REVIEW OF THE WATER RESOURCES INFORMATION SYSTEM OF ARGENTINA

By Norman E. Hutchison

U.S. GEOLOGICAL SURVEY

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DEPARTMENT OF THE INTERIOR

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REVIEW OF THE WATER RESOURCES INFORMATION SYSTEM OF ARGENTINA

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ABSTRACT

In November 1986, a representative of the U.S. Geological Survey attended the First Inter-American Biennial Meeting on Water Resources Information Systems in Buenos Aires, Argentina, and met with personnel of the Argentine Government Center for Water Resources Information (CIH) on water information systems and data bank implementation. The visit was sponsored by the United Nations, Department of Technical Cooperation and Development, and financed by the Inter-American Development Bank.

A minicomputer had been purchased by the CIH about 2 years before for the purpose of developing a water resources data base and application system. Since then, some software has been written by CIH personnel to manage inventory (index) data and water-quality data. Inventory data includes information about availability of water data at various sites, periods of record, and types of data available, as well as other index data. Additional hardware and software have been ordered to upgrade the existing computer and to acquire four microcomputers, statistical and data base management software, and network hardware and software for linking the computers. The new hardware and software are scheduled to be delivered early in the 1987 calendar year. The CIH plans to develop a nationwide distributed data base that will include the major regional offices as nodes.

Several needs for continued development and application of the water resources information system are identified in the report. These include: 1) conducting a requirements analysis to define the contents of the data base and insure that all user requirements are met, 2) preparing a plan for the development, implementation, and operation of the data base, and 3) developing a conceptual design to inform all development personnel and users of the basic functionality planned for the system. A quality assurance and configuration management program also would be desirable to provide oversight to the development process.

INTRODUCTION

Purpose and Scope

A representative of the U.S. Geological Survey travelled to Buenos Aires, Argentina, on November 8-9, 1986, to attend the First Inter-American Biennial Meeting on Water Resources Information Systems during the week of November 10-14, 1986. During the following week, the Survey representative, hereafter referred to as the author of this report, consulted with the Center for Water Resources Information (Centro de Informatica Hidrica) (CIH) in the Instituto Nacional de Ciencia y Tecnica Hidricas (INCYTH) on water-information systems and data-bank implementation. The INCYTH plans to implement a nationwide water-information system. The author's visit was sponsored by the United Nations, Department of Technical Cooperation and Development, through the United Nations Development Program, Project Number ARG-150-3-002-35, and financed by the Inter-American Development Bank. This report presents a summary of the author's visit to INCYTH and of a review of the development of the water resources information system for Argentina.

Meeting

During the first week of the visit, the First Inter-American Biennial Meeting on Water Resources Information Systems was held. At the invitation of Marcos Elinger, Director, CIH, the author made presentations about the redesign of the National Water Data Storage and Retrieval System (WATSTORE) and National Water Data Exchange (NAWDEX) systems of the U.S. Geological Survey to form the new National Water Information System (NWIS). The NWIS will be a national, distributed water data system that will integrate and replace the existing hydrologic, indexing, and bibliographic data systems of the Survey. The Monday session was an overview of the NWIS design, and the Tuesday session was a more technical presentation. The agenda of the meeting is listed in Appendix A. Appendix B is a list of speakers (expertos) and attendees (participantes) at the meeting. Sixty-six persons from 12 countries attended the meeting as speakers or attendees.

Visit to the Instituto Nacional de Ciencia y Tecnica Hidricas

During the second week of the visit, the author visited with Marcos Elinger, Director, CIH, and his staff to review the CIH Water Information System. Staff members Mr. Federico Scuka and Ms. Mirtha Schusterman were interviewed on the CIH Inventory Data Base and other planned activities, and on the CIH Water Quality Data Base. Messrs. Vitesnik, Fernandez, Aguilela, and Diaz in the Centro de Hidrologia Aplicada were interviewed about their needs for a water information system to support their applications.

WATER RESOURCES INFORMATION SYSTEM STATUS AND FUTURE PLANS

General

A Digital Equipment Corporation (DEC)[1/] VAX-11/780 minicomputer was delivered to INCYTH about 2 years ago. Since then, some software has been written by INCYTH personnel to manage inventory (index) data and water-quality data. Hardware and software have been ordered to upgrade the VAX-11/780, and to acquire four microcomputers, statistical and data base software, and network hardware and software. The new hardware and software are scheduled to be delivered in February 1987. The CIH plans to develop a distributed water-resources data base, on a national network, after the INCYTH regional offices have installed the microcomputers.

Hardware

The present VAX-11/780 minicomputer has two megabytes (MB) of random access memory, two disk controllers, four 256-MB disks, three magnetic tape drives, and two printers. Equipment on order will upgrade the VAX to 32 MB of memory, and provide network hardware, four Tektronix 4125 graphic workstations, and four MicroVAX microcomputers to be installed in three Regional Centers at Mendoza, Cordoba, and Sante Fe. Three of the MicroVAX systems will have 9 MB of memory and one will have 5 MB. The MicroVAX's are 32-bit microcomputers. Fourteen portable Compaq 286, 16-bit, microcomputers are also being acquired to provide access to the network for field research units. The VAX-11/780 and the four MicroVAX systems will be linked by a land line network that uses the X.25 telecommunication protocol. The Buenos Aires (Ezeize) and Mendoza offices will also have local area networks (LAN's) that use the Ethernet protocol, which will be linked by the X.25 network.

Software

The present VAX-11/780 runs the DEC operating system called Virtual Memory Storage (VMS). Other software available includes Record Management System (RMS), ISML (a statistical package), Datatrieve (data storage and retrieval system), and compilers for the Fortran 77, Cobol, C, Basic, and Pasqual programming languages. Software to be delivered in February 1987 includes an interface with the local X.25 communications network (ARPAC), Digital Equipment Corporation LAN (DECnet), PLOT 10/GKS (graphics software), and relational data base management system (RDB).

1/ Use of brand and trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

Inventory Data Base

An Inventory Data Base which will eventually contain information for 5,000 hydrologic sites has been developed. Edit, update, and retrieval software have been written. The system is written in Cobol programming language and uses RMS for records management. The retrieval procedures appear to be well designed and easy to use. The system cannot retrieve individual sites, probably because there is no standard for site identification numbers. When data for 5,000 sites has been entered into the system, there will be a requirement for 3 MB of disk storage. The 3 MB's of storage does not include space for future files listed below. The data base includes a site file, agency file, variables file, region file, site type file, and an accounting file. Future plans are to complete files for water levels, provinces, basins, and body-of-water descriptions. There was not sufficient time to have file descriptions translated during the visit, and so they are not presented in this report. Federico Scuka, CIH staff, did the analysis and programming for the Inventory Data Base. Figure 1 is a diagram showing the various files and their relations for the Inventory Data Base.

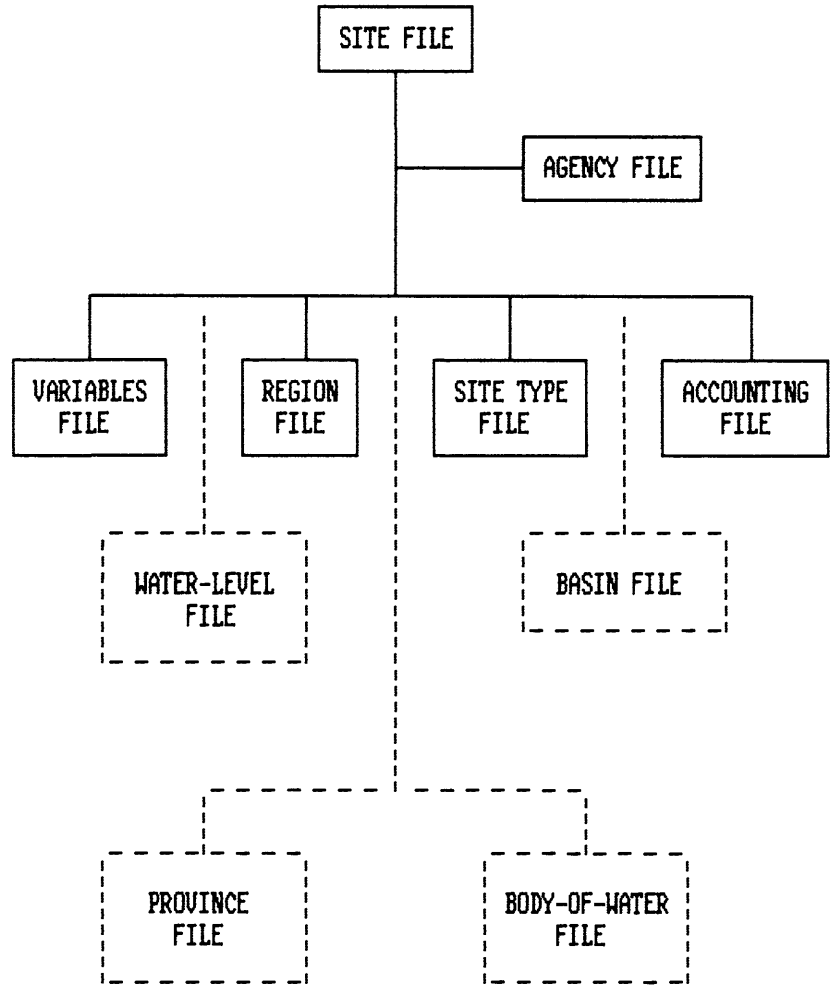
Water-Quality Data Base

A Water-Quality Data Base that now contains data for 20 sites has been developed, but will eventually contain data for 500 sites. Edit, update, retrieval, and some basic statistics and graphics software have been written. The system is written in the Cobol programming language, and also uses RMS for records management. The system used by the Canadian Inland Waterways Directorate was used as the basic design for the Argentina data base system.

The system will require 15 MB of disk storage when 500 records are entered into the system. The data base includes a site file, dictionary file, text file, and data (analysis) file. Support files include units, agency, variables, and parameter value standards files. Data are identified in the data base by a 5-character parameter code structured to identify class, subclass, and chemical technique. Updating and retrieval can be done in interactive and batch mode. A record in the data file contains data for one parameter. Mirtha Schusterman, CIH staff, did the development work on the Water Quality Data Base. Figure 2 is a diagram of the files and their relations in the Water-Quality Data Base.

Organization

The organizational structure in which the Center for Water Resource Information (CIH) is located is shown in figure 3. All of the major centers for INCYTH are shown in figure 3 for information. The lower-level organization of the CIH is also shown.



EXPLANATION:

EXISTING FILES

PLANNED FILES

Figure 1. Schematic diagram of existing inventory data base.

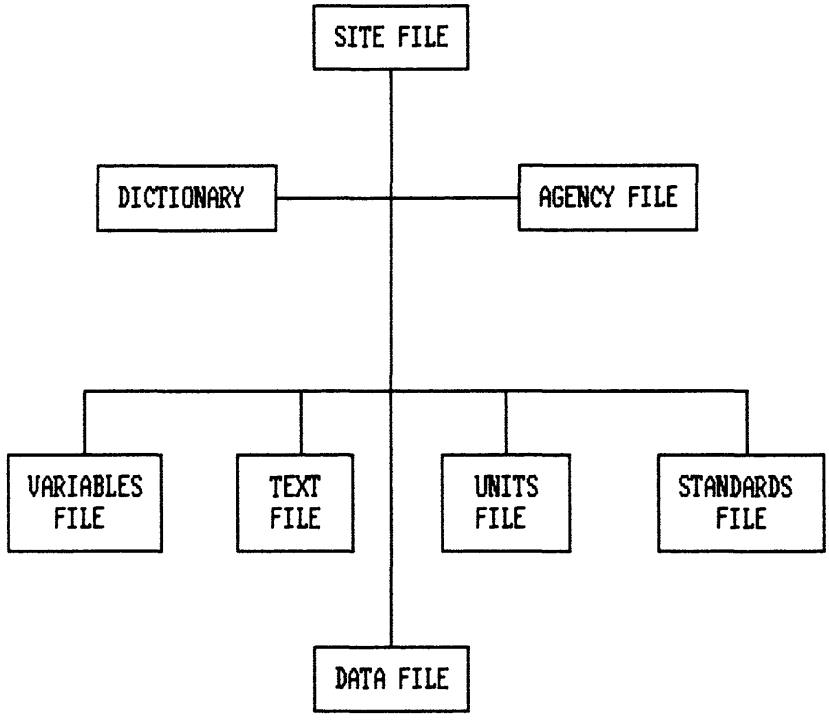


Figure 2. Schematic diagram of water-quality data base

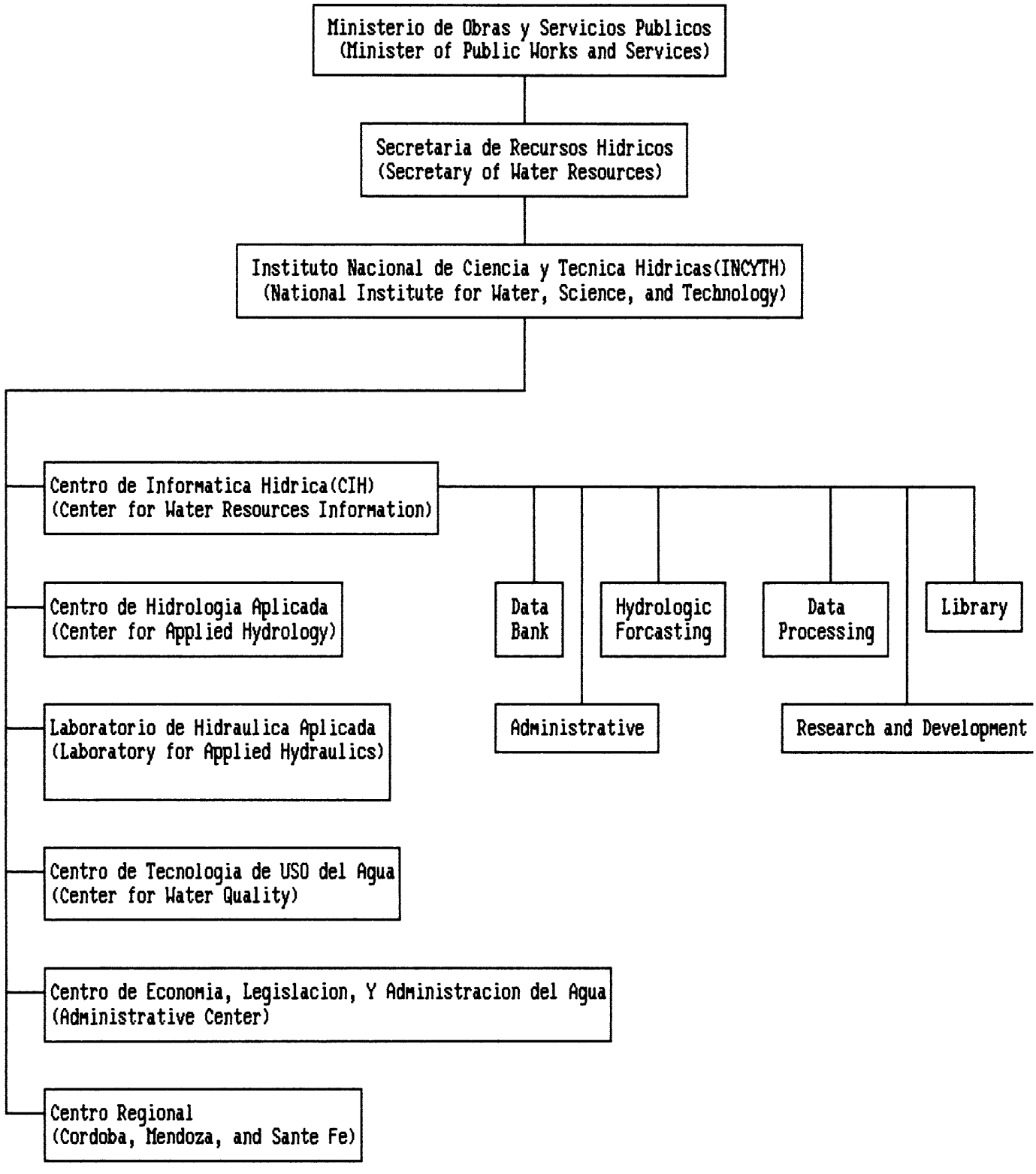


Figure 3. Schematic diagram of organizational location and structure of the Center for Water Resources Information(CIH)

Other Technical Support

Several CIH staff members have received training in the United States and Spain on various software packages and information systems. An analysis of the number and capabilities of CIH personnel for systems analysis, design, and programming was not made during the visit, but needs to be done before much outside assistance is obtained. Capability exists in the CIH to do some of this work, but an anticipated problem will be in diverting personnel from present tasks.

John Uppgren, recent Massachusettes Institute of Technology, Cambridge, Massachusettes, (M.I.T.) graduate, has assisted in reviewing hardware and network requirements. Juan B. Valdes, Universidad Simon Bolivar, Caracas, Venezuela, and Rodolfo Soncini-Sessa, Politecnico di Milano, Italy, have provided assistance in river flow forecasting. Adrian Araya Marin, Universidad de Costa Rica, has provided support for the library (text) file.

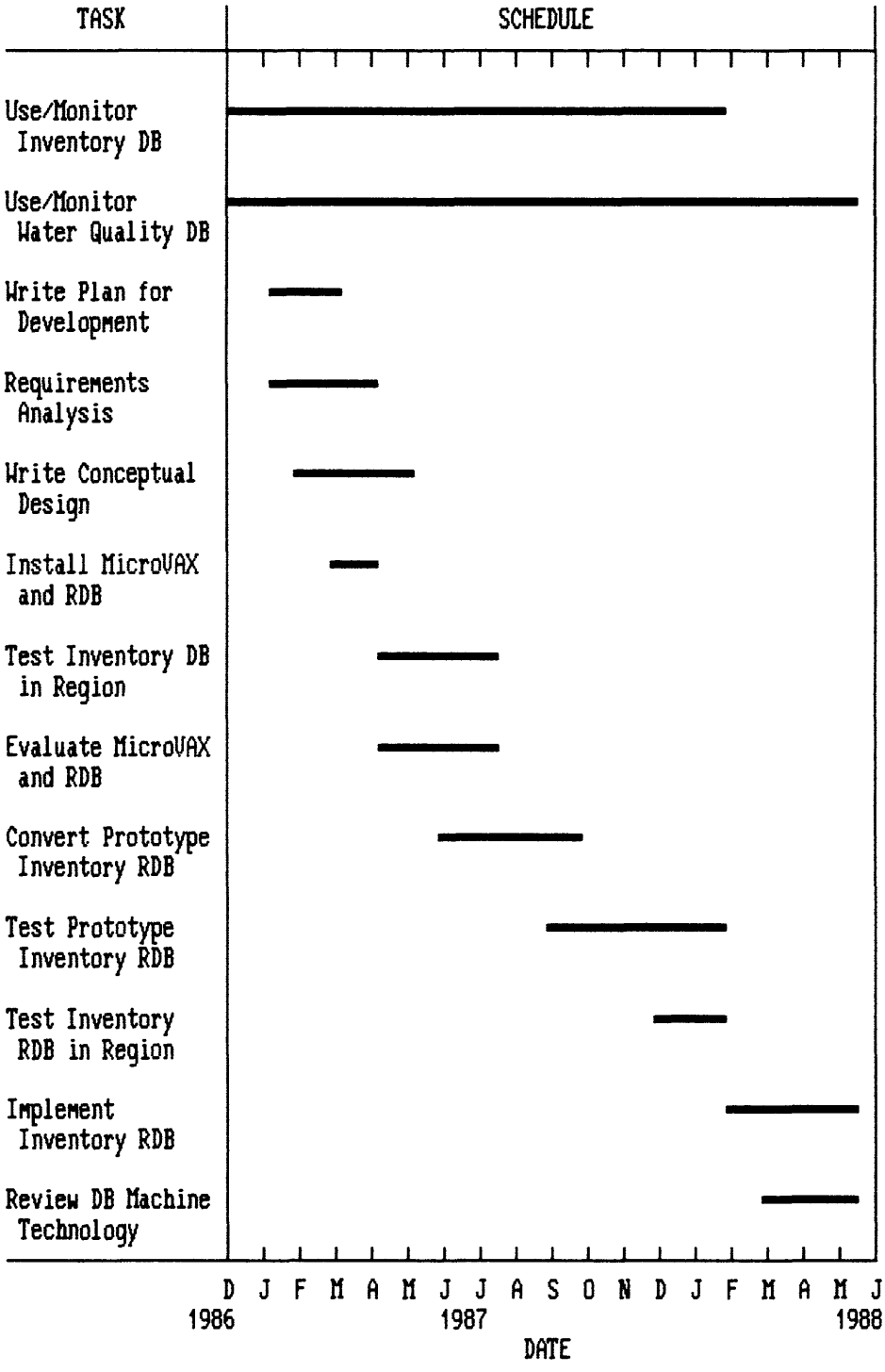
NEED FOR WATER INFORMATION SYSTEM DEVELOPMENT AND APPLICATION

General

Short-term and long-term needs are identified below for each of the areas discussed above. These needs refer to the data base application only and would have to be added to requirements from other areas, such as support for the laboratories and modeling. The short-term period generally refers to 6 months or less from the present. The objective of the development effort is to develop an integrated data base to eliminate duplicate information and to improve access to all types of data. In general, the identified needs include preparing a Requirements Analysis; Conceptual Design Document; and a Plan for the Design, Development, Implementation, and Operation of the Water Resources Information System in the near future to guide the evolution of the system. A requirements analysis will identify user's and their requirements, and also the content of the data base. Figure 4 is a diagram showing the principal tasks identified and an estimated schedule in which they could be accomplished.

Development Procedures

Development of an integrated data base is a complex and lengthy process. It can also be very costly. One way to minimize costs is to use inhouse (within INCYTH) personnel to the extent possible, and to only use outside assistance where needed, such as for overall planning and system integration, or for special technical areas, such as data base management systems or networking. Use of inhouse personnel, however, facilitates user acceptance of the system.



DB = Data Base
RDB = Relational Data Base

Figure 4. Schedule of principal tasks for data base development

Application prototyping is an iterative approach to system design and development and is desirable for development of the integrated data base. Prototyping involves partitioning the data base into small functional components for development and testing. The advantages associated with application prototyping include: (1) the ability to partition the data base into components that have the highest priority for development, (2) design and development efforts can be scaled to fit available resources, (3) early feedback from users on their interaction with the system.

A quality assurance and configuration management (QA/CM) program is also needed to monitor development of the data base. QA/CM consists of planned reviews for software and documentation and planned testing of software by personnel not involved in the development of the software or documentation. Test plans and test data bases are prepared and made available to test teams at various stages of development.

Hardware

Short-term need: Install and use the four MicroVAX's, the additional memory, and the network hardware presently on order.

Long-term need: Hardware usage needs to be monitored and evaluated periodically to determine when the system is becoming loaded and may require additional hardware. Monitoring usage will also identify areas where additional hardware could improve performance or add functionality. Additional microcomputer work stations and data base machines for data management may be considered in 1 to 2 years. The cost of microcomputers is likely to continue to decrease and may be the most cost-effective way to add resources as the VAX becomes loaded. The present cost of a minimum data base machine configuration to manage 70-80 MB of data with three work stations is about $75,000, and this cost may be coming down. A data base machine commercially available that operates in the VAX environment is being evaluated by the U.S. Geological Survey for the National Water Information System.

Software and Data Base

Short-term need: Install the RDB and network software needed to access ARPAC. Continue to use the Inventory Data Base and Water-Quality Data Base for 6 months to 1 year. After the MicroVAX's have been installed in the regional offices, select at least one of those offices to install the Inventory Data Base to gain experience with the network and the MicroVAX itself and to get input from the Region on data base and user requirements. The RDB needs to be evaluated after it is installed. Other tasks include reviewing content of the data base, developing conceptual design, preparing overall plan to guide development of the system, and organizing inventory data for conversion to a prototype RDB. It would be desirable for the Inventory Data Base to be converted to RDB first because it contains the highest level data in the data base and represents a top-down development approach.

Long-term need: Monitor the operation and use of the Inventory and Water-Quality Data Bases to help define requirements for further development. Continue conversion of the Inventory Data Base to RDB prototype and monitor periodically. Test the Inventory/RDB version in at least one regional office. Review literature for data base management hardware and, in a year, review the Geological Survey experience in testing data base machines and microcomputers in a distributed environment. The addition of a unique-site identifier for data management would minimize the problems of data identification, storage, and retrieval. The ultimate long-term objective for data base development is an integrated data base that contains all types of water data. Because a completely integrated data base requires the cooperation of many organizational entities in INCYTH, a development period of 5 to 7 years would be reasonable, based upon the NWIS experience. Figure 5 illustrates the structure of a potential integrated data base.

Organization

A Data Base Administrator is needed to direct development and operation of the data base. The functions of development and operation can be managed by two different persons (groups) under the supervision of the Data Base Administrator. A separate function of quality assurance and configuration management (QA/CM) can be identified and located in either the Office of the President of INCYTH or the Director of CIH. The organizational location of the QA/CM function will depend on the scope and range of users to be accommodated by the data base. This function could be performed by a board appointed by and reporting to the President of INCYTH or the Director of CIH. The QA/CM board should be independent of the development staff. It would be desirable for the board to be composed of 3 to 5 persons with knowledge of the data and software applications in general. Figure 6 illustrates a potential organization scheme for data base activities.

Continuing Technical Support

The INCYTH desires to establish a technical assistance program with the U.S. Geological Survey to assist in the development of the water-data index, hydrologic data bases, and data acquisition technology in general. The format of this assistance would include visits to Argentina by Survey personnel with experience in these areas of expertise, and the training of INCYTH personnel at appropriate Survey sites in the United States. Continuing assistance for data base development is needed; other alternatives for Survey and private consultant involvement could be explored. In many ways, the Survey's NWIS Project could be used as a model for development of the integrated data base. The NWIS is a much larger project and is a redesign of existing systems rather than an initial system design and development. However, many similar and parallel tasks remain, such as evaluation of data base management software and hardware, and INCYTH could benefit from these studies. Further assistance to INCYTH by experts from government or commercial organizations in hardware, systems software, and network implementations would be desirable.

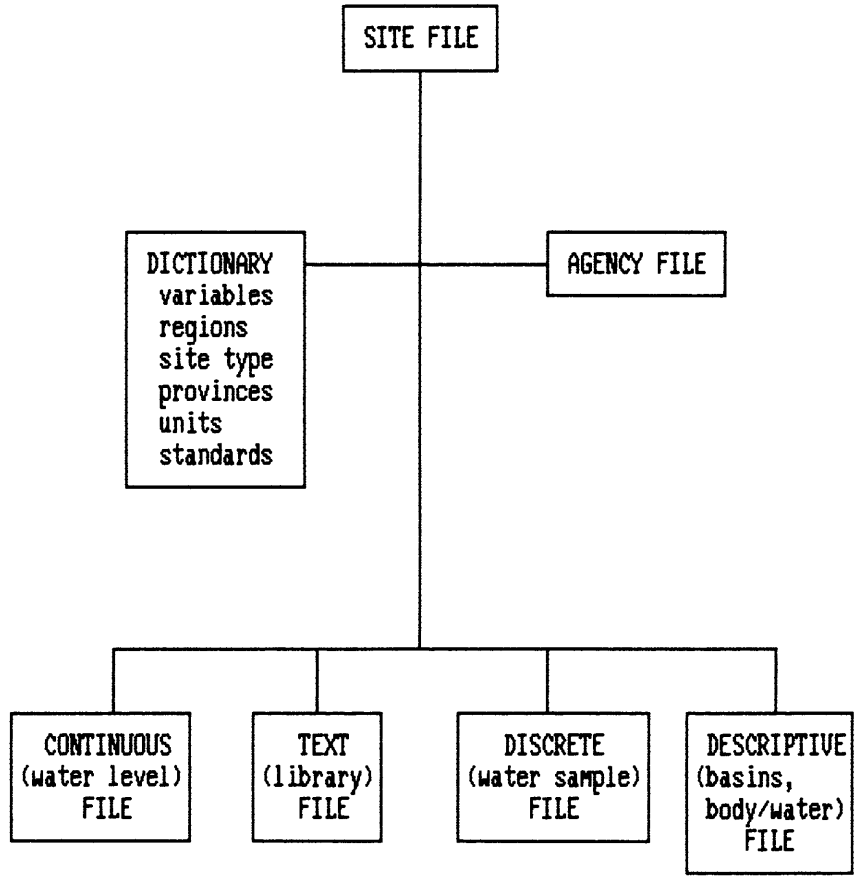


Figure 5. Schematic diagram of integrated water resources data base

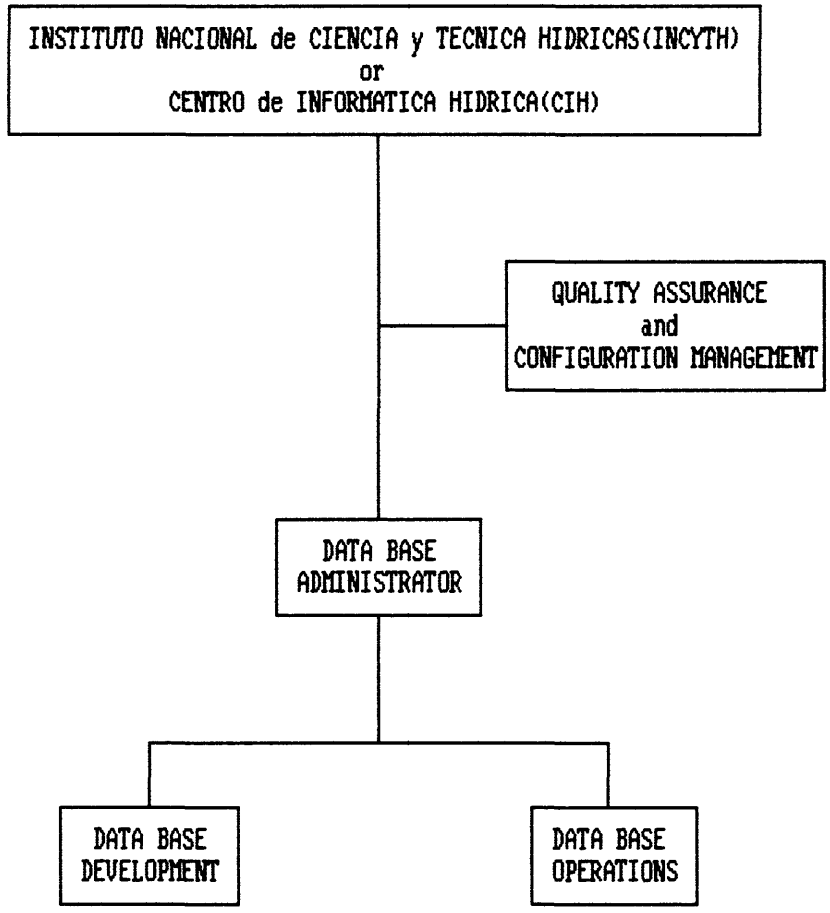


Figure 6. Schematic diagram of organization for data base activities

SUMMARY

The Inventory Data Base and Water-Quality Data Base, as initiated by the CIH are good starting points for developing an integrated data base for use in Argentina. It is useful to build small systems (prototypes) to help define requirements and to provide personnel experience in constructing larger data base systems. The acquisition of additional hardware and software to support initial efforts in building a distributed data system in Argentina appears to be proceeding well. A review of needs for continuing the development of the water resources information system for Argentina was made. The most important of these include: (1) completing a requirements analysis to define the contents of the data base and insure that all user requirements are met, (2) preparing a plan for the development, implementation, and operation of the data base, and (3) preparing a conceptual design so that all development personnel and users know the proposed functionality of the system. It is also important to include a quality assurance and configuration management program in the plans to provide oversight to the development process. These documents do not need to be very lengthy initially, but will need to be updated periodically as requirements change and more details become known. Planning early in the development cycle will help ensure delivery of a system to meet most of the user's requirements.

ACKNOWLEDGMENTS

All personnel contacted in the INCYTH were very helpful in providing information. Marcos Elinger, Director, CIH, provided an office with a computer terminal, and information on the present system and plans for the future. Federico Scuka answered many questions on the Inventory Data Base and translated discussions with other personnel. Mirtha Schusterman furnished information on the Water-Quality Data Base with Graciela Molinari assisting as an interpreter. Messrs. Vitesnik, Fernandez, Aquilela, and Diaz discussed their hydrologic projects in the Centro de Hidrologia Applicada and potential use of an integrated hydrologic data base. Per Bro, Departmento General de Irrigation, Mendoza, was helpful in discussing his needs for access to a hydrologic data base in the Regional Office in Mendoza. John Uppgren graciously guided the author to several business locations in Buenos Aires, and provided background information on the computer and network acquisition activity.

SELECTED REFERENCES

Edwards, M.D. and others, 1986, Conceptual design for the National Water Information System: U.S. Geological Survey Open-File Report 86-604.

Edler, Audrey, 1986, The National Water Information System logical relational data model: McLean, Virginia, Mitre Corporation Technical Report MTR-85W94.

Buys, Ruth T., 1984, Quality assurance and configuration management procedures for the development and operation of the National Water Information System: McLean, Virginia, Mitre Corporation Technical Report MTR-84W118-01.

Hutchison, N.E., Compiler, 1975, WATSTORE User's Guide, Volume 1, Instructions for station header file and daily values file: U.S. Geological Survey Open-File Report 75-426.

DeMoyo, A., and Hunt, E., 1975, Naquadat users manual: Ottawa, Canada, Inland Water Directorate.

APPENDIX A

AGENDA FOR THE FIRST INTER-AMERICAN BIENNIAL MEETING ON WATER RESOURCES INFORMATION SYSTEMS

AGENDA FOR THE FIRST INTER-AMERICAN BIENNIAL MEETING ON WATER RESOURCES INFORMATION SYSTEMS

LUNES 10

8.30 horas: INSCRIPCION Y ACREDITACION DE PARTICIPANTES. ENTREGA DE DOCUMENTACION.

10 horas: ACTO DE APERTURA (Salón Auditorio).

14 horas: CONFERENCIA (Salón Auditorio):
Sistemas de Información Hídrica. El Sistema NAWDEX.
N. E. Hutchinson (United States Geological Survey).

14 horas: CONFERENCIA (Salón Auditorio):
Selección de Microcomputadoras para Soporte de Sistemas de Información Hídrica.
Jean Lelievre (Department of Technical Cooperation Development, Naciones Unidas).

16 horas: CONFERENCIA (Salón "B"):
Predictores para Operación de Sistemas Hídricos.
¿Son una herramienta apropiada?

18 horas: CONFERENCIA (Salón Auditorio):
Políticas de Transferencia de Datos Transfrontera.
Subsecretaría de Informática y Desarrollo, Argentina.

MARTES 11

8.30 horas: REUNION DE TRABAJO (Salón "B"):
Diseño de Banco de Datos Hídricos.
N. E. Hutchinson (United States Geological Survey).

8.30 horas: CONFERENCIA (Salón Auditorio):
Pronóstico Hidrológico.
Juan B. Valdés (Universidad Simón Bolívar, Venezuela).

10.30 horas: CONFERENCIA (Salón Auditorio):
Recursos Hídricos Compartidos y la Transferencia de Información.
Secretaría de Recursos Hídricos, Argentina.

14 horas: CONFERENCIA (Salón Auditorio):
Banco de Datos de Calidad de Aguas. El Sistema NAQUADAT.
Adrian Demayo (Water Quality Branch Inland Waters Directorate, Canadá).

14 horas: REUNION DE TRABAJO (Salón "B"):
Rodolfo Soncini-Sessa (Politécnico de Milán, Italia).

17 horas: CONFERENCIA (Salón Auditorio):
La Información en el Desarrollo de los Recursos Hídricos.
Instituto Argentino de Recursos Hídricos.

MIERCOLES 12

8.30 horas: CONFERENCIA (Salón Auditorio):
Diseño de Redes de Mini y Microcomputadoras.
John Uppgren (Massachusetts Institute of Technology, Estados Unidos).

8.30 horas: REUNION DE TRABAJO (Salón "B"):
Modelos Probabilísticos.
Juan B. Valdés (Universidad Simón Bolívar, Venezuela).

10.30 horas: CONFERENCIA (Salón Auditorio):
Red de Colección de Datos Hidrometeorológicos en l
Cuencas del Limay y Neuquén.
Hidronor S. A., Argentina.

14 horas: EXPOSICION DE TRABAJOS (Salón Auditorio):
Sistemas de Información (Banco de Datos).

14 horas: EXPOSICION DE TRABAJOS (Salón "B"):
Adquisición y Tratamiento de Información Hídrica.

17 horas: CONFERENCIA (Salón Auditorio):
Instrumentos Digitales para Redes Hidrometeorológica
TECMES S. A., Argentina.

JUEVES 13

8.30 horas: CONFERENCIA (Salón "B"):
Sistemas de Información Documental.
Adrián Araya Marín (Universidad de Costa Rica).

8.30 horas: REUNION DE TRABAJO (Salón "C"):
Diseño de Redes de Mini y Microcomputadoras.
John Uppgren (Massachusetts Institute of Technolog
Estados Unidos).

10.30 horas: EXPOSICION DE TRABAJOS (Salón "B"):
Política Hídrica.

10.30 horas: EXPOSICION DE TRABAJOS (Salón "C"):
Pronóstico Hidrológico.

14 horas: VISITA A LAS INSTALACIONES DEL INCY
(Ezeiza).

14 horas: REUNION DE TRABAJO (Salón "B"):
Redes de Información Documental.
Adrián Araya Marín (Universidad de Costa Rica).

VIERNES 14

9 horas: CONFERENCIA (Salón Auditorio):
Red Hidrometeorológica Nacional. Política de Inform
ción.
Servicio Meteorológico Nacional, Argentina.

10.30 horas: CONFERENCIA (Salón "B"):
La Información Hídrica en una Empresa de Energía.
Agua y Energía Eléctrica Argentina.

10.30 horas: CONFERENCIA (Salón "C"):
Desarrollo y Diseño de un Sistema de Procesamien
Digital de Imágenes. Aplicaciones a los Recursos N
turales.
Comisión Nacional de Investigaciones Espaciales, A
gentina.

16 horas: PLENARIO (Salón Auditorio):
Programación de la II-BISIH.
Fundación de la Sociedad Iberoamericana de Sistem
de Información Hídrica.

18 horas: ACTO DE CLAUSURA (Salón Auditorio).

APPENDIX B

LIST OF PARTICIPANTS

PRIMERA BIENAL IBEROAMERICANA DE SISTEMAS DE INFORMACION HIDRICA
LISTADO DE EXPERTOS

APELLIDO y NOMBRE ORGANISMO	DIRECCION
ARAYA MARIN, Adrian Biblioteca Universidad de Costa Rica	Biblioteca Universidad de a Rica San Jose de Costa Rica CA
DEMAYO Adrian Environment Canada	Environment Canada OTTAWA K1A0E7 CANADA
HUTCHISON, Norman Geological Survey	Reston, VA 22092 - USA
SONCINI CESSA, Rodolfo Dipartimento di Eleetronica	20133 Milano - ITALIA Piazza Leonardo Da Vinci 3
UPPGREN, John M.I.T.	100 Angell St. Providence RI02906 EEUU
VALDES, Juan Bernardo Universidad Simon bolivar	Apartado 80659 Caracas 1080-A Venezuela

LISTADO DE PARTICIPANTES

ARGENTINA

ALLEVATO Hugo INCYTH - Centro de Tecnologia del Uso del Agua(CTUA)	C.C. No. 7 Aeropuerto Intcional (1802) Argentina
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ARAUJO Ariel Camara de Senadores Provincia de Santa Fe Comision Estudio sobre Derecho y Administracion del Ambiente y los Recursos Naturales	Gral. Lopez 3055 Santa Fe (3000) Argentina
ARENZO Carlos Abel Administracion Provincial del Agua	Quintera y Villegas Santa Rosa (6300) La Pampa
BARRERA Daniel Universidad de Buenos Aires Facultad de Ciencias Exactas y Naturales	Int. Guiraldes s/n (1428) Ciudad Universitaria

PRIMERA BIENAL IBEROAMERICANA DE SISTEMAS DE INFORMACION HIDRICA
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BERNAL Sofia INCYTH Centro de Informatica Hidrica (CIH)	C.C. No. 23 Aeropuerto Internacional Ezeiza - (1802) Prov. de Buenos Aires
BIENATI Ines INCYTH Centro de Informatica Hidrica (CIH)	C.C. No. 23 Aeropuerto Internacional Ezeiza - (1802) Prov. de Buenos Aires
BOURILHON Marta Hidronor S.A.	Rio Mocoreta 674 - Neuquen
BRO Per Departamento General de Irrigacion	Avda. Espana y Barcala (5500) Mendoza
CALCAGNO Alberto Instituto Argentino de Recursos Hidricos	Moreno 1257 Piso 3 - (1091) Capital Federal
CHIANI Cristian Direccion Provincial de Obras Sanitarias	San Martin 1805 (3000) Santa Fe
DAMBORIANA Carlos Servicio Meteorologico Nacional	25 de Mayo 658 (1002) Capital Federal
CORIA JOFRE Daniel Universidad Nacional de San Juan	Urquiza 91 Norte (5400) San Juan
COSTA Liliana del Carmen Centro de Investigaciones Hidricas de la Region Semiarida (CIHRSA) - Cordoba	Avda. San Martin 1570 (5152) Carlos Paz Cordoba
DESALVO Laura Centro de Investigaciones Hidricas de la Region Semiarida (CIHRSA) - Cordoba	Avda. San Martin 1570 (5152) Carlos Paz Cordoba
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