,116,500	$160,230	$13,500	$1,323,945	$264,789
Field Practices	0	100	32,900	0	0	33,000	6,600
Data Management	34,000	21,800	121,000	0	0	176,800	35,360
Monitoring Program	0	83,625	3,648,700	147,300	123,100	4,002,725	800,545
Total Annual Operation and Maintenance Costs	67,715	105,525	4,919,100	307,530	136,600	5,536,470	1,107,294

Incremental Cost of Using Existing Wells Only Under Framework

	One-Time and Capital Costs						
	IL/IN	TX	NJ	MT	MN	TOTAL	AVERAGE
State Initial Participation	$32,500	$36,275	$38,000	$35,059	$27,000	$168,834	$33,767
Monitoring Network	66,000	131,950	--	--	--	197,950	39,590
Field Practices	--	--	--	--	17,500	17,500	3,500
Data Management	13,100	21,800	121,000	317,600	17,500	491,000	98,200
Monitoring Program	--	--	--	--	--	--	--
Total One-Time and Capital Costs	111,600	190,025	159,000	352,659	62,000	875,284	175,057
Operation and Maintenance Costs							
Monitoring Network	--	--	--	$160,170	$13,500	$173,670	$34,734
Field Practices	--	$100	$32,900	--	--	33,000	6,600
Data Management	--	--	--	--	--	0	0
Monitoring Program	--	83,625	1,313,400	147,300	123,100	1,667,425	333,485
Total Annual Operation and Maintenance Costs	$0	83,725	1,346,300	307,470	136,600	1,874,095	374,819

Capital and one-time costs: Primarily some limited well logging and instrumentation, modification of field practices and data standards, and data-collection automation.

Incremental annual operation and maintenance costs: Changes in field practices for levels and quality measurement, data transmission to a national portal, and increasing frequency of monitoring.

Note: Objective of coverage in spatially underrepresented aquifers would not be addressed from perspective of State pilot projects if using only existing wells.

Table 7.8.4.2 Incremental per-well costs of State pilot projects to participate in the National Ground-Water Monitoring Network and fill gaps identified.

Incremental and Per Well Costs to Address Framework Gap

	One-Time and Capital Costs							
	IL/IN	TX	NJ	MT	MN	TOTAL	AVERAGE	RANGE *MEDIAN*
New Well Capital Costs	$134,600	$0	$1,515,000	$1,604,000	$3,525,000	$6,779,500	$1,355,900	$0–$3,525,000 *$1,515,000*
Number of New Wells	13	0	168	245	136	496	NA	NA *NA*
Average Per New Well Cost	$10,354	$0	$9,018	$6,547	$25,919	NA	$13,668	$0–$25,919 *$9,018*
Other One-Time and Capital Costs	$111,600	$190,025	$159,000	$40,059*	$77,000	$1,130,434	$226,087	$40,059–$190,025 *$111,600*
Number of Total NGWMN Wells	51	1,246	1,142	516	225	3,180	NA	NA *NA*
Average Per-Well Cost	$2,188	$153	$139	$78	$342	NA	$314	$78–$2,188 *$153*
Operation and Maintenance Costs								
Total Annual Operation and Maintenance Costs	$67,715	$105,525	$4,919,100	$307,530	$136,600	$5,536,470	$1,107,294	$67,715–$4,919,100 *$136,600*
Annual Operation and Maintenance Costs Per Total Wells	$1,328	$85	$4,307	$596	$607	NA	$1,741	$85–$4,307 *$607*

Note: "NA" means not applicable.

*Excludes Baseline Process Costs of $552,750.

Table 7.8.4.2 Incremental per-well costs of State pilot projects to participate in the National Ground-Water Monitoring Network and fill gaps identified.—Continued

Incremental and Per Well Cost of Using Existing Wells Only Under Framework

	One-Time and Capital Costs							
	IL/IN	TX	NJ	MT	MN	TOTAL	AVERAGE	RANGE *MEDIAN*
Total One-Time and Capital Costs	$111,600(a)	$190,025(b)	$159,000(c)	$352,659(d)	$62,000(e)	$875,284	$175,057	$62,000–$352,659 *$159,000*
Number of Existing Wells	38	1,246	1,124	271	89	2,768	NA	NA *NA*
Average Cost Per Existing Well	$2,937	$153	$141	$1,301	$697	NA	$316	$153–$2,937 *$697*
	Operation and Maintenance Costs							
Total Annual Operation and Maintenance Costs	$0	$83,725	$1,346,300	$307,470	$136,600	$1,874,095	$374,819	$0–$1,346,300 *$136,000*
Annual Operation and Maintenance Costs Per Existing Well	$0	$67	$1,198	$1,135	$1,535	NA	$677	$0–$1,535 *$1,135*

Notes:

"NA" means not applicable.

(a) Mainly for telemetry and data logging equipment at existing wells.

(b) Mainly for videoing boreholes that lack completion data.

(c) Mainly for one-time logging and data entry for existing wells.

(d) Mainly for one-time baseline water-quality sampling/testing and logging equipment.

(e) Mainly to update field practices and data management.

Incremental and Per Well Cost of Data Management Using Existing Wells Only

	One-Time Costs by State						
	IL/IN	TX	NJ	MT	MN	TOTAL	AVERAGE
Data Management One-Time Costs	$6,200	$20,000	$0	$3,400	$17,500	$47,100	$9,420
Number of Existing Wells	38	1,246	1,124	271	89	2,768	NA
Average Cost Per Existing Well	$163	$16	$0	$13	$197	NA	$17
	Operation and Maintenance Costs by State						
Annual Operation and Maintenance Costs	$0	$0	$0	$0	$0	$0	$0
Annual Operation and Maintenance Costs Per Existing Well	$0	$0	$0	$0	$0	NA	$0

Note: "NA" means not applicable.

7.8.1 State Participation – One-Time Costs

State monitoring program costs to participate in the proposed NGWMN were fairly consistent from State to State. These costs are primarily for staff time to understand the NGWMN Framework, consult internally and with the Subcommittee on Ground Water, analyze their monitoring networks relative to the Framework, identify wells for the State's portion of a proposed NGWMN, evaluate field practices and data management to determine their consistency with the Framework, and write a report identifying their proposed portion of a national network, any monitoring program gaps, and the associated costs to be equivalent to the proposed Framework, as well as propose potential changes to the Framework. The costs ranged from $27,000 (Minnesota) to $38,000 (New Jersey) and averaged $33,767.

7.8.2 State Incremental Framework Costs

States evaluated their monitoring programs and networks to determine what the costs would be to meet the specifications of the NGWMN Framework in four principal areas: (1) well network, (2) field practices, (3) data management, and (4) monitoring program. Each area may have incremental Framework ("gap") costs that are one-time ("startup" or "front-end") expenses, capital expenditures, and annual operation and maintenance outlays.

Monitoring Network. The monitoring-well installation and instrumentation incremental costs across the five State pilot projects averaged $1,395,490, primarily to install monitoring wells in areas not adequately represented by the current State networks. Notably, three State pilot projects focused on the network for the entire State area, and two focused on an individual aquifer or a metropolitan area. For the three States that examined the networks for the entire geographic State area, the average well-installation and instrumentation incremental costs were $1,183,950.

The capital costs for the new wells by themselves averaged $1,355,900 per State, with an average per-well cost of $13,668.

The average incremental operation and maintenance cost for the wells in the monitoring network was $264,789 per State.

Field Practices. Examples of costs include: updating field manuals and additional field time. Relative to field practices operation and maintenance costs, Texas proposed $100/year for measuring tape cleaning, and New Jersey identified $32,900 for modified levels measurement and well sampling preparation. One-time costs for field practices averaged $3,500 per State. Operation and maintenance costs for carrying out the field practices averaged $6,600 per State.

Data Management. One-time data-management costs include modifying data standards, automating data collection, and establishing Web services to deliver data to the portal. The total cost was $178,400 for five State pilot projects, with an average cost of $35,680.

Monitoring Program. States will need to increase monitoring for levels and (or) quality at greater frequencies. Incremental operation and maintenance costs for more frequent monitoring averaged $800,545. The cost was elevated because New Jersey proposed a large number of additional wells for its portion of the network; without New Jersey the average cost for increasing monitoring frequency across the four other State pilots is $71,263.

Cross-State Program Costs. Combined, the one-time and capital costs for the five State pilot projects are $7,909,934 and $4,061,734 for the three States, which included the entire State areas or an average of $1,353,911 across the three States. The incremental operation and maintenance costs for the five State pilots are $5,536,470 and for the three States reporting on entire State networks is $5,332,155 or an average of $1,777,385 per State.

Per-Well Costs. Factoring out new well capital costs and only considering other one-time and capital items, the average per-well capital cost was $314 with a median per well capital cost of $153. Annual operation and maintenance costs per well were $1,741 with a range of $85 to $4,307 and a median of $607.

7.8.3 Cost of Using Existing Wells Only

If the NGWMN relied only on existing wells, the incremental costs of well installation and maintenance and associated monitoring, including the one-time baseline process, would not be considered. In this case, the incremental cost of the NGWMN would be significantly different. The capital and one-time costs would include some limited well logging, modification of data standards, and automation of data collection with an average cost of $175,057 for the five State pilot projects and a per-well cost of $316. Incremental annual operation and maintenance costs would include changes in field practices for levels and quality measurement, data transmission to a national portal, and an increase in the frequency of monitoring, averaging $374,819 for the five State pilot projects with a per-well cost of $677.

7.8.4 Cost of Data Management Only

If the cost of accepting data for existing wells for an initial NGWMN startup were considered, the average incremental one-time data management cost was $9,420 per State—primarily to adjust data systems to report to the national portal—with a per-well cost of $17. The incremental annual operation and maintenance cost per well was $0.

7.9 Recommendations and Next Steps

Water is needed for a growing U.S. population, and ground-water use is increasing. Ground-water level declines have been documented in nearly every area of the Nation. Ground-water quality deterioration is apparent in some regional interstate aquifers. Despite the fact that ground-water level monitoring is done in many places at many scales, a comprehensive repository of ground-water level monitoring data does not exist. The concept of a National Ground-Water Monitoring Network is not new. Past efforts have cited valid justification for such a network, and the reasons for such a network have not diminished over time but in fact have increased in importance. Increasing water demands, climate change, and energy development and their associated effects underscore the need for a network. Past efforts have been hamstrung by the difficulty in combining data from many networks into one data system. The need for a NGWMN has not diminished.

Increased use of computer data systems and development of Internet technologies have made it much easier to combine data from myriad sources. Major steps already have been achieved with recent links between water-quality data in the USGS and USEPA databases. Although there is a "patchwork quilt" of networks across the Nation, it is clear that computer systems have progressed to the point where most data producers are storing information in computer databases, and many serve those data to the public by way of the Internet. These data systems typically can be configured in such a way to document the source of the data and the methods used to collect those data. The feasibility of Internet portal systems for data distribution has been documented commercially by systems such as travel Web sites and environmentally by systems like the CUAHSI Hydrologic Information System. Portal systems may obviate the need for centralized data systems. Data can be maintained where it should be—by the data producer. With the cooperation of data producers, a portal system can be used to obtain the necessary data at the State, regional, interstate, and national scale.

The SOGW recommends that the ACWI pursue a National Ground-Water Monitoring Network through the use of a national data portal. Several steps are necessary to establish such a network:

1. The Subcommittee on Ground Water should continue with its current structure of public and private sector data providers and data users.
2. A National Program Board, possibly supported by Regional Program Boards, composed of NGWMN data providers should be established.
3. An agency should be named to provide day-to-day management of the NGWMN as well as provide guidance to NGWMN data providers. The SOGW recommends, based on experience and mission, that the USGS be considered for this role and that a distinct management and operations group be created within the USGS. The ACWI should provide this recommendation to the Department of Interior for their appropriate action.
4. The management and operations group should begin dialog with data producers to evaluate existing well networks, the coverage of major aquifers, and the addition of the appropriate wells into the NGWMN.
5. Protocols for site selection for the NGWMN should be developed, and gaps in the network should be identified.
6. The preliminary Internet portal system used for the Pilot Studies should be developed into a full production level data portal that can handle all the data for the Nation.
7. The NGWMN cannot be completed without Federal funds to support it. The ACWI should facilitate the Federal funding opportunities outlined in this chapter. Federal funding sources would assure participation by data providers, operation of backbone wells/springs, management and operation of the network, and development and operation of a data portal.

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