Five-Year Water Resource Data Management Plan

Data Management Task Force

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Executive Summary

Five-Year Water Resource Data Management Plan

The diverse and complex nature of Washington's water resource is one of the distinguishing characteristics of this State. Water is critical to Washington's viability as an agriculturally rich area, recreation paradise, abundant fishery, manufacturing and trading center, and international gateway to the Pacific Rim. The development of a Water Resource Data Management Program is necessary because of the growing demands and conflicting needs for this finite resource. Local governments, for example, need access to consolidated water resource data to coordinate their planning efforts in accord with State growth management objectives. More comprehensive and consolidated water resource data expedite planning and help mitigate water shortages during droughts.

Today, Washington's water resource data are scattered among a number of State and Federal agencies, tribal nations, local governments and other sources. No standard system exists for collecting, storing, or accessing data about water availability. A comprehensive Water Resource Data Management Program must be established to protect, allocate and efficiently use water in this State.

In recognition of this, the Washington State Legislature enacted Chapter 295, Laws of 1990. The act calls for the development of a comprehensive Water Resource Data Management Program to provide the information necessary for effective statewide and regional planning and management of the State's water resource. The Water Resource Data Management Task Force was established and works under this mandate. The Task Force includes representatives of appropriate State agencies, Indian tribes, local governments, agricultural and environmental organizations, concerned businesses, and interested parties. The Water Resource Data Management Task Force coordinates with the Water Resources Forum established by the November, 1990, Chelan Agreement. This coordination assures that appropriate data needed for water resource policy decisions will be available.

The projects and activities for implementing the Water Resource Data Management Program are described in this *Five-Year Water Resource Data Management Plan.*

THE WATER RESOURCE DATA MANAGEMENT TASK FORCE

The legislatively-mandated Water Resource Data Management Task Force advises the Department of Ecology in the development of a new, comprehensive water resource data management program, improving data collection, storage, and access for use across the state. Linking data clients to decentralized data sources using a common data sharing infrastructure is the key strategy recommended by the Task Force.

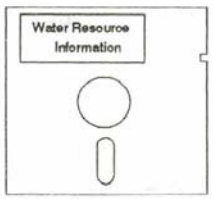
The Five-Year Water Resource Data Management Plan

This *Five-Year Plan* was developed by the Water Resource Data Management Task Force. The *Five-Year Plan* expands on the 15 recommendations from the September, 1990, report, *Preliminary Findings and Recommendations of the Water Resource Data Management Task Force,* and provides a vision and strategy for organizing and managing water resource data. This vision will be achieved in three stages (see figure).

- First, a Data Framework will be produced. A Water Resource Common Data Architecture will be developed which formally names and comprehensively defines data in a common context so they can be easily identified and readily shared. The Architecture, together with standard identification and location systems for surface and ground water, provide the Framework for integrating all data about the State's water resource. A Water Resource Studies Clearing House and data sharing initiatives will facilitate the identification and sharing of data.
- Next, fill the Framework with data to produce a Data Library. The Water Resource Data Collection and Library Stage includes water allocation data (water rights, water right claims, etc.), water quality data, water use data, and water quantity data. The strategy is to identify critical data needed for proper water resource management, define baseline data for those critical needs, identify existing data to meet those needs, and acquire additional data that are not available. This strategy provides both short-term, incrementally cost-effective benefits and long-term advantages.
- Finally, develop water resource relationships, such as those between streamflow and instream resources, surface water and ground water, and water quality and water quantity. This Stage can be implemented incrementally as data are compiled in critical areas. Priorities for implementation will reflect need and funds available. These relationships are developed from data contained in the Water Resource Data Library and will be used to develop comprehensive water resource management models.

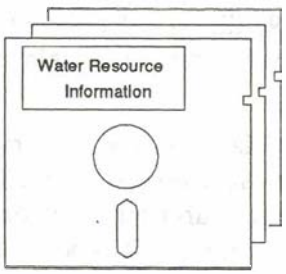
Water Resource Data Management Program

In 1990, the Legislature recognized the need to improve water resource data management. They mandated the development of a comprehensive Water Resource Data Management Program. This Program requires three stages for complete implementation:



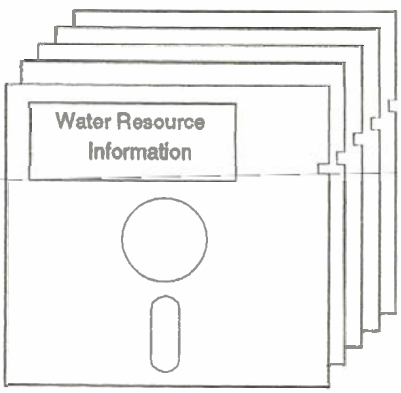
Framework Stage

Data Architecture
Surface Water I.D.
Ground Water I.D.
Data Sharing
Clearing House



Data Collection and Library Stage

Water Allocation
Water Quality
Water Use
Water Quantity



Relationships Stage

Streamflow and Instream Resource
Surface Water and Ground Water
Water Quality and Water Quantity

Budget Estimates

Based on the *Preliminary Findings and Recommendations of the Water Resource Data Management Task Force,* the Legislature appropriated $1.1 million to begin the 1991-1993 biennium effort. The Legislature realized that implementation of the Water Resource Data Management Program will require several biennia to complete. The funding required to continue the Program is summarized in the following table.

	FY 93	FY 94	FY 95	FY 96	FY 97
Fiscal Year Totals	$666,000	$2,101,500	$1,790,500	$3,401,500	$2,498,500
Biennial Totals			$3,892,000		$5,900,000
Grand Total					$10,458,000

Work continues for the current biennium using the remainder of the $1.1 million appropriation. Approximately $3.9 million are needed for the 1993-95 biennium to implement critical Framework and Data Collection and Library Projects which could not be implemented during the current biennium due to a reduced appropriation. An estimated $5.9 million will be needed in the 1995-97 biennium to continue integration and improvement of water resource data and prepare for development of the water resource relationships.

Development of a comprehensive Water Resource Data Management Program is critical to successful management of the State's water resource. Projects are designed to facilitate integration of data between the Water Resource Data Management Program and other major programs, such as Ecology's Strategic Plan, the Growth Management Act, and the Timber, Fish and Wildlife Agreement. This *Five-Year Water Resource Data Management Plan* contains the projects necessary for that Program to be realized.

Acknowledgments

The *Five-Year Water Resources Data Management Plan* is the product of many people and groups. The Water Resources Data Management Task Force was established in response to Legislative mandate to evaluate data management needs and advise the Department of Ecology in developing a *Five-Year Plan* for data collection and information management. The Task Force has successfully achieved their objective through a large commitment of time and energy, and the demonstration of a remarkable ability to work together through the consensus process to reach their goal. The Task Force has directly participated with Ecology staff in generating and refining the concepts, and writing and formatting the *Five-Year Plan*. Their commitment to this task has been an inspiration to the staff which supported their efforts.

Several Task Force committees have contributed to the *Five-Year Plan*. The Planning Subcommittee provided key leadership and management of the plan-writing process. The Surface Water Identification and the Water Rights, Water Use and Water Quality Subcommittees addressed their respective data issues. The Well Identification Task Force pilot tested its well identification system and address related issues.

The Water Resources Forum has shared in the preparation and review of the *Five-Year Plan*, and particularly in the Data Needs Survey, where it generously provided access to its caucuses for the collection of data. Forum members have reviewed and commented on the Data Needs Survey and the *Five-Year Plan*. Pilot Planning Areas established by the Forum have also assisted with the Data Needs Survey and review of the *Five-Year Plan*.

The Department of Ecology Water Resources Program Administration and Data Management Section drafted and coordinated meetings and provided the mechanics of publishing the *Five-Year Plan*. Others at Ecology and other State agencies have contributed a variety of talents for the benefit of the *Five-Year Plan*.

Introduction

Statutory Origin

Legislation passed in 1990 called for development of a comprehensive Water Resource Data Management Program. The Program is to provide information necessary for effective statewide and regional planning and management of the State's water resource. It must include a five-year information management plan, an inventory of existing water resource data, and an assessment of information needs.

The legislation called for establishment of the Water Resource Data Management Task Force comprised of "representatives of appropriate State agencies, Indian tribes, local governments, and interested parties". The Task Force was formed in the spring of 1990 with members representing water users, environmental and recreation interests, Indian tribes, local governments, academia, and State agencies. The mission of the Task Force is:

> To provide continuing guidance to the Joint Select Committee on Water Resource Policy, the Legislature, the Department of Ecology, and the Chelan Agreement planning process, in developing and maintaining an effective information management program for planning and management of the State's water resource on a regional and statewide basis.

Water Resources Forum

Subsequent to establishment of the Water Resource Data Management Task Force, the Water Resources Forum was formed by the Chelan Agreement. The Forum's mission is to address water resource policy issues. The Task Force is committed to working closely with the Forum to ensure that policy and data issues are closely coordinated. Figure 1 shows the relationship between the Forum and the Data Management Task Force.

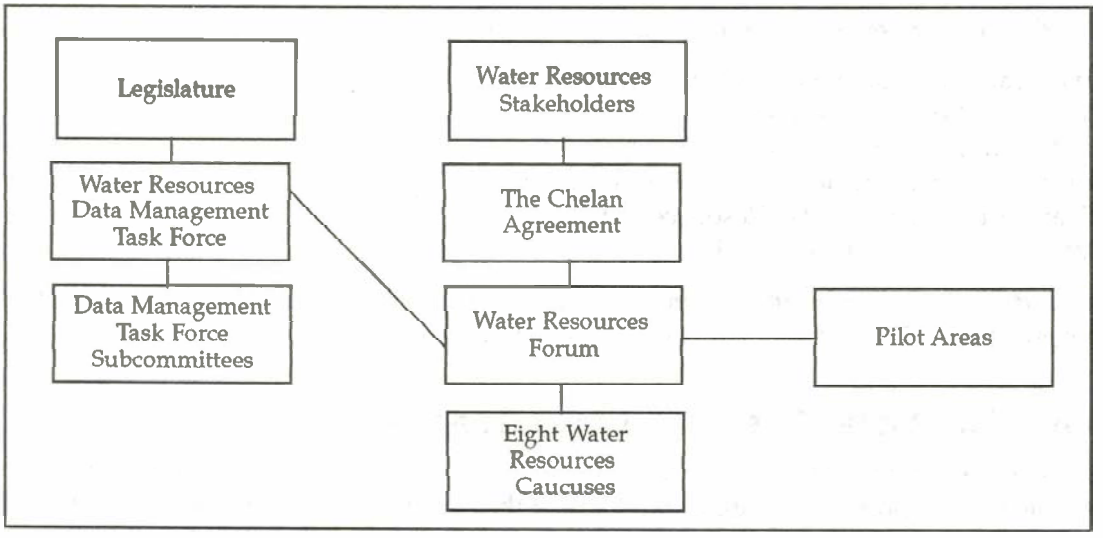


Figure 1. Organizational Relation of Task Force and Forum

The Forum is organized into eight caucuses, each representing concerns of a category of stakeholders in water resource issues. The caucuses are:

- Agriculture
- Business
- Commercial & Recreational Fishing
- Environmental
- Local Government
- Recreation
- State Government
- Indian Tribes

Forum members and many of its caucus members are regularly informed of Task Force activities through reports at each Forum meeting and routine circulation of Task Force meeting minutes, documents, and newsletters.

Preliminary Findings and Recommendations

The Water Resource Data Management Task Force published a report titled *Preliminary Findings and Recommendations of the Water Resource Data Management Task Force* in September, 1990. That report contains 15 recommendations for developing a comprehensive Water Resource Data Management Program to support management of the State's water resource. The *Preliminary Findings and Recommendations* reported back to the Legislature specific activities which would be undertaken, if funding was provided. Among those tasks would be production of the *Five-Year Water Resource Data Management Plan*. The Legislature provided funding for the *Five-Year Plan*, based on the *Preliminary Findings and Recommendations*.

Interim Action Plan

The first recommendation in the *Preliminary Findings and Recommendations* is development of a *Five-Year Plan* for the Water Resource Data Management Program by July, 1991, subject to funding. Funding was not provided and a *Five-Year Plan* was not developed by July, 1991. However, a *Five-Year Water Resource Data Management Plan* was developed during Fiscal Year 1992 for the period July 1, 1992, to July 1, 1997.

An *Interim Action Plan* was developed to guide the Task Force and Department of Ecology staff activities during Fiscal Year 1992 until the *Five-Year Plan* was completed. The *Interim Action Plan* included development of the *Five-Year Plan* and work on five other Task Force recommendations that are critical to water resource management. Those tasks are:

- Five-Year Data Management Plan
- Common Data Architecture
- Well Identification System
- Surface Water Identification and Location System
- Clearing House for Water Resource Studies
- Data Needs and Data Availability Surveys

The Five-Year Plan superseded the *Interim Action Plan* in July, 1992, to guide continued development of a comprehensive Water Resource Data Management Program.

The Five-Year Water Resource Data Management Plan

The 15 recommendations from the *Preliminary Findings and Recommendations* are projects in the *Five-Year Plan*. Each project contains a statement of the current situation or issue and what changes are needed. Projects are divided into activities for resolving the issues. Each activity contains a statement of the situation and needs, recommendations, benefits, and dependencies on other projects/activities. Proposed project durations and cost estimates are summarized at the end of the Plan.

Activity definition and durations are based on rankings from the Water Resource Data Needs Survey, reports from the Task Force Subcommittees, regular Task Force meetings, and work sessions of the Water Resource Data Management Task Force held on April 17, and May 7, 1992. Additional information about all these activities may be found in the *Water Resource Data Management Annual Report*.

All projects are integrated with the Department of Ecology's *Information Resource Management Strategic Plan* to eliminate inconsistencies and duplication of effort, and to integrate funding sources. The projects are also coordinated with other data management initiatives within and without State government such as: growth management; the Geographic Information Council; and the Timber, Fish, and Wildlife Agreement.

The Five-Year Plan is a strategic plan. A strategic plan is different from a tactical or operational plan because it is high level, general, and of broad scope. It conveys a 10 year vision and objectives for achieving that vision. It provides a guide for tactical and operational planning.

Tactical and operational plans are more detailed, specific, and with shorter range objectives. Many projects or activities in the *Five-Year Plan*, when implemented, will result in tactical or operational plans. Tactical and operational plans could propose, for example, use of specific computer software, hardware, data coding, and database translation techniques.

This *Five-Year Plan* proposes delivery of many products. While some of these products are to be defined in the course of implementing the Plan, others are known. The known products include:

Five-Year Water Resource Data Management Plan
Water Resource Data Management Annual Report
Water Resource Common Data Architecture
Enhanced Water Resource Glossary
Water Resource Data Source Book
Electronic Water Resource Data Guide
Water Resource Data Needs and Availability Survey Procedures
Statewide Electronic Communications Network
Water Resource Studies Clearing House
Streamflow Study Bibliography
Maps of Public Water Supply Service Areas

The *Five-Year Plan* will include several implementation plans, feasibility studies and pilot tests. Each of these activities will result in a document which will add to the products of this Plan.

A Vision of the Future

Washington's water resource is limited and today's water resource managers must balance many, and often conflicting, demands for water with a limited supply. Proper management of the State's water resource requires that existing water resource data be readily identifiable and easily accessible. Management of complex issues such as hydraulic continuity, streamflow maintenance versus water diversions, additional water allocation, appropriate water use, and water quality require dynamic water models to support water resource management decisions. These management decisions require considerable, detailed data about the State's water.

A comprehensive data management program that provides data about the State's water to support water resource management decisions requires a strategic plan with a vision of the future. The vision for water resource data management is to provide the data required to support more informed decisions about proper management of the State's water resource. Data are provided

through a comprehensive Water Resource Data Library and through integrated Water Resource Models that analyze alternative scenarios. Decision makers and resource managers use data from the Library and the Models to determine water availability for the State.

The comprehensive Water Resource Data Library is decentralized like traditional neighborhood libraries. It is not a single centralized database. A Water Resource Data Guide provides information to readily identify and easily obtain water resource data wherever they reside, similar to the card catalog in a traditional library. Sophisticated computer systems provide assistance to State agencies, local government, Indian tribes, and others by helping them identify, locate, and obtain data that meet their needs.

The Water Resource Common Data Architecture provides a framework for formally naming and comprehensively defining data in a common context so they can be easily identified and readily shared. All data in the Water Resource Data Library are uniformly named and defined under the Architecture. This Architecture together with unique identification and standard locations for surface water and wells provides a foundation for a comprehensive data management program.

The strategy to achieve this vision identifies critical data needs, defines baseline data for those critical needs, identifies existing data to meet those needs, arranges access to those data, and acquires data that are not available. This strategy provides short-term benefits that are incrementally cost effective and achieves long-term goals. It leverages limited resources to provide maximum benefits.

The strategy includes integration with other agencies and initiatives to prevent further data fragmentation. It includes integration of data throughout the Department of Ecology and with other State agencies, such as the Departments of Health, Fisheries, Wildlife, and Natural Resources. It includes integration with other initiatives, such as Growth Management; Timber, Fish, and Wildlife Agreement, and the Geographic Information Council. It includes integration with local governments and Federal agencies. The strategy fosters cooperation, collaboration, exchange, and sharing of data to meet critical organizational needs.

The horizon for developing a comprehensive Water Resource Data Library and integrated Water Resource Models is ten years. A Five-Year Water Resource Data Management Plan provides the direction for achieving the ten-year vision. The *Five-Year Plan* is more detailed in the near term and less detailed in the long-term, but it identifies the major steps required to achieve the vision. The Data Management Task Force defined specific projects and activities to take the major steps towards this vision.

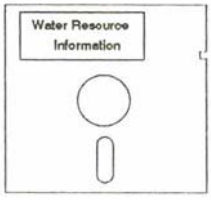
The risk of not developing a comprehensive data management program is continued inefficiencies in managing the State's water resource, loss of habitats, poorer water quality, inappropriate use of water, depletion of aquifers, and lower productivity. Less informed decisions will be made. The risk can be avoided with development of a comprehensive Water Resource Data Management Program that provides a foundation for managing data to support management of the State's water resource.

Achieving the Vision

The Water Resource Data Management Vision is achieved through three stages. Figure 2 shows the sequence of the three stages for improving water resource data management and achieving the Vision.

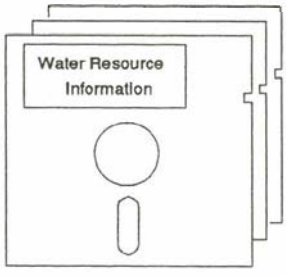
Water Resource Data Management Program

In 1990, the Legislature recognized the need to improve water resource data management. They mandated the development of a comprehensive Water Resource Data Management Program. This Program requires three stages for complete implementation:



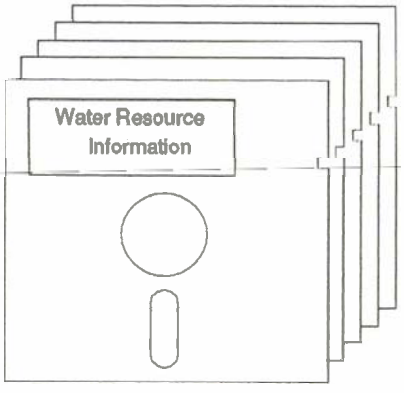
Framework Stage

Data Architecture
Surface Water I.D.
Ground Water I.D.
Data Sharing
Clearing House



Data Collection and Library Stage

Water Allocation
Water Quality
Water Use
Water Quantity



Relationships Stage

Streamflow and Instream Resource
Surface Water and Ground Water
Water Quality and Water Quantity

Figure 2. Water Resource Data Management Program

Plan Stages

The *Five-Year Water Resource Data Management Plan* has three Stages. The Stages are the Framework, Data Collection and Library and Relationships.

- First, a Data Framework will be produced. A Water Resource Common Data Architecture will be developed which formally names and comprehensively defines data in a common context so they can be easily identified and readily shared. The Architecture, together with standard identification and location systems for surface and ground water, provide the Framework for integrating all data about the State's water resource. The Water Resource Studies Clearing House and Data Sharing initiatives will facilitate the identification and sharing of data.
- Next, fill the Framework with data to produce the Data Library. The Water Resource Data Collection and Library Stage includes water allocation data (water rights, water right claims, etc.), water quality data, water use data, and water quantity data. The strategy is to indentify critical data needed for proper water resource management, define baseline data for those critical needs, identify existing data to meet those needs, and acquire additional data that are not available. This strategy provides both short-term, incrementally cost-effective benefits and long-term advantages.
- Finally, develop water resource relationships, such as those between streamflow and instream resources, surface water and ground water, and water quality and water quantity. This Stage can be implemented incrementally as data are compiled in critical areas. Priorities for implementation will reflect need and funds available. These relationships are developed from data contained in the Water Resource Data Library and will be used to develop comprehensive water resource management models.

The stages are broken into fifteen projects, composed of 55 activities. The projects, and their component activities, are explained in the following section.

Water Resource Projects

For the past year the Task Force operated under the *Interim Action Plan* to develop the *Five-Year Plan*. The *Five-Year Plan* was developed by the Task Force members, Task Force Subcommittee members, Department of Ecology staff, and others.

The Department of Ecology is the lead agency responsible for implementing all projects in the *Five Year Plan*. These projects will be accomplished by Ecology staff, staff from other Federal, State and local agencies, persons and organizations outside government, and private contractors. Every project includes opportunity for significant cooperative involvement by persons inside and outside the Department of Ecology. The *Five-Year Plan* invites participation in data sharing and implementation of its many projects. The Data Management Task Force and its subcommittees are evidence of current participation from a wide variety of interests. Additional participants in the *Five-Year Plan* implementation activities are welcome, along with the participation by anyone with data needs or data available to share.

Each project contains one or more activities. Subheadings under the projects and activities are:

Project Description - The name and number of the project from the *Preliminary Findings and Recommendations* and a brief description of the general situation or problem. It also can include a statement of the needs and a description of the priority for the project according to the Water Resource Data Needs Survey. Several large projects contain subprojects.

Justification - An explanation of why the project is needed, such as high priority from the Water Resource Data Needs Survey, predecessor to a high priority project, etc. It includes references to major organizational strategies and Federal or State law.

Activity Description - The name and number of a project activity, a description of the current situation or problem, and an explanation of progress that has been made to date.

Recommendation - A description of the actions or tasks necessary to accomplish the activity.

Benefits - An explanation of how the activity helps achieve the Water Resource Data Management Vision, how it provides incrementally cost effective benefits, how it achieves integration of water resource data, and the risk or impact if the activity is not done.

Dependencies - An explanation of preceding or integrated activities. Dependent activities are not included.

Project 1. Develop Five-Year Water Resource Data Management Plan

The *Preliminary Findings and Recommendations* contains a recommendation to develop and publish a *Five-Year Water Resource Data Management Plan* as prescribed in Chapter 295, Laws of 1990. This document is the *Five-Year Water Resource Data Management Plan.*

The *Five-Year Plan* is more detailed for the near future and less detailed further in the future. The *Five-Year Plan* needs to be reviewed periodically so that it remains a viable plan and guides development of the Water Resource Data Management Program towards the Water Resource Data Management Vision.

The *Water Resource Data Management Annual Report* provides a review of the water resource data management projects during the previous fiscal year. It explains the progress toward achieving the Water Resource Data Management Vision. It also provides input into development of the next *Five-Year Plan* that will make future projects more effective. This project contains activities that will continue enhancement of the *Five-Year Water Resource Data Management Plan* and produce a *Water Resource Data Management Annual Report.*

Justification

Reviewing of the *Five-Year Plan* is necessary to define the details of future projects and to obtain funding for those projects from the Legislature. It presents an opportunity to incorporate new insight and technology, and to reaffirm commitment from supporters of the Plan.

Annual reports are required by law. They support future funding requests by providing accountability for current and past appropriations. They document progress toward achieving the Water Resource Data Management Vision of the Future.

Activity 1.1. Review the Five-Year Plan

A *Five-Year Plan* must be reviewed regularly to reflect progress toward the Water Resource Data Management Vision and changes in emphasis for water resource data management.

Recommendation

Update the *Five-Year Water Resource Data Management Plan* during the last quarter of every even-numbered fiscal year. The updated *Five-Year Plan* recommends projects to be completed over the next five years and identifies the funding necessary to carry out those projects. The Water Resource Data Management Task Force and any other interested parties will provide input regarding projects in the *Five-Year Plan.*

Benefits

The *Five-Year Water Resource Data Management Plan* provides a guide for achieving the Water Resource Data Management Vision. It provides a mechanism to coordinate efforts and focus funding on projects which are critical for achieving the Vision. Without the *Five-Year Plan,* data management efforts would be fragmented and the chance of achieving the Vision would be severely limited.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 1.2. Produce Water Resource Data Management Annual Reports

The *Five-Year Plan* needs a periodic review of the progress, and identification of worthwhile practices that should be continued and undesirable practices that should be avoided. An annual report must be produced to summarize progress made with the *Five-Year Plan.*

Recommendation

Develop a *Water Resource Data Management Annual Report* during the first quarter of every fiscal year showing accomplishments from the previous fiscal year. The *Annual Report* should summarize accomplishments during the previous fiscal year, how those accomplishments fit with the *Five-Year Plan,* and what practices might be used during the following fiscal year to assure successful projects. Distribute the *Annual Report* to the Legislature and all interested parties.

Benefits

The *Annual Report* provides a review of the accomplishments during the previous fiscal year. It builds enthusiasm by showing progress toward achieving the Water Resource Data Management Vision. It identifies good practices that should be carried forward to the next planning cycle. Without this review, enthusiasm for the Vision will decline and Plan implementation will suffer from reduced accountability and visibility.

Dependencies

This activity is not dependent on completion of any other activities.

Framework Stage

Project 2. Develop a Water Resource Common Data Architecture

Water resource data exist in many different forms, in many different databases, in many organizations. These data have different names, limited definitions, varying integrity, and can be redundant and inconsistent. There is no easy way to identify these data, access them, and share them in a consistent, efficient manner. There is no easy way to coordinate and integrate these data to support water resource managers.

Coordination and integration are achieved with the Water Resource Common Data Architecture. The Architecture provides a framework for defining data in a common context so they can be easily identified and readily shared. It provides information about the names and definitions of water resource data, their structure, their integrity, and their accuracy. It includes existing and new data, as well as tabular and non-tabular (spatial, image, textual, voice, etc.) about the water resource. It includes elemental and derived data, as well as automated and manual data.

The Architecture provides a shell for coordinating and integrating decentralized data. It provides a framework for cross referencing existing data, identifying the data variability, designating official variations, and developing translation schemes to those official variations. It provides short-term, incrementally cost effective benefits for identifying, acquiring, and sharing water resource data to support water resource managers. It provides a long-term migration strategy to achieve the Water Resource Data Management Vision and the Water Resource Data Library.

This project is part of the Framework Stage. This Stage contains activities for maintaining the Architecture, designating an Architecture Repository for data defined within the Architecture, continuing enhancement of the Water Resource Glossary, inventorying existing data, developing water and location systems, creating a clearing house of water resource studies, and developing information on sharing data.

Justification

The Department of Ecology's *Information Resources Management Strategic Plan* identifies development of a data architecture as a critical priority. *Toward 2010: An Environmental Action Agenda* recommends:

> Develop a comprehensive, integrated environmental information management system. The development of an integrated information management system to which all relevant agencies would contribute, and to which all would have access, would dramatically improve the situation.
>
> An Architecture, a Repository for that Architecture, and a Water Resource Glossary are key elements of proper data management to support effective management of the State's water resource. An Architecture is needed to coordinate and integrate data from different sources and to facilitate data sharing. The architecture needs to be maintained so the shell is available for use by any activity (for example, ground water quality data collection or research on water available for allocation) involved in managing water resource data.

Activity 2.1. Maintain Water Resource Common Data Architecture

The Water Resource Common Data Architecture is a framework for defining water resource data in a common context so they can be readily identified and easily shared. It is a set of techniques and rules for properly managing water resource data that are scattered over many databases in many organizations. It is a shell that is used by specific activities to define and manage data in that project.

Recommendation

Maintain the Architecture as a shell for other data management activities. Assure that the Architecture is coordinated and integrated with the statewide Common Data Architecture and with the Department of Ecology's data architecture. Identify and resolve any discrepancies between the architectures so that data can be readily identified and easily shared within and without the Water Resource Data Management Program.

Benefits

The Architecture is used by nearly every activity in the *Five-Year Plan to* assure that all data are defined uniquely and consistently. It provides a stable foundation for developing databases that will ultimately comprise the Water Resource Data Library. Failure to define all water resource data within the Architecture greatly increases the risk of data fragmentation and duplicative data collection. The Water Resource Data Management Vision will not be achieved without the Architecture.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 2.2. Designate a Water Resource Common Data Architecture Repository

Currently data defined within the Water Resource Common Data Architecture reside in word processing software files and a PC database. The contents of the word processor files and PC database are printed and distributed to clients for reference. As the size of the Architecture grows, a formal repository needs to be designated that has the capacity to handle the Architecture and provides ready access for clients.

Recommendation

Determine the requirements and features for an Architecture Repository. Evaluate the possibilities for a Repository. Identify client needs for access to the Repository and the information they need about the Architecture. Develop a plan for implementing a Repository and integrate that plan with the State's directions and the Department of Ecology's plans for data repositories.

Benefits

The Repository provides easy client access and allows rapid growth of the Architecture. The current PC-based Repository is not acceptable for the size of the Architecture and printed output is not acceptable for a large client base. The Water Resource Data Management Vision will not be achieved without a Repository to provide access to the Architecture.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 2.3. Continue Enhancement of Water Resource Glossary

There are many terms, phrases, and abbreviations used in water resource management. Each of these terms needs to be defined so that people readily understand their meaning and their differences, and use them appropriately. The best way is to provide a common glossary of definitions. A comprehensive Water Resource Glossary was initiated during Fiscal Year 1992.

Recommendation

Continue enhancing the Water Resource Glossary as new terms, phrases, abbreviations, and alternative definitions are encountered. Integrate the Water Resource Glossary with the data definitions in the Water Resource Common Data Architecture. Determine the proper location for the master Water Resource Glossary. Determine the method to inform people of the existence of the Water Resource Glossary and how they can access it and contribute to its contents.

The Water Resource Glossary is not intended to set water resource policy, but to be a central location for terms and their generally accepted definitions. Where more than one definition is in use and policy considerations are implied by a definition, more than one definition may be included in the Glossary.

Benefits

Building a comprehensive Water Resource Glossary assures that people use terms properly and consistently. Glossaries in future water resource studies need not be assembled from scratch. They can draw from and enhance the Water Resource Glossary eliminating redundant effort. Without the Water Resource Glossary terms will be used inconsistently and inappropriately causing confusion and misunderstanding about water resource management.

Dependencies

This activity is not dependent on completion of any other activities.

Project 3. Develop Detailed Water Resource Data Inventory

Many organizations across the State collect water resource data. These data collection efforts are often redundant and result in expenditures that are not necessary. They also result in gaps in water resource data that could be avoided if data collection efforts were coordinated. There are many opportunities to increase efficiencies or control the cost of managing the State's water resource by using data that already exist.

The *Preliminary Findings and Recommendations* contains a recommendation to perform a comprehensive inventory of the State's water resource data, including the organizations collecting those data, the time frames and extent of those data, the organizations maintaining those data, and the contacts in those organizations. The inventory must be done within the Water Resource Common Data Architecture.

The Water Resource Data Availability Survey was conducted during Fiscal Year 1992 based on the broad data groupings defined in the *Preliminary Findings and Recommendations*. The Survey is explained in the *Water Resource Data Management Annual Report* and the results of the survey are contained in the *Water Resource Data Source Book*.

For more information about the *Water Resource Data Source Book*, see the *Water Resource Data Management Annual Report*. Copies of the *Water Resource Data Source Book* may be obtained from:

Publications
Washington State Department of Ecology
P 0 Box 47600
Olympia, WA 98504-7600
(206) 438-7472

The Water Resource Data Needs Survey was also conducted during Fiscal Year 1992 based on the broad data groupings defined in the *Preliminary Findings and Recommendations*. The Survey is explained in the *Water Resource Data Management Annual Report*. The results of this Survey can be cross-referenced with the results of the Water Resource Data Availability Survey. The Survey was designed to identify what water resource data meet existing needs, and what data need to be collected in order to meet existing needs. Data that already exist can be shared as described in the Data Sharing Project. Data collection is described in other appropriate activities.

This project is part of the Framework Stage. This Stage contains activities for maintaining the Architecture, designating a repository for data defined within the Architecture, continuing enhancement of the Water Resource Glossary, inventorying existing data, developing water identification and location systems, creating a clearing house of water resource studies, and developing information on sharing data.

Justification

Many of the activities in this *Five-Year Plan* require knowledge of the availability of water resource data. Continuing the Water Resource Data Availability Survey identifies existing data, reduces redundant data capture, fosters cooperation and collaboration for collection of additional data, and promotes the sharing of all data. Information collected during the water resource data surveys also assists clients working independently of the *Five-Year Plan* by allowing them access to existing data and encouraging them to collect data that do not already exist.

Activity 3.1. Continue Water Resource Data Availability Survey

The Water Resource Data Availability Survey conducted during Fiscal Year 1992 did not cover all organizations that have water resource data. The Water Resource Data Availability Survey needs to continue to identify all organizations that have data about the State's water resource.

Recommendation

Continue the Water Resource Data Availability Survey until the majority of organizations that have data about the State's water resource have been contacted and the extent of their water resource data is known. Enter the information gained into the *Water Resource Data Source Book.* Provide a mechanism for organizations that have water resource data to enhance information in the *Water Resource Data Source Book* as that information changes.

Benefits

A current, accurate survey of water resource data promotes effective and efficient collection and use of data. It allows organizations to cooperate, collaborate, exchange, and share data in the most efficient manner. The information collected during the Survey will contribute to the *Water Resource Data Source Book* and the electronic Water Resource Data Guide. It assures the best use of currently available data and provides a foundation for more detailed water resource data inventories. Without continuation of the Water Resource Data Availability Survey, full use of existing data is impossible.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 3.2. Develop Water Resource Data Needs Procedure

The Water Resource Data Needs Survey identifies critical data needs for managing the State's water resource. These data needs are identified by the broad data groupings defined in the *Preliminary Findings and Recommendations,* not at a detailed level. Specific data required to support data management activities must be identified before they can be acquired.

Recommendation

Establish a generic Water Resource Data Needs Identification Procedure, i.e. a format for identifying detailed water resource data needs within the Water Resource Common Data Architecture. Document this procedure and make it available to any data management activity that plans an inventory of water resource data needs.

Benefits

Establishing a generic procedure for identifying detailed data needs assures that data needs of a water resource data management activity are identified. It assures data needs are coordinated across data management activities and that the Water Resource Data Library can support many different water resource data management activities. Failure to develop uniform procedures for inventorying data needs will allow inconsistencies in later Data Library Projects.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 3.3. Develop Water Resource Data Availability Procedure

The Water Resource Data Availability Survey identifies data that currently exist and could be used to meet data needs of a particular activity. These data were identified by the broad data groupings defined in the *Preliminary Findings and Recommendations*, not at a detailed level. In addition, Activity 3.2, Develop Water Resource Data Needs Procedure, will present a format for identifying data needed to support data management activities. Specific data characteristics that already exist must be identified before they can be used to meet the data needs without being redundantly captured.

Recommendation

Establish a generic Water Resource Data Availability Identification Procedure for identifying detailed water resource data that currently exist. Include in the Procedure the documentation of available data in the *Water Resource Data Source Book.* Assure that this Procedure fits existing data within the Water Resource Common Data Architecture. Document the Procedure and make it available for use by any activity that requires data.

Benefits

Establishing a generic procedure for identifying existing data that could meet data needs assures that available data are used rather than being captured redundantly. It assures that a standard, consistent procedure is used to identify existing data and that those data are identified and defined within the Architecture. It also assures that existing data are documented and will, if available, be shared with other data management activities. It assures that additional data are collected only when necessary and leverages limited resources to meet critical water resource data management needs. Failure to develop uniform procedures for inventorying data availability allows inconsistencies in later Data Library Projects.

Dependencies

This activity is not dependent on completion of any other activities.

Project 4. Develop Standard Water Identification and Location Systems

There are two major groups of water location and identification systems. The first group includes the identification and location of surface water, such as streams, wetlands, estuaries, marine areas, and lakes. The second group includes the identification and location of wells. Each of these groups is described in a separate subproject. This project is part of the Framework Stage. It contains activities for maintaining the Architecture, designating a repository for data defined within the Architecture, continuing enhancement of the Water Resource Glossary, inventorying existing data, creating a clearing house of water resource studies, and developing information on sharing data.

Subproject 4.a. Develop Standard Surface Water Identification and Location System

Considerable data have been collected for surface water in the State. However, it is difficult to correlate and integrate these data because there is no standard identification and location system for surface water. It is difficult, and often impossible, to determine which surface water the data actually characterize. Many maps exist with unique identifiers for selected surface water. None of these maps has been adopted as a standard for identification of all surface water. This situation results in inefficiencies, limited data sharing, and lower productivity.

This subproject contains activities to evaluate existing surface water identification and location systems and establish and pilot test a Standard Surface Water Identification and Location System. The Standard Surface Water Identification and Location System is implemented in other activities.

Justification

The Water Resource Data Needs Survey identified data about surface water, particularly stream data, as critical to proper management of the State's water resource. These data can not be correlated without a Standard Surface Water Identification and Location System that uniquely identifies and accurately locates each surface water body in the State. Adequate surface water data result in more effective action in compliance with State law. Specific laws cited in the Water Resource Data Needs Survey are:

- Growth Management Act
- Shorelines Management Act
- State Environmental Policy Act
- Title 53 RCW: Port Districts
- Title 54 RCW: Public Utility Districts
- Water Resource Act of 1971
- Water Pollution Control Act

Activity 4.a.1. Identify Standard Surface Water Identification and Location System

A variety of different surface water identification and location systems are currently in use by many organizations. Each of these systems meets specific needs, but not necessarily the needs of others. Nor do they include all surface water. A Standard Surface Water Identification and Location System needs to be designed that uniquely identifies all surface water in the State.

Recommendation

Evaluate major surface water identification systems currently in use within the State for their extent of coverage, structure, effectiveness, and deficiencies. Evaluate prominent surface water identification systems in use outside the state for their structure, effectiveness, and deficiencies. Determine clients' needs for a comprehensive Surface Water Identification and Location System. Establish criteria for recommending a system.

Designate a standard surface location system, such as State Plane Coordinates or latitude/longitude, and a standard altitude measurement, such as the North American Vertical Datum. Identify a method for determining the location of surface water according to the designated location system. Recommend a Standard Surface Water Identification System that meets all client needs possible, within the limits of reasonable cost.

Benefits

A Standard Surface Water Identification and Location System is mandatory for integrating water resource data and achieving the Water Resource Data Management Vision. Without a standard identification and location system, there is no way to uniquely identify all surface water and no way to bring existing data about those surface waters together. Current and future data collection will be of substantially less value if this activity is not completed.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 4.a.2. Evaluate Standard Surface Water Identification and Location System

When a Standard Surface Water Identification and Location System is designated, it must be tested before it is placed in use. Relations to other existing systems must be documented, including an assessment of the system's integrity and its ability to meet client needs. Cross references to translate between existing systems and the standard system must be developed. The feasibility, benefits, costs, and impacts of implementing a Standard Surface Water Identification and Location System across the State must be thoroughly evaluated following a pilot test, before a standard system is implemented.

Recommendation

Conduct a pilot test of the recommended Surface Water Identification and Location System. Pilot test the system's ability to meet client needs, and its overall integrity. Select a geographic area that includes a full range of typical conditions, to assure validity of the test. Document any features found to be unsatisfactory or lacking. Enhance the system to resolve any deficiencies.

Conduct a feasibility study for implementation of the Standard Surface Water Identification and Location System across the State. Base the feasibility study on the pilot test results and evaluate the costs, benefits, and impacts of implementing the Standard Surface Water Identification and Location System on a statewide basis. Recommend approaches to implementation, such as identification of critical areas of the State, or critical surface water. Determine priorities for statewide implementation.

Benefits

Implementation of a Standard Surface Water Identification and Location System across the State is a large and time-consuming task. Pilot testing assures an orderly and cost effective implementation. A feasibility study identifies the best approaches to implementing the Standard System and designates a sequence of implementation based on critical needs and incremental, cost effective returns. Without a pilot test, significant time and money could be wasted in revising a statewide implementation.

Dependencies

This activity is dependent on completion of activity:

4.a.1. Identify Standard Surface Water Identification and Location System

Subproject 4.b. Develop Unique Well Identification and Location Systems

A large part of the State's ground water resource data is derived from well construction reports. Currently, there is no unique system for identifying wells, assuring that supplied location data are accurate, and for coordinating well data with wells. There is no unique, shared identifier for a water source in data collected by a variety of agencies. The lack of a uniform identifier makes it difficult to correlate water quality data from Environmental Protection Agency and the Department of Health with well construction and water level data from Ecology and the U.S. Geological Survey. Reported well locations are often inaccurate, and insufficient information about the well makes it nearly impossible to correlate water quality, water right, water quantity, and water use information for wells.

This subproject contains activities for implementing a unique well identification system, improving well location data, and applying those systems to existing databases. It is a basic activity that supports many other data management activities.

Justification

Many of the data needs cited in the Water Resource Data Needs Survey are difficult to meet because wells are not uniquely identified and reported locations have significant error. Existing data are difficult to correlate without a well identification system that uniquely identifies each well. A unique well identification system and an accurate location system are mandatory for correlating well data and properly managing ground water resources.

Adequate well location data enhance compliance with State laws pertaining to water quality, land development, waste disposal, and environmental protection. Specific laws cited in the Water Resource Data Needs Survey are:

Boundaries and Plats
Dangerous Waste
Growth Management Act
State Environmental Policy Act
Title 54 RCW: Public Utility Districts
Superfund
Water Pollution Control Act
Water Resources Act of 1971
Water Well Construction

Activity 4.b.1. Implement Unique Well Identification System

Well data, such as construction reports, water quality tests, etc., cannot be readily integrated without a system that uniquely identifies each well. A unique well identification system is needed to readily integrate all well data for proper management of the State's ground water data.

Recommendation

Continue implementation of the Unique Well Identification Program that is currently in progress through the Well Identification Task Force. Identify an implementation sequence throughout the State that identifies wells in areas that have a critical need for water resource management. Develop a database of wells that are tagged and make those data available to all. Invite local governments and State agencies that conduct field visits to wells to participate in the well tagging effort in their jurisdictions. Provide training in well tagging procedures for well drillers. Propose legislation for the upcoming legislative session to amend the Water Well Construction Act to include specific language authorizing well identification.

Benefits

A unique well identification system is vital to integrating ground water data. It provides a system allowing integration of all ground water data from many different organizations. It greatly improves the effectiveness of managing ground water data. Without a unique well identification system there is no way to uniquely identify all ground water withdrawals and no way to integrate existing data about those withdrawals.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 4.b.2. Implement Well Location Data System

Most information about well locations is provided by well drillers. This information is inconsistent and of variable quality. Well locations must be complete and accurate for proper analysis and management of the State's water resource. A system is needed that can accurately identify the map location and altitude of every well by standard horizontal and vertical coordinate reference systems. An improved well location system will support many other data management activities.

Recommendation

Develop a program for training well drillers to accurately determine well locations and wellhead elevations. Revise the standard well construction report so it is easier for well drillers to provide complete, accurate location information.

Encourage the use of digital altimeters by State and local agency field staff and interested well drillers to provide accurate wellhead elevation information. Encourage use of the Global Positioning System by State and local agency field staff and interested well drillers to provide accurate, precise locations. Also encourage surveying of wells for site specific work to provide accurate location and elevation information. Offer continuing education on determining accurate, precise locations and elevations without the use of Global Positioning Systems.

Benefits

Assuring accurate well location data facilitates more effective water resource management by State and local water resource managers. Precise well locations are important for integrating well data and ground water withdrawal data. Precise well locations are mandatory for Geographic Information Systems. Comprehensive water resource models are based on precise geographical locations. Without precise altitude and location data these models will not be as effective and the direction of ground water flows cannot be determined.

Dependencies

This activity is not dependent on completion of any activities.

Activity 4.b.3. Include Unique Well Identifiers in Databases

Implementation of the Unique Well Identification Program is useless until existing databases are retrofitted with the Unique Well Identifier. The Unique Well Identifier must be added to existing databases so data are easily integrated and shared.

Recommendation

Through the Communication and Training Strategy, Activity 5.3, develop and conduct an outreach program about the Unique Well Identification Program. Develop a plan to include the Unique Well Identifier in these databases. Revise forms and reports to include the Unique Well Identifier. Coordinate implementation of this recommendation with the Well Identification Task Force.

Benefits

This activity provides improved access and integration of existing well data based on the Unique Well Identifier. It delivers the benefits of the Unique Well Identification Program and provides a foundation for modeling the State's ground water resources. Without placing the Unique Well Identifier in existing databases, ground water data cannot be integrated, accurate ground water models cannot be developed, and the Water Resource Data Management Vision cannot be achieved.

Dependencies

This activity is dependent on completion of activity:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System

Project 5. Facilitate Water Data Sharing

Sharing water resource data between organizations is difficult because there is no framework for data sharing. Identifying, locating, and accessing data collected by other organizations is often difficult, costly, and time consuming. It may require traveling to different organizations, searching documentation, and copying paper files. The data obtained may not be in a readily usable form and often can not be integrated with data from other organizations. The result is limited data sharing, higher costs, and lower productivity.

The general approach to facilitating data sharing is to know what data exist, identify the primary sources of those data, make that information about data readily available to clients so they can arrange to acquire data they need, and ultimately develop a data sharing network based on primary sources of data and clients needs. It is difficult, if not impossible, to develop a data sharing network without first knowing the data needed to support critical activities, the locations where those data are needed, and the primary sources of data.

This project contains activities for enhancing the *Water Resource Data Source Book,* developing an electronic Water Resource Data Guide, implementing a communication and training strategy, developing a statewide communications network, and reviewing open records legislation. This project is part of the Framework Stage. This Stage contains activities for maintaining the architecture, designating a repository for data defined within the Architecture, continuing enhancement of the Water Resource Glossary, inventorying existing data, creating a clearing house of water resource studies, and developing information on sharing data.

Justification

Data sharing is one of the primary reasons for the Water Resource Data Management Program. It has been emphasized throughout many of the tasks in the *Preliminary Findings and Recommendations,* in the *Interim Action Plan,* and in this *Five-Year Plan.* It has been repeatedly discussed at Task Force meetings, Forum meetings, and subcommittee meetings. The need for data sharing was readily evident in responses to the Water Resource Data Needs Survey. Facilitation of data sharing is the most important project in the Water Resource Data Management Program.

Activity 5.1. Enhance Water Resource Data Source Book

The *Water Resource Data Source Book* provides information about data that exist, where those data can be located, and who to contact to obtain those data. It also contains any other information pertinent to acquisition of data. Data source books are available for other disciplines, such as Growth Management, and have been moderately successful for leading clients to the data they need.

The *Water Resource Data Source Book* was developed during Fiscal Year 1992 following the Water Resource Data Availability Survey. Information gained from the Survey was placed in the *Source Book*. However, the *Source Book* is far from complete because it only covered a few of the many organizations that have water resource data and it was done by broad data groupings. More information about the State's water resource data is needed.

Recommendation

Enhance the *Water Resource Data Source Book* by incorporating new material. Enhance and reprint the *Source Book* periodically. Seek feedback from clients regarding the effectiveness of the *Source Book* and make appropriate enhancements in the *Source Book* to overcome deficiencies.

Expand the *Water Resource Data Source Book* to include sample quality assessment and quality control procedures, sample agreements for data sharing, and sample media exchange standards.

Benefits

The *Water Resource Data Source Book* is a first step in facilitating data sharing by providing information about data that exist, where those data are located, and who to contact to acquire those data. The *Water Resource Data Source Book* provides a shell that can be enhanced by many of the other data management activities. Without the *Water Resource Data Source Book* there is limited data sharing and increased redundant data capture and storage.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 5.2. Develop Electronic Water Resource Data Guide

The *Water Resource Data Source Book* provides considerable information about the existence of water resource data, where they are located, and who to contact to access those data. However, the *Source Book* is difficult to update and distribute in a timely manner. An automated version of the *Source Book* is needed to accurately reflect the current status of water resource data.

Recommendation

Produce an electronic Water Resource Data Guide that contains current, accurate information on the status of the State's water resource data and make it readily available to clients. Evaluate other technologies, such as CD-ROM, as part of a continuing improvement of the Guide. Seek input and feedback from clients regarding the effectiveness of other technologies. Investigate a variety of platforms to provide the broadest service base to clients.

Promote the Water Resource Data Guide through an active marketing campaign. Identify the client base and actively move toward one-stop data identification for clients.

Benefits

The electronic Water Resource Data Guide is a more effective means for delivering information from the *Water Resource Data Source Book.* It provides a directory of information about the location and availability of water resource data, and other features to readily identify and provide easy access to water resource data.

The Water Resource Data Guide, like the *Water Resource Data Source Book,* provides a shell that can be enhanced by many of the other data management activities. Without the Water Resource Data Guide, clients must rely on the *Source Book,* which becomes dated.

Dependencies

This activity is dependent on completion of the following activity:

2.2. Designate Water Resource Common Data Architecture Repository

Activity 5.3. Implement a Communication and Training Strategy

Many activities in this *Five-Year Plan* call for outreach through training or targeted education efforts. The Water Resource Data Needs Survey identified a profound interest in cooperative efforts to improve water resource data and data access. A communication and training program is needed to provide information about all the water resource data management efforts and to provide training where necessary.

Recommendation

Develop a strategy for communication and training about water resource data management activities. Expand the content and distribution of the *Water Resource Data Management Task Force Update* newsletter. Train existing and potential water resource data clients. Coordinate the design for all communications and training efforts recommended in this *Five-Year Plan.*

Design an overall marketing and communications strategy for water resource data management. Identify the client community or communities, assess their needs for information, determine appropriate communication tools, design the tools, make the tools available for the various activities, and carry out other communications and training support functions.

Benefits

Centralized communication and training reduces the cost and increases the effectiveness of many activities in the *Five-Year Plan.* Coordinated communication and training programs reach similar audiences, target audiences for outreach and training, give the *Five-Year Plan* a common identity, and provide the benefits of specialization.

This activity provides a mechanism to coordinate and integrate communication and training from all other data management activities. It provides a common, consistent communications vehicle to anyone interested in or involved in water resource management. Without this activity, communication and training would be inconsistent and fragmented, and could create confusion about water resource management.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 5.4. Develop Statewide Electronic Communications Network

The ultimate goal of data sharing is for a client to be able to access a network, identify the data they need, and readily access those data. Ideally, the client does not need to know where data are located or how they are accessed. The client only identifies the data they need to perform their activity. A statewide communications network is needed before this goal can be achieved.

Recommendation

Prepare a preliminary conceptual design for a statewide communications network for accessing water resource data. Identify the client base that will be using the data, the critical data that are needed, and the primary data sources. Integrate design efforts with the Department of Information Services to assure they are consistent with their plans for a statewide backbone communications network. Develop a plan for implementing the Communications Network based on the critical data needs. Implement the plan. Provide an instruction manual.

Benefits

An electronic communications network encourages and facilitates data sharing. It provides a mechanism to readily identify and easily access data from a terminal or personal computer, regardless where those data exist. It also provides a mechanism to readily share data between organizations. Inefficient data sharing will result from absence of an electronic communications network.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 5.5. Review Open Records Legislation

Any data sharing effort opens the issue of privacy and confidentiality. Every effort must be made to assure the privacy and confidentiality of people and organizations during data sharing. The current State and Federal laws pertaining to protection of privacy and disclosure of privileged information must be known before data are shared.

Recommendation

Review the State and Federal open records legislation for potential constraints on water resource data sharing initiatives. Coordinate with Geographic Information Council research on privacy and confidentiality. Propose changes to water resource data sharing efforts to assure privacy and confidentiality of water resource data where necessary. Provide this information to all clients using or maintaining water resource data.

Benefits

This activity assures that State and Federal laws regarding privacy and confidentiality are followed for water resource management data. It minimizes the risk of violating privacy and confidentiality of a person or organization. Data sharing will be impaired without assurance that data privacy and confidentiality will be respected.

Dependencies

This activity is not dependent on completion of any other activities.

Project 6. Develop Water Resource Studies Clearing House

A wide variety of water resource studies have been completed, are in progress, or are pending. These studies are seldom coordinated with each other and can be overlapping or redundant. Results of the studies are seldom integrated, leading to inconsistent findings and fragmented data about the State's water resource.

There is no centralized, coordinated bibliographic system for water resource studies. Information about existing and historical water resource studies is not consolidated and exists in many different forms. Study categories are not well-defined and citations do not exist for many studies.

The Water Resource Data Needs Survey indicated that water resource studies are critical for achieving organizational goals. These studies benefit from a coordinating mechanism so that limited funding can be leveraged for maximum benefit in areas critical to water resource management. A mechanism is needed that identifies water resource studies that have been completed and allows organizations to collaborate and cooperate on implementation of current and pending water resource studies.

This project contains activities for determining the feasibility of a Water Resource Clearing House, pilot testing a Clearing House, and implementing the Clearing House. This project is part of the Framework Stage. This Stage contains activities for maintaining the Architecture, designating a repository for data defined within the Architecture, continuing enhancement of the Water Resource Glossary, inventorying existing data, creating a clearing house of water resource studies, and developing information on sharing data.

6

Justification

Water resource studies are a major source of raw data, interpreted data, and conclusions about the State's water resource. They are an integral part of water resource management and provide substantial information for water resource management decisions. Opportunities for coordination of water resource studies assure that information about critical water resource management issues are collected in an effective and efficient manner.

Activity 6.1. Determine Feasibility of Water Resource Studies Clearing House

Water resource studies cover a wide range of topics and study areas, and contain considerable information about the State's water resource. Coordination of these water resource studies requires a feasibility study to determine the extent of studies, the information contained in those studies, and client needs.

Recommendation

Conduct a feasibility study to develop a Water Resource Studies Clearing House. Determine the scope of the Clearing House, client needs, and features. Contact State agencies, such as the Washington State Library, and outside vendors, regarding approaches to developing a comprehensive Clearing House. Conduct an inventory of pertinent existing water resource study bibliographies and research tracking systems. Include funding, implementation schedule and other aspects of implementing a Water Resource Clearing House in the feasibility study. Investigate development of a library or reference system for hard-to-find publications.

Benefits

A feasibility study assures that the full scope of client needs and Clearing House features are investigated before development of the Clearing House begins. A feasibility study also identifies the cost of implementation, the implementation schedule, and the benefits of a Clearing House. It also provides alternatives for implementation. Without a feasibility study, there is risk that a costly project will not meet client requirements.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 6.2. Pilot Test Water Resource Studies Clearing House

Implementation of a Water Resource Studies Clearing House is a large project. A pilot test needs to be conducted to determine the detailed requirements and steps for implementation to assure that the Clearing House is properly developed.

Recommendation

Conduct a pilot test of the Water Resource Studies Clearing House based on the feasibility study. The pilot test should include an assessment of the Clearing House and its ability to meet client needs. Document any features found to be unsatisfactory or lacking. Enhance the Clearing House to resolve those discrepancies.

Benefits

A pilot test identifies needed changes in the Clearing House before full-scale implementation. Changes during the pilot test are much less costly and can be tested before a major commitment is made to the activity. Without a pilot test, there is risk that the project will not meet client needs.

Dependencies

This activity is dependent on completion of activity:

6.1. Determine Feasibility of Water Resource Studies Clearing House

Activity 6.3. Implement Water Resource Studies Clearing House

The feasibility study and pilot test identify the feasibility, scope, requirements, and cost for a Water Resource Studies Clearing House. The Clearing House needs to be implemented and populated with information about water resource studies.

Recommendation

Implement the Water Resource Studies Clearing House based on the feasibility and pilot test. Establish procedures for maintaining the Clearing House. Develop an instruction manual and conduct training sessions for users of the Clearing House. Determine the organization that will be responsible for long-term administration of the Water Resource Studies Clearing House.

Benefits

Implementation and long-term administration of the Water Resource Studies Clearing House assures that water resource studies can be coordinated, results of studies will be integrated, redundant studies will be avoided, and funding will be used to maximum advantage. Without implementation of the Clearing House, studies will be less coordinated, resulting in reduced benefits from research resources.

Dependencies

This activity is dependent on completion of activity:

6.2. Pilot Test Water Resource Studies Clearing House

Data Collection and Library Stage

Project 7. Develop Improved Ground Water Data

There are three major areas for improving ground water data. The first area includes consolidation and automation of well construction reports. The second area includes delineating and characterizing aquifers. The third area includes improving ground water data collection and sharing. Each of these major areas is described as a separate subproject.

The Water Resource Common Data Architecture, inventory of ground water data, and identification of existing ground water studies for the Clearing House, are essential components of this project. This project is part of the Data Collection and Library Stage. This Stage contains activities for collecting and organizing data by subject area, including ground water, surface water, water quality, water quantity, water use, and water allocation. Additional data will be identified and collected during this Stage to supply information to models used to make water resource decisions.

Justification

A 1991 survey showed that 37% of calls to the Department of Ecology's Regional Offices were requests for well information. Consolidating and automating well construction reports allows data to be readily available and easily shared. It also allows additional well construction data to be integrated with existing well construction data. Access to well construction data will contribute significantly to updating maps of major aquifers.

Aquifer mapping and characterization facilitates management of ground and surface waters, maximizes water use, and protects the water resource. It establishes a baseline for tracking impacts of withdrawals and aids aquifer modeling.

Collecting and sharing ground water data within the Water Resource Common Data Architecture assures that data required to support water resource management are readily available. It also assures that those data are not captured redundantly and are readily shared.

Adequate ground water data enhance compliance with State laws governing well construction, land development, waste disposal and environmental protection. Specific laws cited in the Water Resource Data Needs Survey are:

- 1945 Ground Water Code
- 1917 Water Code
- Boundaries and Plats
- Dangerous Waste
- Growth Management Act
- State Environmental Policy Act
- Superfund
- Title 84 RCW: Public Utility Districts
- Title 87 RCW: Irrigation
- Underground Storage Tanks
- Water Well Construction Act
- Water Pollution Control Act
- Water Resources Act of 1971

Subproject 7.a. Consolidate and Optically Image Well Construction Reports

Well drillers submit a well construction report for each water well and resource protection well they drill in the State. These reports supply original data about the well location, depth, water level, geologic materials, etc. Data from well construction reports are not automated and require considerable time to locate. Once located, additional time is required to manually copy data from the reports. Data from the well construction reports need to be automated to allow easy access and data sharing in support of water resource management activities.

This subproject contains activities for conducting a feasibility study for optically imaging well construction reports, and designing, pilot testing and implementing a Well Construction Report System.

Activity 7.a.1. Conduct Well Construction Report Feasibility Study

Most of the data contained on well construction reports provided by well drillers are not accessible because of the time and expense involved in manual retrieval of the data. An automated system is needed for well construction data so clients can easily access data they need.

Recommendation

Conduct a feasibility study for optically imaging current and past well construction reports and compiling related well data. The feasibility study should include the scope of data, priorities, features, client-friendly access, any impact on well drillers, cost of implementation, sequence of implementation, and any other information related to design and implementation. It should include the Unique Well Identification and Well Location Data Systems.

Benefits

A feasibility study identifies the best approaches to implementing a new system and designates a sequence of implementation based on critical needs and incrementally cost effective returns from a new system. It assures design within the Water Resource Common Data Architecture and use of the Unique Well Identification and Well Location Data Systems. Not conducting a feasibility study increases the risk of a system that does not provide the required features, is costly, or is not consistent with the Architecture.

Dependencies

This activity is dependent on completion of activities.

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System

Activity 7.a.2. Develop Well Construction Report System

The Well Construction Report Feasibility Study identifies the scope, feasibility, cost, and requirements for a Well Construction Report System. The System will be designed and developed based on the requirements identified in the Feasibility Study.

Recommendation

Design a Well Construction Report System based on results of the feasibility study. Include requirements identified in the feasibility study. Include the Unique Well Identification and Well Location Data Systems in the design. Assure that data are defined within the Water Resource Common Data Architecture.

Benefits

Development of a Well Construction Report System provides automated data about well construction to clients in a consistent format. Clients can readily access these data to meet their needs. They can integrate other well data with the well construction data for better management of the State's water resource. Clients and the Department of Ecology avoid the significant expense of current manual searches. Not optically imaging the well construction reports continues the manual effort of locating the well construction reports and manually copying information from those reports. This practice limits the use of data contained in those reports and takes regional staff time that could be spent more effectively.

Dependencies

This activity is dependent on completion of activity:

7.a.1. Conduct Well Construction Report Feasibility Study

Activity 7.a.3. Pilot Test Well Construction Report System

The Well Construction Report System must to be tested before it is implemented on a statewide basis. A pilot test needs to be conducted to test the design and to determine a strategy for implementation that automates data for critical areas first.

Recommendation

Conduct a pilot test of the new Well Construction Report System based on a small sampling of data. Evaluate the features of the new system and the data contained in the system. Solicit feedback from clients regarding useability of the system and any features that need to be changed or added. Enhance the system as necessary to resolve problems and discrepancies. Identify a strategy for implementing the new system.

Benefits

A pilot test identifies changes needed in the Well Construction Report System before it is fully implemented. Changes made during the pilot test are less costly and can be tested before a major commitment is made to full implementation of the system. It also identifies the sequence of implementation that assures critical data are entered first. Not conducting a pilot test increases the risk of a system that does not meet client requirements and increases the risk of entering noncritical data before critical data.

Dependencies

This activity is dependent on completion of activity:

7.a.2. Develop Well Construction Report System

Activity 7.a.4. Implement Well Construction Report System

The Well Construction Report System needs to be implemented on a statewide basis in a sequence that provides data for the most critical areas first.

Recommendation

Implement the Well Construction Report System on a statewide basis according to priorities identified in the feasibility study and the pilot test. Identify potential clients of well construction reports and make consolidated well construction report data available to those clients. Provide training to clients on use of the system and the scheduled implementation.

Benefits

A Well Construction Report System provides improved access to well construction data. It reduces research time and provides more timely response to public requests for well data. It also supports Aquifer Mapping and Characterizing and facilitates geologic research for water supplies, wellhead protection area modeling, mining, and construction. Without implementation of the Well Construction Report System, there will be an inability to access well and ground water data in an efficient and timely manner.

Dependencies

This activity is dependent on completion of activity:

7.a.3. Pilot Test Well Construction Report System

Subproject 7.b. Map and Characterize Aquifers

Delineation of the State's aquifers is far from complete and detailed information about the State's aquifers is inadequate. There is insufficient information on aquifers in the State to allow a standard set of reference maps and a standard aquifer identification system to be adopted. The existing sources of information for aquifer locations and extents consist of a very general map of the State, and scattered reports for specific areas at various scales by the U.S. Geological Survey, Department of Ecology, local governments, Ground Water Management Areas, consultants, and others.

This subproject contains activities for conducting a feasibility study for mapping and characterizing aquifers, conducting a pilot test to map and characterize aquifers, and implementing a program to map and characterize aquifers in the State.

Activity 7.b.1. Conduct Aquifer Mapping and Characterization Feasibility Study

Ground water availability assessments, water allocation decisions, aquifer vulnerability assessments, and aquifer protection measures are difficult to carry out because of insufficient information on the aquifer boundaries, recharge and discharge zones, and qualities of the State's aquifers. Mapping and characterization of the State's aquifers is needed for effective ground water management in critical areas.

Recommendation

Determine criteria for aquifer mapping and characterization. Conduct a feasibility study to determine how to develop and publish an updated version of the study *Principal Aquifers and Well Yields in Washington,* (Molenaar, et.al. 1980) based on existing U.S. Geological Survey, Ground Water Management Area studies, and Well Construction Report data. Include in the feasibility study the extent of the effort needed to map and characterize aquifers, the cost involved, the time involved, the general approach and base for mapping and characterizing, the map scale, and an implementation plan.

Benefits

A feasibility study identifies the best approaches to implementing a new system and designates an implementation sequence based on critical needs and incrementally cost-effective returns. It also assures that the process is designed within the Water Resource Common Data Architecture. Not conducting a feasibility study increases the risk of a procedure that does not provide the required information, is costly, and is not consistent with other water resource management activities.

Dependencies

This activity is dependent on completion activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System

Activity 7.b.2. Pilot Test Aquifer Mapping and Characterization

A pilot test needs to be conducted after the feasibility study to determine the procedure for mapping and characterizing aquifers. A pilot test identifies and refines the techniques for aquifer mapping and characterization and assures that the effort continues on a consistent and productive basis.

Recommendation

Conduct a pilot test for mapping and characterizing aquifers in a critical area of the State. The pilot test should evaluate the procedure to map and characterize aquifers based on available information from a variety of sources. Enhance the procedure as information is gained about the aquifer mapping and characterizing process. Evaluate the procedure in a variety of geologic areas. Document problems encountered with application of the procedure and resolve those problems. Enhance the design to include the problem resolutions.

Benefits

A pilot test allows extensive technical review of the proposed aquifer map and characterization system. It refines the system and results in greater integrity and usefulness. A pilot test is a cost effective method of perfecting the system prior to statewide implementation. Not conducting a pilot test increases the risk of implementing a procedure that is ineffective or costly and will not meet water resource manager needs.

Dependencies

This activity is dependent on completion of activity:

7.b.1. Conduct Aquifer Mapping and Characterization Feasibility Study

Activity 7.b.3. Implement Aquifer Mapping and Characterization System

The Aquifer Mapping and Characterization System needs to be implemented statewide following the pilot test.

Recommendation

Implement the Aquifer Mapping and Characterization System on a statewide basis according to priorities identified in the feasibility study and pilot test. Document the System and provide training to users in aquifer mapping and characterization.

Benefits

Mapping and characterizing aquifers contributes to management of ground and surface waters, maximizing water use, and protecting the dependent environmental resources. It provides baseline information for aquifer vulnerability, ground water modeling, and allows for an integrated view of critical areas.

Dependencies

This activity is dependent on completion of activity:

7.b.2. Pilot Test Aquifer Mapping and Characterization System

Subproject 7.c. Ground Water Data Collection and Sharing

Ground water data are collected and used by many organizations, such as cities, counties, State agencies, Federal agencies, public utilities, and Indian tribes. These data have different formats and are often inaccessible to people outside the organization maintaining the data. These data are in constant demand and are currently transferred manually because automated data sharing has not been implemented. Ground water data need to be defined in a common context so they can be readily identified and easily shared to support water resource management activities.

Even though considerable ground water data are collected there is a strong demand for additional ground water data. These data need to be identified and a data collection program established to collect the additional ground water data.

This subproject contains activities to conduct a ground water data collection inventory study, implement ground water data integration and sharing, and implement ground water data collection.

Justification

The integration and sharing of ground water data are an important component of comprehensive water resource management and imperative for efficient use of limited resources. Defining existing ground water data within the Water Resource Common Data Architecture assures that the data can be readily identified and can be shared within a common context. Identifying additional ground water data that are needed but not collected allows water resource managers the opportunity to collect those data and improve water resource management. The Water Resource Data Needs Survey showed that the collection and sharing of ground water data was critical to the functions of most organizations.

Activity 7.c.1. Conduct Ground Water Data Inventory

Considerable ground water data currently exist in databases in many organizations, but the extent of those data are not known. Additional ground water data may need to be collected to supplement data that currently exist. However, since the extent of existing data is not known, and the requirements for ground water data are not known, it is difficult to determine what additional data need to be collected. An Inventory will be conducted to determine the ground water data that currently exist. Analysis of the Inventory will indicate additional data which are needed to properly manage the ground water resource.

Recommendation

Conduct an Inventory to determine the scope of ground water data that currently exist, the data needed to support comprehensive ground water management, and the data that need to be collected. The Inventory should define existing ground water data within the Water Resource Common Data Architecture. The Inventory should follow the standard procedures for the Water Resource Data Needs Inventory and Water Resource Data Availability Inventory.

Benefits

Conducting an Inventory assures that the extent of existing ground water data is known, and the requirements for ground water data are identified. It also assures that all data are defined within the Architecture. Not performing the Inventory increases the risk of not sharing existing data, redundantly collecting data that already exist, and not collecting data that are needed for proper ground water management.

Dependencies

This activity is dependent on completion of activity:

7.a.4. Implement Well Construction Report System

Activity 7.c.2. Implement Ground Water Data Integration and Sharing

Ground water data currently exist in a variety of databases in many, different organizations. It is very difficult to identify and integrate these data for water resource management purposes. It is common to collect separate sets of data and manually analyze them to make water resource decisions. A mechanism is needed to share and integrate ground water data to directly support water resource management activities.

Recommendation

Develop and conduct an outreach program to promote the use of Common Data Architecture with ground water data. Identify ground water data users and inform them of the results of the data inventory. Develop and implement a plan to share critical data on a regular basis.

Benefits

Integrating and sharing existing ground water data makes those data readily available to water resource managers. It allows them to make more informed decisions about water resource management, such as water allocation and water quality protection. It also makes those data readily available for the development of water resource models. Not integrating and sharing existing ground water data limits the information available to water resource managers, increases the risk of making inappropriate decisions, and limits the data available for water resource models.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
7.c.1. Conduct Ground Water Data Inventory

Activity 7.c.3. Implement Ground Water Data Collection

Considerable ground water data already exist. However, these data are not complete or current in many areas. Additional ground water data need to be collected to provide a more complete understanding of the State's ground water resource.

Recommendation

Develop a plan for collecting additional ground water data. The plan should include sequence of collection, time frames for collection, responsible organizations, funding, integration with existing ground water data, and any other information pertaining to the collection of additional ground water data.

Benefits

Collecting additional ground water data provides a more complete understanding of the State's ground water resources. More informed decisions will be possible when these data are integrated with existing ground water data. It also provides more complete data for development of the water resource models. Not collecting the additional ground water data limits the data available to water resource managers and increases the risk of less informed decisions. It also limits the data available to the water resource models.

Dependencies

This activity is dependent on the completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
7.c.1. Conduct Ground Water Data Inventory

Project 8. Develop Surface Water Inventory

Surface water bodies are identified by a variety of identification schemes that are not consistent for all surface water. Surface water data are captured and maintained by a variety of organizations in different formats. Surface water data are difficult to integrate and share because of these variations. A set of digital maps incorporating the Standard Surface Water Identification System is needed for integrating the data from the various classification schemes.

This project contains activities for implementing the Standard Surface Water Identification and Location System and cross referencing existing surface water identifiers to the Standard System. This project is part of the Framework Stage. This Stage contains activities for maintaining the Architecture, designating a repository for data defined within the Architecture, continuing enhancement of the Water Resource Glossary, inventorying existing data, creating a clearing house of water resource studies, and developing information on sharing data.

Justification

A standard method to integrate surface water data benefits all clients who use surface water data. Data collectors also benefit from the ability to accurately compare site locations, and avoid redundant collection. All surface water data can be integrated within a common, unique identification scheme.

Several Water Resource Data Needs Survey respondents identified State laws justifying their need for surface water data. A Standard Surface Water Identification System and a surface water inventory will help meet these needs. The State laws cited in the Data Needs Survey were:

- Growth Management Act
- Shorelines Management Act
- Title 53 RCW: Port Districts
- Title 54 RCW: Public Utility Districts
- State Environmental Policy Act
- Water Pollution Control Act
- Water Resources Act of 1971

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Activity 8.1. Implement Standard Surface Water Identification and Location System

Data which identify and locate the State's surface water are not standard. Without a standard identification and location scheme, data on surface water cannot be easily integrated. Data may be redundant or less useful because they cannot be readily related to previous data collection sites and efforts. The Standard Surface Water Identification and Location System will be implemented for surface water by geographic area.

Recommendation

Implement the Standard Surface Water Identification and Location System across the State based on criteria defined during the pilot test and feasibility study. Create a Surface Water Atlas containing a standard set of reference maps and a map index for surface water using the Standard Surface Water Identification and Location System. Maintain the Atlas in digital form and provide paper copies as needed. Add maps, photographs, tabular indices, and other data on surface water and watersheds as appropriate.

Document the Standard Surface Water Identification and Location System and provide that documentation to clients. Develop procedures to maintain the Surface Water Atlas through periodic updates with new and enhanced surface water data.

Benefits

Implementing the Standard Surface Water Identification and Location System provides the foundation for integrating surface water data. A comprehensive Surface Water Atlas can not be produced without implementing the Standard Surface Water Identification and Location System. The Surface Water Atlas will be a valuable reference tool to researchers and water resource managers. It reduces redundant data collection and increases data sharing. Current and future data collection will be of substantially less value and the Vision will not be achieved if this activity is not completed.

Dependencies

This activity is dependent on completion of activity:

4.a.2. Evaluate Standard Surface Water Identification and Location System

Activity 8.2. Cross Reference Surface Water Identifiers

Identification of a Standard Surface Water Identification and Location System is not useful unless that system is applied to existing databases. A mechanism needs to be implemented that provides a cross-reference to existing surface water identification schemes or places the new Standard Surface Water Identification and Location System in existing databases.

Recommendation

Identify significant existing databases containing surface water data that will benefit from a cross reference to the Standard Surface Water Identification and Location System. Develop a plan to cross reference the Standard Surface Water Identifier to these databases. Contact interested organizations that have databases containing surface water data with information about the Standard Surface Water Identification and Location System.

Identify forms and reports that require the Standard Surface Water Identifier. Develop a plan by which interested organizations may change those forms and reports to include the Standard Surface Water Identifier.

Benefits

Cross referencing significant databases to the Standard Surface Water Identification and Location System allows easier access and sharing of surface water data. It allows data to be integrated for analysis and reporting, and to develop data resource models. Not cross referencing the Standard Surface Water Identifier limits the ability to integrate surface water data and quantify streamflow requirements. Inability to cross reference adversely impacts water use, water quality, and hydraulic continuity assessments.

Dependencies

This activity is dependent on completion of activity:

8.1. Implement a Standard Surface Water Identification and Location System

Project 9. Develop Improved Water Quality Data

Substantial and increasing quantities of water quality data are being collected. However, these data can not be readily correlated to surface water and aquifers. Data about pollution sources, potential pollution sources, and sources of water degradation do not have standard locations. Integrating these data with standard location identifiers is critical to data sharing efforts. The inability to integrate water quality data makes it difficult to predict the need and cost of water treatment, and it results in further water quality degradation. Decreased water quality impacts the entire hydrologic system and large population areas. Instream resources, such as fish and wildlife habitats, are jeopardized or at risk.

A water quality data architecture and an inventory of water quality data are essential components of this project. This project contains activities to develop water quality data collection and sharing, identify water quality studies, and develop an ambient water quality monitoring program. This project is part of the Data Library Stage. This Stage contains activities for collecting and organizing data by subject area, including ground water, surface water, water quality, water quantity, water use, and water allocation. Additional data will be identified and collected during this Stage to supply information to models used to make water resource decisions.

Justification

The Water Resource Data Needs Survey identified water quality data for streams and ground water as critical to the proper management of the State's water resource. Failure to assess water quality data needs and improve data sharing severely limits the ability to protect the State's water resource. Effective water quality management requires comprehensive data which can be integrated.

Water quality data assist in setting waste discharge standards and administering waste water discharge permits. A wide range of other regulatory programs utilize water quality data. These data assist in protecting drinking water, wildlife, fish, shellfish, and food supplies, all of which depend on clean water. Many other uses of water quality data were identified in the data needs survey.

Port districts, irrigation districts, utility districts and conservation districts are required by law to utilize data on water quality. Other laws directing use of water quality data include:

- 1917 Water Code
- Federal Clean Water Act
- Growth Management Act
- Safe Drinking Water Act
- State Environmental Policy Act
- Water Pollution Control Act

Activity 9.1. Develop Water Quality Data Collection and Sharing

There is no organized approach to access water quality data or integrate water quality data with other water resource data, such as water quantity data or water allocation data. Procedures to readily integrate and share water quality data need to be developed.

Recommendation

Develop a plan for accessing and sharing water quality data. Identify water quality data needs and water quality data that are already available. Integrate water quality data into the Water Resource Common Data Architecture. Identify tasks necessary to share existing water quality data and to acquire critical water quality data that do not already exist.

Define a common set of data identifiers necessary to determine the quality and nature of water quality data. Establish a Water Quality Committee consisting of water quality data contributors and clients to develop the plan.

Benefits

Completion of this project enhances data integration and sharing capability. The ability to integrate data is a key step toward the relationship project, Develop Water Quality/ Water Use Relationship Information. Water resource and water quality decisions will be coordinated, providing greater certainty that water resources can be managed for maximum benefits. Water quality data that can be integrated will result in increased cost efficiencies in tasks using water quality data, such as the State's biennial statewide water quality assessment, the 305b Report. Not performing this activity severely limits the integration and sharing of water quality data.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
8.1. Implement Standard Surface Water Identification and Location System

Activity 9.2. Identify Water Quality Studies

Information about historical water quality data, research and survey projects, and on-going sampling projects is not readily available. This information needs to be identified and organized so it can be readily accessed.

Recommendation

Identify completed, ongoing, and planned water quality projects and include information about those projects in the Water Resource Studies Clearing House. Establish a committee to assist with project identification and collection of information about each project.

Benefits

Water quality studies can benefit from previous studies and will be less redundant as a result of this activity. Access to water quality data will be improved. The water quality section of the Water Resource Studies Clearing House will be enhanced. Failure to identify water quality studies for the Clearing House limits information available to water resource managers.

Dependencies

This activity is not dependent on completion of any other activities.

Activity 9.3. Develop Ambient Water Quality Monitoring Plan

Changes in water quality can not be adequately evaluated without historical data as a reference. Baseline water quality data are needed to assess changes in water quality. A plan needs to be developed that provides ambient water quality monitoring to establish the baseline water quality data.

Recommendation

Determine the minimum level of ambient water quality monitoring necessary to provide a base for managing both surface and ground water quality. Review surveys of existing water quality data in the *Water Resource Data Source Book*. Evaluate existing ambient water quality

monitoring efforts. Identify the location of additional ambient monitoring sites crucial to establishing a baseline for water quality management. Identify the data that need to be collected at each site and the frequency of collection. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, and 15.1, Model Water Use/Water Quality Relationships. Develop an action plan to establish priorities and time lines for completing ambient water quality monitoring.

Benefits

An action plan for collecting ambient water quality data is the most efficient way to collect water quality data. The Water Resource Data Needs Survey identified ambient water quality data as critical to proper management of the State's water resource. This activity defines the data that need to be collected and suggests priorities for current and proposed expenditures by public and private sectors. Water quality data also facilitate modeling of water quality/use interactions. Not developing the plan allows uncoordinated water quality data collection to continue.

Dependencies

This activity depends on the completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
7.a.4. Implement Well Construction Report System
8.1. Implement Standard Surface Water Identification and Location System

Project 10. Develop Improved Water Use Data

Comprehensive water use data are necessary to make informed decisions on water availability, conservation measures, growth management, impacts on water quantity and water quality, and the best possible use for water. Water use data are very limited and presently there is no long-term strategy or commitment for collecting additional water use data. Water use is often estimated from inadequate data. A plan is needed for the collection and management of a higher quality of water use information, utilizing spacial data and standard identifiers.

Water use data architecture, inventory of water use data, and identification of existing water use studies for the Clearing House, are essential components of this project. This project includes a water use data collection system, standardized water use reporting, water use estimation methods, coordination of instream use criteria, and mapping of public water supply service areas. This project is part of the Data Library Stage. This Stage contains activities for collecting and organizing data by subject area, including ground water, surface water, water quality, water quantity, water use, and water allocation. Additional data will be identified and collected during this Stage to supply information to models used to make water resource decisions.

Justification

The Water Resource Data Needs Survey indicated that both stream and ground water use data are critical for proper management of the State's water resource. The report of the Independent Fact Finder in *Washington's Water Future* states:

> Parties that regularly deal with Washington's water administration consistently expressed the need for better data regarding water use.

Failure to improve water use data will result in continued inability to assess water availability and increased uncertainty about water allocation decisions.

Several Water Resource Data Needs Survey respondents identified State laws justifying their need for water use data. The laws cited are:

- Growth Management Act
- Shorelines Management Act
- State Environmental Protection Act
- Title 53 RCW: Port Districts
- Title 54 RCW: Public Utility Districts
- Water Use Efficiency Act of 1989
- Water Resources Act of 1971
- 1917 Water Code

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Activity 10.1. Design Water Use Data Collection System

Limited water use data are collected by a few organizations. Additional water use data are needed for proper water resource management, but are not collected. A coordinated water use data collection mechanism is needed to estimate or collect water use data for proper management of the State's water resource.

Recommendation

Develop short-term and long-term goals for collecting water use data. Identify the specific data required and the locations where water use data are needed. Prepare a plan for developing and implementing a Water Use Data Collection System that incorporates the required water use data. Identify and include data elements necessary for modeling efforts in Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships.

Incorporate data collections and collection efforts by interested organizations. Implement a plan for ongoing water use data collection and access. Provide client-friendly access to all water use data.

Benefits

Additional water use data provide a base for more informed decisions regarding water allocations. They also provide additional data for development of water resource models. Water use data become more critical as areas with seasonal and chronic water shortages become more common. Determination of critical shortages and the protection of priority water rights is improved with additional water use data. Water use data are needed to understand and predict the impact a type of water use will have on the water resource. Water use data provide the means to evaluate water conservation efforts. Not providing additional water use data greatly increases the risk of making inappropriate water allocation decisions and adversely impacting the State's water resource.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
8.1. Implement Standard Surface Water Identification and Location System

Activity 10.2. Standardize Water Use Reporting

Very few standards exist for reporting water use and there are few requirements for water use reporting. Organizations that report water use do not provide water use data in a consistent manner. Water use reporting requirements and standards need to be developed and organizations which report water use data must provide those data in a consistent format.

Recommendation

Determine what organizations should report water use. Establish a committee of affected organizations and persons to develop water use reporting requirements, including revision of the initial list of water use reporters. Specify the data to be collected, acceptable methods of data collection, and frequency of collection. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Integrate the recommendations in *Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Method, and Conservation Programs.* Identify water use forms and reports. Develop a plan to change those forms and reports to the standard format. Conduct an outreach program to inform water system managers about standardized water use reporting.

Benefits

Additional water use data will be available from water purveyors and other water users. Clients will have easier access to more water use data and those data will be of higher quality. Water resource managers will make more informed decisions based on more data and higher quality data. Without standardization there will be less actual water use data, inaccurate actual water use data, and more estimated water use.

Dependencies

This activity is dependent on completion of activity:

10.1. Water Use Data Collection System

Activity 10.3. Develop Estimation Method for Non-Reported Water Use

Water resource management decisions often depend on estimates of water use. Many organizations and individuals that collectively use significant quantities of water do not provide water use data. It is important to understand this water use in critical areas. Current water use estimation methods are not adequate to confidently estimate non-reported water use. Standardized water use estimation methods need to be defined and made available to water resource managers.

Recommendation

Develop procedures for estimating water use in areas where water use data are not reported. Establish a committee that includes the U.S. Geological Survey and others with water resource experience to develop the water use estimation procedures. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Develop standards for field verification of estimated water use. Develop a plan to apply those procedures to areas that have critical water resource management issues.

Benefits

Estimated water use data are necessary to supplement reported data and provide a more complete picture of water use. Enhanced water use data will greatly improve water use analysis, help define water relationships, and lead to better modeling. Confidence in water use data and the resulting relationships and models will be improved and acceptance of the results will be greater. More informed water resource management decisions will result from the additional data and better models. Not developing and implementing water use estimation procedures results in increased risk of inappropriate water use allocations and adverse impacts on the State's water resource.

Dependencies

This activity is dependent on completion of activities:

- 4.b.1. Implement Unique Well Identification System
- 4.b.2. Implement Well Location Data System
- 8.1. Implement Standard Surface Water Identification and Location System

Activity 10.4. Pilot Test Water Use Data Collection System

When the Water Use Data Collection System has been designed it needs to be tested prior to implementation on a statewide basis. A pilot test assures the System meets client needs.

Recommendation

Select pilot areas for testing the Water Use Data Collection System. Pilot areas should be experiencing growth, have a variety of types of competing water uses, metered and unmetered water systems, and a mixture of surface and ground water sources. Collect water use data from organizations required to report water use and estimate water use where it is not reported. Evaluate the data to determine how effectively they meet the needs of water resource managers and the decision making process. Identify weaknesses and deficiencies and enhance the System to resolve those problems.

Benefits

A pilot test verifies the Water Use Data Collection System and identifies changes needed in the System before it is implemented statewide. Modifications made during the pilot test are less costly and can be tested before full implementation of the System. Not conducting a pilot test increases the risk of implementing a system that collects the wrong data, does not collect critical data, or is not easy to use.

Dependencies

This activity is dependent on completion of activities:

10.1. Design Water Use Data Collection System
10.3. Develop Estimation Method For Non-Reported Water Use

Activity 10.5. Coordinate Instream Use Criteria

A system is needed to provide the data necessary to evaluate instream use criteria and options for managing streamflow. Comparable coordinated criteria for instream uses (fisheries, fishing, white water rafting, hydropower, aesthetics, swimming, inland water transportation, etc.) are not available. Evaluation of a stream's potential is difficult.

Recommendation

Establish a minimum size stream for study and identify the streams that are above the minimum size. Develop a comprehensive list of instream uses for those streams. Establish criteria which, if applied, would maintain streamflow consistent with those instream uses. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Put the data in a usable form consistent with the Water Resource Common Data Architecture and provide it to water resource managers and decision makers.

Benefits

Data about instream uses and criteria for maintaining them allow water resource managers and decision makers to make more informed decisions. The data will also assist development of water resource/water use models. Not developing instream use criteria increases the risk of poor analysis and poor use of a stream's potential.

Dependencies

This activity is dependent on completion of activities:

8.1. Implement Standard Surface Water Identification and Location System

Activity 10.6. Map Public Water Supply Service Areas

Public water systems use considerable quantities of water. Data on many of the boundaries of public water systems do not exist or are not readily accessible in a consistent format. The boundaries of public water systems need to be known so that water used by those public water systems can be properly managed. Definition and documentation of public water system boundaries are needed so that boundary data is readily available to water resource managers.

Recommendation

Identify the 200 largest public water systems in the State. Obtain or create accurate maps of the boundaries of those public water systems and their service areas. Convert the maps to spatial data and add related water right information. Provide the data to water resource managers and decision makers. Obtain evaluations from water resource managers and decision makers regarding usefulness of the data. Map additional public water systems as needs are identified.

Benefits

Understanding the extent of public water systems allows State and local governments to make more informed decisions regarding applications for water rights, basin closures, public water supplies, building permits, and other water resource management, public health, and safety functions. Not developing public water system maps severely limits the ability of water resource managers to manage the water resource in areas that have large public water systems.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
8.1. Implement Standard Surface Water Identification and Location System

Project 11. Develop Improved Surface Water Quantity Data

Understanding and managing the State's surface water resource requires data about surface water quantities and how those quantities vary over time. Surface water quantity data are obtained from stream, lake, and reservoir gauging. These data are necessary to determine water availability for allocation, to assess the instream uses a stream or lake can serve, to evaluate relationships between surface water quantity and quality, and to develop models for predicting water availability. Some streams are well documented by continuous gauges, but few data are available for other streams.

Increased awareness of the interactions between surface water and ground water, and their effects on streamflow has increased the need for additional data to manage these complex interactions. It is difficult to provide an informed response to these issues in a timely manner with limited data.

This project contains activities for improving surface water quality data by developing a streamflow bibliography, collecting streamflow and climate data, and standardizing field data collection methods. This project is part of the Data Library Stage. This Stage contains activities for collecting and organizing data by subject area, including ground water, surface water, water quality, water quantity, water use, and water allocation. Additional data will be identified and collected during this Stage to supply information to models used to make water resource decisions.

Justification

The report of the Independent Fact Finder in *Washington's Water Future* states:

> Parties that regularly deal with Washington's water administration consistently expressed the need for better data regarding water supplies.

The Water Resource Data Needs Survey identified surface water quantity data as critical to their functions. Failure to acquire improved surface water quantity data results in ineffective water resource planning and management decisions.

Several State laws were reported in the Water Resource Data Needs Survey as justifications for improved streamflow data. Laws cited were:

- 1917 Water Code
- Growth Management Act
- Shorelines Management Act
- State Environmental Protection Act
- Title 87 RCW: Irrigation
- Water Resources Act of 1971
- Water Pollution Control

11

Activity 11.1. Develop Streamflow Study Bibliography

A comprehensive directory of existing streamflow studies is not available. Lack of knowledge about existing studies results in limited use of those data and in the unintentional collection of redundant data. Existing streamflow studies need to be identified and documented so the information in those studies are readily available to water resource managers.

Recommendation

Develop a statewide bibliography of streamflow studies that includes the organization performing the study, the source of data, dates and times, specific locations, methods used, purpose of measurement, and any other useful information. Use the Standard Surface Water Identification and Location System to identify surface water involved in each study. Identify

and map the site locations to provide a comprehensive view of streamflow measurements. Include the bibliography in the Water Resource Studies Clearing House and the *Water Resource Data Source Book.*

Benefits

A streamflow bibliography will facilitate coordination of streamflow studies, greatly reduce the time required to research streamflow studies, and promote maximum utilization of funding. This activity enhances the Water Resource Studies Clearing House with streamflow studies. Not developing the bibliography will result in duplication of research and restricted data sharing.

Dependencies

This activity is dependent on completion of activities:

8.1. Implement Standard Surface Water Identification and Location System

Activity 11.2. Collect Streamflow Data

Streamflow data do not support decision-making with the level of statistical confidence desired because only large streams have been adequately studied. Statistical confidence is critical when high costs or risks are associated with water resource management decisions. A system is needed to collect additional streamflow data in areas that have critical water resource management issues.

Recommendation

Identify areas where additional streamflow measurements are needed. Determine the most cost effective level of streamflow monitoring necessary to provide a baseline for managing water quantity. Review surveys of existing water quantity data in the *Water Resource Data Source Book.* Identify locations for additional flow monitoring sites crucial to establishing a baseline for water quantity management. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Develop a plan to implement water quantity baseline monitoring.

Benefits

A plan to implement baseline streamflow monitoring is the most efficient way to acquire additional streamflow data. Streamflow data were identified in the Water Resource Data Needs Survey as one of the most critical areas for additional data. Adequate streamflow data provide statistical confidence to support water resource management, capital investment, and high risk decisions. These data facilitate modeling of water quality/use interactions, streamflow/instream resource relationships, and interactions between surface and ground waters. An inadequate picture of stream flow will continue without this activity.

Dependencies

This activity is dependent on the completion of activity:

8.1. Implement Standard Surface Water Identification and Location System.

Activity 11.3. Collect Climate Data

Climate data are not available for many watersheds and estimates are used for analysis and modeling. These estimates may not have sufficient basis to adequately support decision making. Additional climate data need to be collected for watersheds that have critical water resource management issues.

Recommendation

Review existing climate data in the *Water Resource Data Source Book*. Identify watersheds where additional climate data are needed and determine the types of climatic data needed. Identify the locations for collecting additional climatic data. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Determine the most cost effective way to acquire those data. Develop a strategic plan to implement the acquisition of additional climatic data. Develop a procedure for integrating climatic data and streamflow data.

Benefits

A strategic plan to acquire climate data is the most efficient way to meet data needs. Climate data were identified in the Water Resource Data Needs Survey as one of the most critical areas in which data were needed. Adequate climate data will provide statistical confidence to support water resource management, capital investment, and high risk decisions. These data facilitate modeling of water quality/water use interactions, streamflow/instream resource relationships, and interactions between surface and ground waters. An inadequate picture of climate data will continue without this activity.

Dependencies

This activity depends on completion of activity:

8.1. Implement Standard Surface Water Identification and Location System.

Activity 11.4. Promote Standard Field Methods

There are many different methods for collecting water quantity data and field personnel often use these methods inconsistently. A set of standard field methods need to be defined and field personnel need to be trained in consistent use of the methods.

Recommendation

Develop standard methods for collecting surface water quantity data. Review existing procedures and methods available, including data collection requirements of permits issued and grant and loan programs sponsored by State and Federal agencies. Develop a plan to promote the use of standard methods and train field personnel in the consistent use of those methods. Identify the training costs required and the sequence for implementing standard methods and training field personnel. Distribute the standard methods to all organizations collecting surface water quantity data.

Benefits

Designating standard methods for collecting surface water quantity data and training field personnel to use those methods consistently will improve the accuracy of surface water data collection and recording. Not designating standard methods and training field personnel results in continued uncertainties in surface water quantity data and severely impacts water resource management decisions and the development of water resource models.

Dependencies

This activity is not dependent on completion of any other activity.

Project 12. Develop Improved Water Allocation Data

Data about the quantity of water allocated through water rights, water right claims, Federal reserved rights, exempt use, and State reserved water are necessary for assessing water availability, making water allocation decisions, and determining risks when contamination is discovered. Comprehensive water allocation information is currently unavailable. Water rights data require extensive manual analyses to be of value for specific geographic areas and specific water bodies. They do not identify the precise locations of water use, diversion, or withdrawals, and are not always current and accurate. Water right claim data are incomplete, unverified, and of questionable quality. Federal reserved rights and exempt use data are unavailable.

Lack of accessible and accurate water allocation data results in unnecessary expenditures by State agencies, local agencies, and other organizations to estimate unquantified allocations. In some cases, actual water allocation quantities can not be calculated or reasonably estimated, resulting in uncertainties about water availability.

This project contains activities for developing a comprehensive water allocation system, enhancing water allocation data, evaluating water right claims, evaluating Federal reserved rights, quantifying critical exempt ground water allocations, and integrating water rights with current land ownership. This project is part of the Data Library Stage. This Stage contains activities for collecting and organizing data by subject area, including ground water, surface water, water quality, water quantity, water use, and water allocation. Additional data will be identified and collected during this Stage to supply information to models used to make water resource decisions.

Justification

A 1991 survey showed that 22% of calls to the Department of Ecology's Regional Offices were requests for water right data. A report from the Independent Fact Finder in *Washington's Water Future* stated that water rights data are inadequate and not sufficiently accessible. The Water Resource Data Needs Survey showed that water right data were critical to water resource management activities. Several State laws were reported in the Water Resource Data Needs Survey as justifications for needing improved water allocation data. Laws cited were:

- 1917 Water Code
- Boundaries and Plats
- Growth Management Act
- State Lands Act
- State Environmental Policy Act
- Title 54 RCW: Public Utility Districts
- Title 87 RCW: Irrigation
- Water Resources Act of 1971
- Water Pollution Control

The Department of Ecology must process water right applications in a timely and judicious manner. The Department must determine if water is available and if issuance of a new water right will not impair existing water rights. A comprehensive Water Allocation System is necessary to process water right applications in a timely and judicious manner.

Activity 12.1. Develop Water Allocation System

The current Water Right Information System (WRIS) does not provide the data required for today's water resource decisions. Data retrieval is not flexible and many important water allocation data are not available. The system is written in an obsolete computer language that few programmers understand, making any modifications expensive and difficult to accomplish. A new system is needed to provide complete, current, and accurate data for better water resource decisions.

Recommendation

Design a comprehensive, integrated Water Allocation System based on the Water Resource Common Data Architecture and data currently contained in the Water Right Information System (WRIS). Include other water allocation data such as water right claims. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Design the System to provide tabular, spatial, and image data. Develop and implement the Water Allocation System.

Benefits

Development of a Water Allocation System significantly improves the processing of water right applications and making more timely water allocation decisions. It speeds the process of identifying and locating existing water allocations and assists identification of water right protection measures necessary during periods of critical water shortages. It allows integration of water allocation data with other water resource data through the Standard Surface Water Identification and Location Systems and Unique Well Identification and Location Systems. It provides data for developing water resource models. Not developing the Water Allocation System severely impacts the integration of water resource data and increases the risk of making inaccurate water allocation decisions.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
8.1. Implement Standard Surface Water Identification and Location System.

Activity 12.2. Enhance Water Allocation Data

Data in the current Water Rights Information System (WRIS) are incomplete. When these data are moved to the new Water Allocation System they will still be incomplete. Additional data need to be entered into the new Water Allocation System.

Recommendation

Verify the accuracy of data transferred from the Water Rights Inventory System to the new Water Allocation System. Identify additional data needed to enhance the Water Allocation System. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Develop a plan to acquire or collect those data and add them to the Water Allocation System. The plan should include a sequence of acquisition or collection based on the need for data in areas with critical water resource management issues.

Benefits

Enhancing the Water Allocation System with additional data and verifying existing data provide water resource managers with higher quality data for making water allocation decisions. It significantly improves the usefulness of the data and increases productivity. Not verifying and enhancing data in the Water Allocation System increases the risk of over allocating water and causing severe impacts on the State's water resource. Without a new Water Allocation System, water reuse, restoration of streamflows and instream resources, coordination of public water supplies, conservation and growth management issues will be difficult to resolve.

Dependencies

This activity is dependent on completion of activity:

12.1. Develop Water Allocation System

Activity 12.3. Evaluate Water Right Claims

Claims filed under the Water Right Claims Registration Act (RCW 90.14) have not been evaluated for validity or accuracy. Claim reporting forms did not require all the data needed for proper management. The claims need to be evaluated for validity and accuracy, and additional data need to be collected.

Recommendation

Evaluate water right claims and collect additional data in the Methow and the Dungeness/Quilcene pilot areas. Establish procedures for making water right claims determinations based on experience from the pilot areas and other efforts, such as the Yakima Adjudication. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Develop Water Quality/Water Use Relationships. Develop a plan to apply those procedures to other water right claims throughout the State.

Benefits

Evaluating the validity and accuracy of water right claims provides additional information on water allocations. Water availability decisions will be made more efficiently and with greater confidence. It improves the understanding of water allocation decisions in areas that have critical water resource issues. Not evaluating water right claims increases the risk of improperly allocating water resources and creating adverse impacts on the State's water resource.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
8.1. Implement Standard Surface Water Identification and Location System
12.1. Develop Water Allocation System

Activity 12.4. Evaluate Federal Reserved Rights

A complete inventory of the Federal reserved rights in the State does not exist and the quantity of water used or reserved is not known. All water allocations, including Federal reserved rights, must be known to adequately manage the State's water resource. Federal reserved rights need to be identified and their quantities evaluated.

Recommendation

Identify and document all Federal reserved rights in the State and the stakeholders. Establish a committee of stakeholders and water resource analysts to identify the criteria for evaluating Federal reserved rights. Evaluate the Federal reserved rights according to the established criteria. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships.

Benefits

Evaluation of Federal reserved rights allows water resource managers to make decisions about water allocations in areas where Federal reserved rights exist. Not evaluating Federal reserved rights increases the risk of over allocating water resources in areas where Federal reserved rights exist.

Dependencies

This activity is dependent on completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
8.1. Implement Standard Surface Water Identification and Location System
12.1. Develop Water Allocation System

Activity 12.5. Quantify Critical Exempt Ground Water Allocations

Some ground water withdrawals are exempt from applying for a permit to the State. Very little is known about these withdrawals because of the exemption. These withdrawals may amount to significant quantities of water. Their quantification may be essential in areas where ground water management is critical.

Recommendation

Identify geographic areas where exempt ground water withdrawal is critical to water resource allocation. Develop a plan to collect or estimate ground water withdrawals in these areas. Determine and accommodate the data needs of Activities 13.1, Model Streamflow/Instream Resource Relationships, 14.1, Model Surface Water/Ground Water Interactions, and 15.1, Model Water Use/Water Quality Relationships. Conduct an outreach program to educate local government and citizen groups about the collection or estimation of ground water withdrawals. Solicit support from these organizations to assist with estimation or collection of ground water withdrawal data.

Benefits

All significant ground water withdrawals must be considered in establishing water resource policy and making water allocation decisions. Quantifying exempt ground water use in areas where there are critical water resource management issues is essential to proper management of ground water resources. Not collecting or estimating exempt ground water withdrawals increases the risk of over allocating ground water resources and causing severe impacts on the quantity and quality of the State's water resource.

Dependencies

This activity is dependent on the completion of activities:

4.b.1. Implement Unique Well Identification System
4.b.2. Implement Well Location Data System
12.1. Develop Water Allocation System

Activity 12.6. Identify Water Rights with Current Land Ownership

The existing Water Rights Inventory System (WRIS) does not track the division or aggregation of land parcels, or the current owner of a land parcel. There is no easy way to identify current owners of land parcels that have water rights. A method needs to be developed to identify current land parcel owners for proper management of water rights.

Recommendation

Identify data needed about land parcel division and aggregation, and owners of land parcels. Develop a method to relate water right data maintained by the Department of Ecology with the land parcel data maintained by County Assessors. Develop a plan, with the cooperation of county assessors, to implement the method in areas that are critical to the management of water rights.

Benefits

Developing a relationship between water rights data and land parcel data makes it possible to notify current water right owners of hazards and water use restrictions. It prevents redundant data collection and provides a timely means to relate a water right to current ownership of the associated property. Response to public requests for water right information associated with a specific land parcel will be improved. Not developing this relationship continues a system where water rights and land ownership cannot be connected in a timely fashion.

Dependencies

This activity is dependent on the completion of activity:

12.1. Develop Water Allocation System

Relationships Stage

Project 13. Develop Streamflow/Instream Resource Relationships

Instream resource variation with streamflow can be measured to provide input data for models of these relationships. Instream/streamflow relationships vary for different fish and wildlife species, recreational activities, and water allocations. Existing studies provide some of the relationships, but the detailed relationships for all situations are not well understood. A model needs to be developed that contains relationships for a wide variety of situations.

This project supports modeling of the relationships between streamflows and instream resources. This project is part of the Relationships Stage. This Stage includes activities quantifying water resource relationships, such as those between streamflow and instream resources, surface water and ground water, and water quality and water quantity. These relationships are developed from data contained in the Water Resource Data Library and will be used to develop or further develop comprehensive water resource management models.

Justification

Streamflow/instream resource relationships allow determination of the quantity of water needed to protect instream resources such as fisheries and wildlife resources, recreational activities, and aesthetics. They also provide a mechanism to evaluate impacts of water allocation on instream resources. Without an understanding of the relationships between streamflow and instream resources, it is difficult to evaluate the impacts of water allocations, determine surplus water for allocation, or accurately establish minimum streamflow protection levels.

Activity 13.1. Model Streamflow/Instream Resource Relationships

The relationships between streamflows and instream resources are not well understood. Relationships between different, often competing, instream water uses and streamflows are widely debated and inconclusive. A model of the relationships between streamflow and instream resources is needed to better understand the relationships.

Recommendation

Analyze existing streamflow/instream resource relationships and identify additional studies needed to better understand the relationships. Develop models of the relationships between streamflow and instream resources in a variety of different situations. Develop a plan for pilot testing models, and developing additional models to better understand the relationships between streamflow and instream resources. Make the models available to water resource managers.

Benefits

Developing models of relationships between streamflow and instream resources provides a mechanism to evaluate alternatives for water resource management and identifies the benefits and impacts of each alternative. It provides a base for more appropriate water allocation decisions and water allocation policy. It provides a higher level of certainty for water resource management decisions. Not developing these models increases the risk of making inappropriate water resource decisions and severely impacting instream resources.

Dependencies

This activity is dependent on completion of projects:

9. Develop Improved Water Quality Data
10. Develop Improved Water Use Data
11. Develop Improved Surface Water Quantity Data
12. Develop Improved Water Allocation Data

Project 14. Develop Surface Water/Ground Water Interactions

Surface water and ground water are constantly interacting in a relationship known as hydraulic continuity. This interaction requires that surface water and ground water be managed together rather than as separate water resources. However, the interaction is not well understood and it is difficult to quantify the impacts of ground water withdrawals on surface water. There is increased uncertainty as new ground water withdrawals are allocated. The interaction between surface water and ground water needs to be modeled so the relationships can be better understood.

This project supports the application of modeling to hydraulic continuity between surface water and ground water. This project is part of the Relationships Stage. This Stage includes activities quantifying water resource relationships, such as those between streamflow and instream resources, surface water and ground water, and water quality and water quantity. These relationships are developed from data contained in the Water Resource Data Library and will be used to develop or further develop comprehensive water resource management models.

Justification

A report by the Independent Fact Finder in *Washington's Water Future,* stated that:

> In particular, more information is needed on ground water, including its relationship to surface flows, to make important allocation decisions.

Information on the interaction of ground water and surface water facilitates timely, cost effective estimation of the impacts of water use on the surface water and ground water resource. It provides information to help water resource managers better manage the State's water resource.

Activity 14.1. Model Surface Water/Ground Water Interactions

The interactions between surface water and ground water are not well understood. Existing studies provide some information on the interactions, but considerable information is still needed to adequately manage the water resource to prevent severe impacts. A greater emphasis on modeling is required to show the interactions between surface water and ground water.

Recommendation

Analyze existing ground water/surface water interactions and identify additional studies needed to better understand the interactions. Support the application of existing, enhanced and newly developed models of the interactions between surface water and ground water, including time factors and the movement of water between surface water and aquifers in different geologic settings. Make the models available to water resource managers.

Benefits

Modeling the interactions between surface water and ground water facilitates better protection of the State's water resource. Models provide a mechanism to analyze alternative water allocation policies and determine the best allocation policy to protect the State's water resource. Not developing surface water/ground water interaction models increases the risk of severe impact to both surface water and ground water resources through over allocation and inappropriate use.

Dependencies

This activity is dependent on completion of projects:

7. Develop Improved Ground Water Data
10. Develop Improved Water Use Data
11. Develop Improved Surface Water Quantity Data
12. Develop Improved Water Allocation Data

Project 15. Develop Water Quality/Water Use Relationships

The relationships between water use and water quality are not well understood. Water uses could be allocated in a manner that would severely impact water quality. Fisheries habitats and potable water supplies could be severely impacted. A model of the relationships between water use and water quality is needed to better understand the interactions between water use and water quality.

This project supports modeling of water use/water quality relationships to better understand the interaction between water use and water quality. This project is part of the Relationships Stage. This Stage includes activities quantifying water resource relationships, such as those between streamflow and instream resources, surface water and ground water, and water quality and water quantity. These relationships are developed from data contained in the Water Resource Data Library and will be used to develop or further develop comprehensive water resource management models.

Justification

The relationships between water use and water quality show how existing water quality varies with water use. Establishing these relationships provides the base for determining potential water uses while protecting instream resources and downgradient or downstream use. These relationships help identify the tradeoffs among various uses of the same water and potential cumulative effects of downgradient and downstream water uses.

Developing water use/water quality relationships results in better water allocation policy. It also increases water resource manager's ability to evaluate impacts of water diversion on the aquatic system, on instream resources, and on downgradient or downstream uses.

Activity 15.1. Model Water Use/Water Quality Relationships

Relationships between water use and water quality are not well understood. Sewer outfall/upstream diversion, agricultural return flows/downstream water quality and instream use/potable water supplies are examples of water use/quality relationships. Relationships between water use and water quality need to be modeled to better understand water resource dynamics.

Recommendation

Analyze existing information and begin modeling water use/water quality relationships. Identify additional relationships needed to better understand interactions between water use and water quality. Prepare a plan for developing water use/water quality models and making those models available to water resource managers.

Benefits

Developing water use/water quality models increases understanding of the relationships between water use and water quality. The models provide a base for preparing water allocation policy, analyzing water quality, and adopting appropriate land use practices. They assist water resource managers in identifying alternative uses of water and impacts on water quality. They also allow water resource managers to make more informed decisions. Not developing water use/water quality models increases the risk of inappropriate water uses and water quality degradation.

Dependencies

This activity is dependent on completion of projects:

9. Develop Improved Water Quality Data
10. Develop Improved Water Use Data
11. Develop Improved Surface Water Quantity Data
12. Develop Improved Water Allocation Data

Dependencies

Project Dependencies

Many of the projects in this *Five-Year Plan* are dependent on the completion of other projects. A Project Dependency Chart is shown in Figure 3.

- Project 1 establishes a *Five-Year Plan* that is updated every two years. Projects 2, 3, 5, and 6 are Framework Projects that provide a foundation for the entire Water Resource Data Management Program.
- Project 2 establishes a Water Resource Common Data Architecture that encompasses all water resource data.
- Project 3 provides standard procedures for conducting detailed inventories of water resource data needs and data availability within the Architecture.
- Project 5 facilitates data sharing efforts within the Architecture.
- Project 6 provides a Clearing House for all water resource related activities.

The Framework Stage also includes Subprojects 4.a, 4.b, 7.a, 7.b, and Project 8 which provide basic identification and location schemes for describing and managing the State's water resources. These identification projects support the collection, management, and use of all water resource data.

- Subproject 4.a provides a standard identification and location system for all surface water.
- Subproject 4.b provides standard identification and location systems for all wells.

Subprojects 7.a, 7.b, and Project 8 implement Subprojects 4.a and 4.b and support the Data Collection and Library Projects.

- Subproject 7.a consolidates and automates the well construction reports.
- Subproject 7.b maps and characterizes aquifers.
- Project 8 provides an atlas of surface water in the State based on the Standard Identification and Location System for Surface Water.

Subproject 7.c and Projects 9, 10, 11, and 12 are Data Collection and Library Projects that are dependent on the Framework Projects.

- Subproject 7.c provides improved ground water data.
- Project 9 provides improved water quality data.
- Project 10 provides improved water use data.
- Project 11 provides improved surface water quantity data.
- Project 12 provides improved water allocation data.

Projects 13, 14, and 15 are Relationship Projects that develop water resource relationships prior to building comprehensive water resource models. They are dependent on the Data Collection and Library Projects to provide the data to develop comprehensive models.

- Project 13 provides streamflow/instream resource relationships.
- Project 14 provides surface water/ground water relationships.
- Project 15 provides water quality/water use relationships.

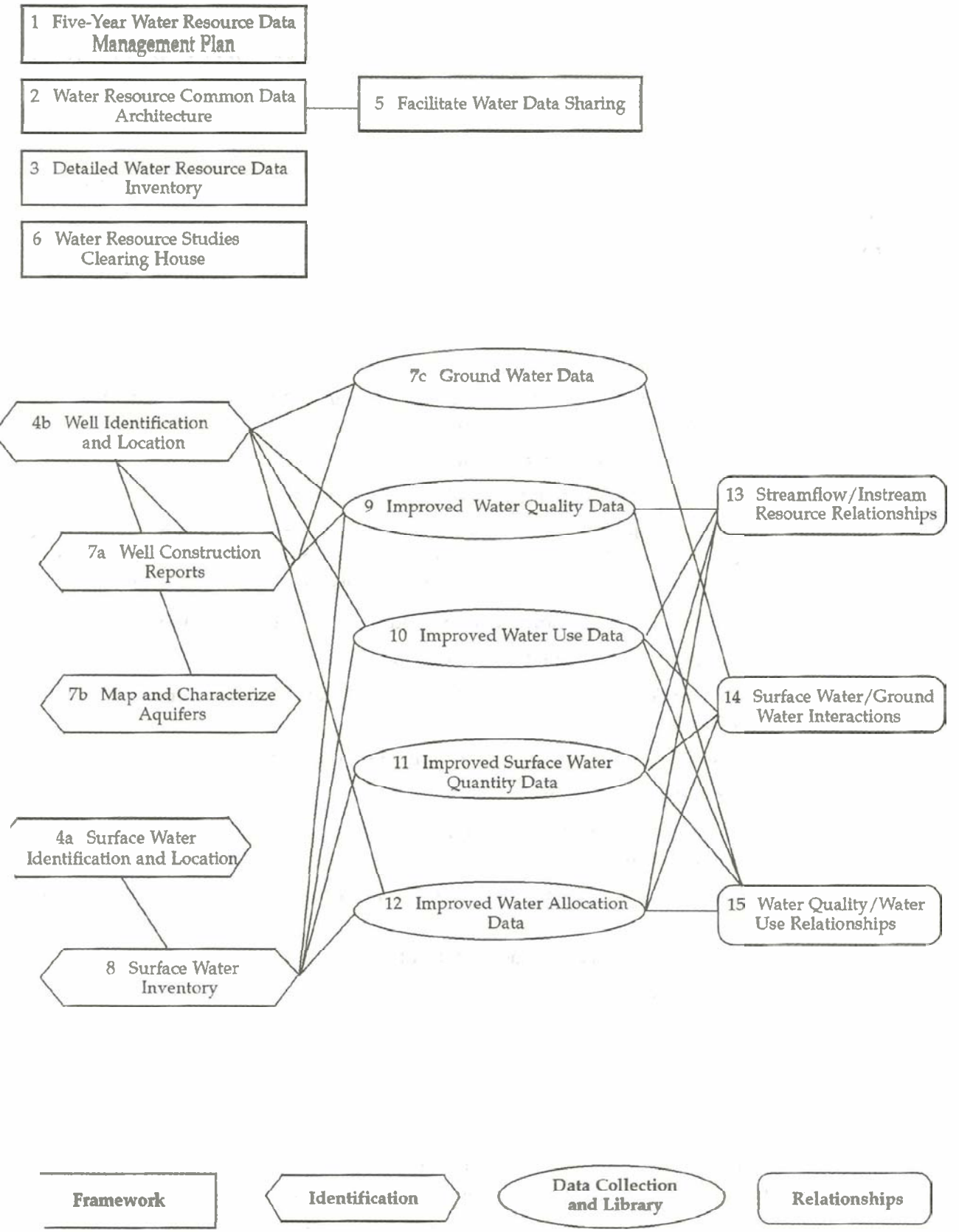

Figure 3. Project Dependency Chart

Project Duration and Cost

Table 1 shows a summary of estimated costs by projects. The remainder of the $1.5 million appropriated for the current biennium will be used to continue Projects 2, 3, 4, 6, and Subproject 7.a. These projects provide the framework and identification systems. Project 12, to improve water allocation data, is also being started because of need and complexity. This project requires a large database design effort.

Fiscal Years 1994 and 1995 concentrate on the data needs and data sharing activities with Projects 5, 8, 9, 10, and 11, and phased implementation of Project 12. Projects 5, 8, 9, 10, and 11 do not have large database development activities because existing systems may be modified to meet the needs. In addition, dollars for collection of new data will be necessary for meeting the Data Resource Management Vision.

Fiscal Years 1996 and 1997 continue integration of existing data and collection of new data, and full implementation of Project 12.

Projects 13, 14, and 15 are not scheduled to be formally begun until after Fiscal Years 1996 and 1997. Data collection efforts to support these modeling efforts will begin in Fiscal Years 1993 through 1996.

Table 2 shows more detailed cost estimates by activity. Staff are shown in full time equivalents (FTE). Costs are shown by salary and benefits, contracts, equipment, and travel.

Tables 3 and 4 show estimated durations for projects and activities, respectively. The times shown presume funding is provided as requested in the *Five-Year Plan*.

Table 1. Five-Year Budget Projection by Project

PROJECT	FISCAL YEAR				
	1993	1994	1995	1996	1997
1 Develop Five-Year Water Resource Data Plan	$ 29,950	$ 6,650	$ 13,300	$ 6,650	$13,300
2 Develop Water Resource Common Data Architecture	76,900	106,650	6,650	6,650	6,650
3 Develop Detailed Water Resource Data Inventory	25,000				
4 Develop Standard Water ID & Location Systems	229,700	114,850	103,200	53,200	53,200
5 Facilitate Water Data Sharing		84,900	26,600	50,000	50,000
6 Develop Water Resource Studies Clearing House	43,300	113,300	6,650	13,300	6,650
7 Develop Improved Ground Water Data	74,900	211,450	347,300	396,300	396,300
8 Develop Surface Water Inventory		316,500	316,500	816,500	816,500
9 Develop Improved Water Quality Data	6,650	216,500	166,500	316,500	316,500
10 Develop Improved Water Use Data	49,900	116,500	66,500	341,500	166,500
11 Develop Improved Surface Water Quantity Data		225,000	225,000	525,000	500,000
12 Develop Improved Water Allocation Data	129,700	589,200	512,300	875,900	172,900
13 Model Streamflow/Instream Resource Relationships*					
14 Model Surface Water/Ground Water Interactions*					
15 Model Water Use/Water Quality Relationships*					
Fiscal Year Totals	**$666,000**	**$2,101,500**	**$1,790,500**	**$3,401,500**	**$2,498,500**
Biennial Totals			**$3,892,000**		**$5,900,000**
GRAND TOTAL					**$10,458,000**

*Although no funds are listed to begin modeling efforts, data collection under other projects will be anticipating the data needs of these projects.

Table 2. Five-Year Budget Projection by Activity

Project	Activity	Fiscal Year 1993					Fiscal Year 1994				
		A	B	C	D	E	A	B	C	D	E
Develop Five-Year Water Resource Data Plan	1										
Review the Five-Year Plan	1.1	0.1	$ 6,650	$5,000							
Produce Data Management Annual Reports	1.2	0.2	13,300	5,000			0.1	$ 6,650			
Develop Water Resource Common Data Architecture	2	0.1	6,650								
Maintain Water Resource Common Data Architecture	2.1	0.3	19,950	25,000			0.1	6,650			
Designate Common Data Architecture Repository	2.2	0.1	6,650		$12,000					$100,000	
Continue Enhancement of Water Resource Glossary	2.3	0.1	6,650								
Develop Detailed Water Resource Data Inventory	3			25,000							
Continue Data Availability Survey	3.1										
Develop Data Needs Procedure	3.2										
Develop Data Availability Procedure	3.3										
Develop Standard Water ID & Location System	4	0.1	6,650								
Develop Standard Surface Water ID & Location	4.a										
Identify Standard Water ID & Location System	4.a.1	0.7	46,550								
Evaluate Standard Water ID & Location System	4.a.2	0.3	19,950	75,000							
Develop Unique Well ID & Location Systems	4.b										
Implement Unique Well ID System	4.b.1	0.2	13,300		25,000	$10,000	0.3	19,950	25,000	10,000	
Implement Well Location Data System	4.b.2	0.3	19,950				0.4	26,600		20.000	
Include Well Identifiers in Databases	4.b.3	0.2	13,300				0.2	13,300			
Facilitate Water Data Sharing	5						0.1	6,650			
Enhance Data Source Book	5.1								10,000		
Develop Electronic Data Guide	5.2									25,000	
Implement Communication & Training Strategy	5.3						0.4	26,600			
Develop Statewide Electronic Communications	5.4										
Review Open Records Legislation	5.5						0.1	6,650	10,000		
Develop Water Resource Studies Clearing House	6										
Determine Clearing House Feasibility	6.1	0.1	6,650								
Pilot Test Clearing House	6.2	0.1	6,650	30,000							
Implement Water Resource Studies Clearing House	6.3						0.2	13,300	100,000		
Develop Improved Ground Water Data	7	0.1	6,650								
Consolidate & Automate Well Construction Reports	7.a										
Conduct Well Construction Report Feasibility Study	7.a.1	0.1	6,650				0.1	6,650			
Develop Well Construction Report System	7.a.2	0.1	6,650	10,000							
Pilot Test Well Construction Report System	7.a.3	0.2	13,300	25,000							
Implement Well Construction Report System	7.a.4						1.0	66,500		15,000	10,000
Map and Characterize Aquifers	7.b										
Conduct Aquifer Mapping Feasibility Study	7.b.1										
Pilot Test Aquifer Mapping & Characterization System	7.b.2										
Implement Aquifer Mapping & Characterization System	7.b.3										
Ground Water Data Collection and Sharing	7.c	0.1	6,650								
Conduct Ground Water Data Inventory	7.c.1						0.2	13,300			
Implement Ground Water Data Integration and Sharing	7.c.2										
Implement Ground Water Data Collection	7.c.3								100,000		

A = FTEs
B = Salaries and Benefits
C = Contracts
D = Equipment
E = Travel

Fiscal Year 1995					Fiscal Year 1996					Fiscal Year 1997					General Comments
A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	
0.1 0.1	$ 6,650 6,650				0.1	$ 6,650				0.1 0.1	$ 6,650 6,650				FY 93 Contracts are for Printing
0.1	6,650				0.1	6,650				0.1	6,650				
															Ongoing
0.3 0.4 0.1	19,950 26,600 6,650	20,000	10,000 20,000		0.3 0.4 0.1	19,950 26,600 6,650				0.3 0.4 0.1	19,950 26,600 6,650				Ongoing
0.4	26,600						50,000					50,000			DIS to dev & imp in 95-97
0.1	6,650				0.2	13,300				0.1	6,650				
0.2	13,300	25,000			0.2	13,300				0.2	13,300				Ongoing
1.0 1.0	66,500 66,500		76,000		2.0	133,000				2.0	133,000				Ongoing
		100,000					250,000					250,000			Ongoing

A = FTEs
B = Salaries and Benefits
C = Contracts
D = Equipment
E = Travel

Table 2. Five-Year Budget Projection by Activity (continued)

Project	Activity	Fiscal Year 1993 A	Fiscal Year 1993 B	Fiscal Year 1993 C	Fiscal Year 1993 D	Fiscal Year 1993 E	Fiscal Year 1994 A	Fiscal Year 1994 B	Fiscal Year 1994 C	Fiscal Year 1994 D	Fiscal Year 1994 E
Develop Surface Water Inventory	8										
Implement Standard Surface Water ID & Location Sys	8.1						1.0	$66,500	$250,000		
Cross Reference Surface Water Identifiers	8.2										
Develop Improved Water Quality Data	9	0.1	$ 6,650								
Develop Water Quality Data Collection and Sharing	9.1						1.0	66,500			
Identify Water Quality Studies	9.2								50,000		
Develop Ambient Water Quality Monitoring Plan	9.3								100,000		
Develop Improved Water Use Data	10	0.2	13,300	10,000			0.5	33,250			
Design Water Use Data Collection System	10.1	0.1	6,650								
Standarize Water Use Reporting	10.2	0.3	19,950				0.1	6,650			
Develop Estimation Method for Non-Reported Use	10.3						0.1	6,650	50,000		
Pilot Test Water Use Data Collection System	10.4						0.3	19,950			
Coordinate Instream Use Criteria	10.5										
Map Public Water Supply Service Areas	10.6										
Develop Improved Surface Water Quantity Data	11										
Develop Streamflow Study Bibliography	11.1										
Collect Streamflow Data	11.2								100,000		
Collect Climate Data	11.3								100,000		
Promote Standard Field Methods	11.4								25,000		
Develop Improved Water Allocation Data	12	1.8	119,700	10,000			0.3	19,950			
Develop Water Allocation System	12.1						4.5	299,250	70,000	200,000	
Enhance Water Allocation Data	12.2										
Evaluate Water Right Claims	12.3										
Evaluate Federal Reserved Rights	12.4										
Quantify Critical Exempt Ground Water Allocations	12.5										
Identify Water Rights with Current Land Ownership	12.6										
Model Streamflow/Instream Resource Relationships*	13										
Model Surface Water/Ground Water Interactions*	14										
Model Water Use/Water Quality Relationships*	15										
Object Totals		6.0	$399,000	$220,000	$37,000	$10,000	11.0	$731,500	$990,000	$370,000	$ 10,000
Fiscal Year Totals						$666,000					$2,101,500
Biennial Totals											
GRAND TOTAL											

A = FTEs
B = Salaries and Benefits
C = Contracts
D = Equipment
E = Travel

*Although no funds are listed to begin modeling efforts, data collection under other projects will be anticipating the data needs of these projects. In later years, approximately $2,000,000 will be needed for model development in each project—Projects 13, 14, and 15.

Fiscal Year 1995					Fiscal Year 1996					Fiscal Year 1997					General Comments
A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	
0.5	$33,250	$250,000			0.5	$33,250	$750,000			0.5	$33,250	$750,000			
0.5	33,250				0.5	33,250				0.5	33,250				
1.0	66,500				1.0	66,500				1.0	66,500				
		100,000					250,000					250,000			
1.0	66,500				1.0	66,500				1.0	66,500				
							100,000								
							75,000								
							100,000					100,000			
		25,000					25,000								
		100,000					250,000					250,000			Ongoing
		100,000					250,000					250,000			Ongoing
5.0	332,500	50,000						703,000							
1.0	66,500				2.0	133,000				2.0	133,000				FY96-7 0.5 FTE/ Region
					0.2	13,300				0.2	13,300				
0.2	13,300	50,000			0.2	13,300				0.2	13,300				
					0.2	13,300				0.2	13,300				Ongoing
13.0	$864,500	$820,000	$106,000	$0	9.0	$598,500	$2,100,000	$703,000	$0	9.0	$598,500	$1,900,000	$0	$0	
				$1,790,500					$3,401,500					$2,498,500	
				$3,892,000										$5,900,000	
														$10,458,000	

A = FTEs
B = Salaries and Benefits
C = Contracts
D = Equipment
E = Travel

Table 3. Five-Year Time Line by Project

	PROJECT	FISCAL YEAR				
		1993	1994	1995	1996	1997
1	Develop Five-Year Water Resource Data Plan					
2	Develop Water Resource Common Data Architecture					
3	Develop Detailed Water Resource Data Inventory					
4	Develop Standard Water ID & Location Systems					
5	Facilitate Water Data Sharing					
6	Develop Water Resource Studies Clearing House					
7	Develop Improved Ground Water Data					
8	Develop Surface Water Inventory					
9	Develop Improved Water Quality Data					
10	Develop Improved Water Use Data					
11	Develop Improved Surface Water Quantity Data					
12	Develop Improved Water Allocation Data					
13	Model Streamflow/Instream Resource Relationships*					
14	Model Surface Water/Ground Water Interactions*					
15	Model Water Use/Water Quality Relationships*					

*Although funds are not listed to begin modeling efforts, data collection under other projects will be anticipating data needs of these projects.

Table 4. Five-Year Time Line by Activitty

Project	Activity	Fiscal Year				
		1993	1994	1995	1996	1997
Develop Five-Year Water Resource Data Plan	1					
Review the Five-Year Plan	1.1					
Produce Data Management Annual Reports	1.2					
Develop Water Resource Common Data Architecture	2					
Maintain Water Resource Common Data Architecture	2.1					
Designate Common Data Architecture Repository	2.2					
Continue Enhancement of Water Resource Glossary	2.3					
Develop Detailed Water Resource Data Inventory	3					
Continue Data Availability Survey	3.1					
Develop Data Needs Procedure	3.2					
Develop Data Availability Procedure	3.3					
Develop Standard Water ID & Location System	4					
Develop Standard Surface Water ID & Location	4.a					
Identify Standard Water ID & Location System	4.a.1					
Evaluate Standard Water ID & Location System	4.a.2					
Develop Unique Well ID & Location Systems	4.b					
Implement Unique Well ID System	4.b.1					
Implement Well Location Data System	4.b.2					
Include Well Identifiers in Databases	4.b.3					
Facilitate Water Data Sharing	5					
Enhance Data Source Book	5.1					
Develop Electronic Data Guide	5.2					
Implement Communication & Training Strategy	5.3					
Develop Statewide Electronic Communications	5.4					
Review Open Records Legislation	5.5					
Develop Water Resource Studies Clearing House	6					
Determine Clearing House Feasibility	6.1					
Pilot Test Clearing House	6.2					
Implement Water Resource Studies Clearing House	6.3					
Develop Improved Ground Water Data	7					
Consolidate & Automate Well Construction Reports	7.a					
Conduct Well Construction Report Feasibility Study	7.a.1					
Develop Well Construction Report System	7.a.2					
Pilot Test Well Construction Report System	7.a.3					
Implement Well Construction Report System	7.a.4					
Map and Characterize Aquifers	7.b					
Conduct Aquifer Mapping Feasibility Study	7.b.1					
Pilot Test Aquifer Mapping & Characterization System	7.b.2					
Implement Aquifer Mapping & Characterization System	7.b.3					
Ground Water Data Collection and Sharing	7.c					
Conduct Ground Water Data Inventory	7.c.1					
Implement Ground Water Data Integration and Sharing	7.c.2					
Implement Ground Water Data Collection	7.c.3					

Table 4. Five-Year Time Line by Activitty (continued)

Project	Activity	Fiscal Year				
		1993	1994	1995	1996	1997
Develop Surface Water Inventory	8					
Implement Standard Surface Water ID & Location Sys	8.1					
Cross Reference Surface Water Identifiers	8.2					
Develop Improved Water Quality Data	9					
Develop Water Quality Data Collection and Sharing	9.1					
Identify Water Quality Studies	9.2					
Develop Ambient Water Quality Monitoring Plan	9.3					
Develop Improved Water Use Data	10					
Design Water Use Data Collection System	10.1					
Standardize Water Use Reporting	10.2					
Develop Estimation Method for Non-Reported Use	10.3					
Pilot Test Water Use Data Collection System	10.4					
Coordinate Instream Use Criteria	10.5					
Map Public Water Supply Service Areas	10.6					
Develop Improved Surface Water Quantity Data	11					
Develop Streamflow Study Bibliography	11.1					
Collect Streamflow Data	11.2					
Collect Climate Data	11.3					
Promote Standard Field Methods	11.4					
Develop Improved Water Allocation Data	12					
Develop Water Allocation System	12.1					
Enhance Water Allocation Data	12.2					
Evaluate Water Right Claims	12.3					
Evaluate Federal Reserved Rights	12.4					
Quantify Critical Exempt Ground Water Allocations	12.5					
Identify Water Rights with Current Land Ownership	12.6					
Model Streamflow/Instream Resource Relationships*	13					
Model Surface Water/Ground Water Interactions*	14					
Model Water Use/Water Quality Relationships*	15					

*Although no funds are listed to begin modeling efforts, data collection under other projects will be anticipating the data needs of these projects.

Glossary

Activity – As used in the *Five-Year Plan*, the name and number of a project activity, a description of the current situation or problem, and an explanation of progress that has been made to date.

Adjudication – A legal proceeding, conducted through the Superior Court, to determine the validity, priority and extent of existing water rights in a given area.

Altimeter – An apparatus for determining elevation.

Architecture – The strategic framework that guides the development and acquisition of information technology and resources.

Aquifer – Hydraulically interconnected, recognizable or mappable, saturated geologic materials (rock or sediment) that are sufficiently conductive to provide a usable supply of water to a well or spring and that are hydraulically distinctive from surrounding geologic materials. Aquifers are distinguished by a combination of hydraulic properties, geologic character, hydraulic boundaries, hydraulic head, and water quality.

Basin – The area into which the adjacent land drains. For surface water this is typically the area drained by a river and its tributaries. A basin includes the ground water that interacts with surface water. *See also Watershed.*

Beneficial Use – Beneficial use shall include but not be limited to, use for domestic water, irrigation, fish, shellfish, game and other aquatic life, municipal, recreation, industrial water, generation of electric power, and navigation. (RCW 90.14.031)

Benefits – As used in the *Five-Year-Plan,* an explanation of how the activity helps achieve the Water Resource Data Management Vision, how it provides incrementally cost effective benefits, how it achieves integration of water resource data, and the risk or impact if the activity is not done.

Data – Individual pieces of information.

Database – A collection of data designed to be used by a variety of clients.

Data Characteristic – A logical data element with definition but no physical parameters. A data characteristic is also called an attribute.

Data Element – Basic unit of information that cannot be further subdivided.

Data Subject – An entity representing a group of attributes describing a data subject of a transaction. A data subject is also called a data entity.

Dependencies – As used in the *Five-Year Plan,* an explanation of preceding or integrated activities. Dependent activities are not included.

Diversion – 1) The taking of water from a stream or other body of water into a canal, pipe or other conduit. 2) The physical structure for the removal of water from a stream channel.

Ecology – The Washington State Department of Ecology; responsible for implementing many environmental protection laws and for administering water rights issuance and compliance.

Elevation – The vertical distance above or below a reference surface. In the United States this reference surface is the National Geodetic Vertical Datum of 1929, which approximated mean sea level.

Exempt Water Use – Certain ground water withdrawals are exempt from State permitting requirements. Included are stock watering, watering a lawn or noncommercial garden not exceeding ½ acre, single or group domestic uses not exceeding 5,000 gallons per day, and industrial use not exceeding 5,000 gallons per day.

Feasibility Study – A feasibility study, as used in the *Five-Year Plan*, defines a project at the tactical level. It includes setting the scope of the project, and the specific activities and timeline to accomplish the project. It identifies costs, risks, and benefits.

Gaging (Gauging) Station – A particular site on a stream, lake, or reservoir where systematic observations of flow or volume are collected.

Geographic Information Systems (GIS) – An integrated database containing information about georeferenced spatial objects (points, lines, and areas) and information (attributes) regarding use of these objects. The essential components of a GIS are its georeferenced database, personnel, graphics-based software and hardware.

Ground Water – All waters that exist beneath the land surface or beneath the bed of any stream, lake, or reservoir, or other body of surface water within the boundaries of Washington State, whatever may be the geological formation or structure in which such water stands or flows, percolates or otherwise moves. (RCW 90.44.035)

Ground Water Basin – General term used to define a ground water flow system that has defined boundaries and may include more than one aquifer. A basin includes both the surface watershed and the permeable materials beneath it. A ground water basin is separated from adjacent basins by hydrologic boundaries sometimes formed by geologic materials or structures.

Ground Water Model – A simplified conceptual or mathematical image of a ground water system, describing the features essential to the purpose for which the model was developed and including various assumptions pertinent to the system. Mathematical ground water models can include numerical and analytical models.

Hydraulic Continuity – The natural interconnection of ground water and surface water.

Image Data – Data that are captured as images and stored in an imaging system. Image data are non-tabular data.

Information Resource Management – A formal discipline for managing data to produce information that is retained as knowledge.

Instream – Within the natural stream channel.

Instream Resources – Resources, values, or activities, such as fish or other organisms, navigation, recreation, hydropower, and water quality, which require water in the stream channel.

Instream Values – Defined by law as fish, wildlife, recreation, aesthetics, navigation, water quality, and other environmental values subject to protection through establishment of regulations such as minimum instream flows and water quality standards.

Inwater – A generic version of "instream," this term refers to values, resources, etc., in streams, and in lakes, swamps, marine and other water bodies.

Justification – As used in the *Five-Year Plan*, an explanation of why the project is needed, such as high priority from the Water Resource Data Needs Survey, predecessor to a high priority project, etc. It includes references to major organizational strategies and Federal or State law

Location System – Specific geographic locations on, below, or above the surface of the earth. Latitude-longitude, Universal Transverse Mercator, State Plane Coordinates, and Public Land Survey are some of the systems used for specifying geographic location.

Minimum Instream Flow – Streamflows established by administrative rule for the purpose of protecting and preserving instream values. When adopted by rule, these flows constitute an appropriation of water with a priority date of the effective date of their adoption.

Model – An accurate simulation, by means of description, statistical data, or analogy, of a thing or process that cannot be observed directly or that is difficult to observe directly. Models may be derived by various methods, *e.g.* by computer, from stereoscopic photographs.

Non-tabular Data – Non-tabular data are data that are not of a tabular nature, such as voice data, image data, textual data, and geographic information data. Non-tabular data are modeled and designed the same as tabular data.

Project – As used in the *Five-Year Plan*, the name and number of the project from the *Preliminary Findings and Recommendations* and a brief description of the general situation or problem. It also can include a statement of the needs and a description of the priority for the project according to the Water Resource Data Needs Survey. Several large projects contain subprojects.

Potable Water – Water that is suitable for human consumption.

Public Water Supply System – Any system or water supply intended or used for human consumption or other domestic use, where water is furnished to any community, collection, or number of individuals, or is made available to the public for human consumption or domestic use, but excluding a water system serving one single family residence. In Ecology: 1) Municipal Supply - water system operated by a city or town, public utility district, water company, etc. 2) Community Domestic - domestic supply for 10 or more services 3) Group or Multiple Domestic - domestic supply for two to nine connections, motels, restaurants, etc. 4) Single Domestic - one single family residence.

Recommendation – As used in the *Five-Year Plan*, a description of the actions or tasks necessary to accomplish the activity.

Spatial Data – Spatial data are one form of non-tabular data and commonly appear in geographic information systems.

Stakeholder – Any individual or group of individuals with a vested interest in the outcome of a decision process.

Streamflow – The rate at which water passes a given point in a stream or river, usually expressed in cubic feet per second (CFS).

Surface Water – 1) An open body of water such as a stream, lake, marsh, glacier, wetland, pond, irrigation ditch, or ocean, at or on the land surface. 2) Water flowing in a stream or present in a lake, pond, marsh, estuary, etc.

Tabular Data – Tabular data are data that can be placed in a table, or exist as tables. They do not include data such as voice, textual, image, or geographic information data.

Water Allocation – Legal processes whereby water use is authorized or reserved for the future. Examples include State issue of water rights, creation of vested rights, establishment of exempt water rights, and Federally reserved rights.

Water Right – A legal right to obtain water from a specific source for application to beneficial use.

Water Supply System – The system for collection, treatment, storage, and distribution of potable water from the sources of supply to the consumer.

Water Use – The removal of water from a source for a purpose. In addition to the purpose for removing the water, water use information can include water quality and quantity infor- mation, user name and address, removal and conveyance information, location of removal site, and any other information that describes the water from the time it is removed until it returns to a natural source.

Watershed – The area drained by a river and its tributaries. Used interchangeably with river basin or stream basin.

Well – Any excavation that is drilled, cored, bored, washed, driven, dug, jetted, or otherwise constructed when the intended use of the excavation is for the location, diversion, artificial recharge, or withdrawal of ground water. Well includes water supply wells and resource protection wells.

Well Construction Report – Standard reports submitted by well drillers specifying the geologic characteristics encountered during drilling and well construction details. Well construction record refers to the Water Well Report or Resource Protection Well Report required by the State of Washington. (Chapter 18.104 RCW)