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NATIONAL WATER DATA EXCHANGE

SUMMARY OF FOURTH MEMBERSHIP CONFERENCE AND WORKSHOP OF THE NATIONAL WATER DATA EXCHANGE

June 8-10, 1982
Austin, Texas

U.S. GEOLOGICAL SURVEY
Open-File Report 83—766

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Compiled by Beverly M. Myers and Cassandra D. Blackwell

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INTRODUCTION

The National Water Data Exchange (NAWDEX), whose primary objective is to assist users of water data in the identification, location, and acquisition of needed data, was formally established and made operational in January 1976. It consists of member organizations from all sectors of the water-data community. The U.S. Geological Survey accepted the responsibility for implementing this program. A central Program Office, located administratively within the Water Resources Division, provides data-exchange policy and guidelines to all participants in the NAWDEX program. The Program Office is physically located in the U.S. Geological Survey's National Center in Reston, Va. Melvin D. Edwards, a hydrologist with the Survey, serves as the NAWDEX Program Manager.

The fourth national NAWDEX membership conference was held June 8-10, 1982, at the Bradford Hotel in Austin, Tex. The conference was cosponsored by the Texas Natural Resources Information System (TNRIS) and the U.S. Geological Survey. The conference was convened at 8:30 a.m. on Tuesday, June 8. After a brief welcome by Mr. Edwards NAWDEX Program Manager, Mr. C. R. Baskin, Chairman of TNRIS, gave the keynote address on "NAWDEX, TNRIS, and the Importance of Such." He was followed by Mr. James Biesecker, Assistant Chief Hydrologist for Scientific Publications and Data Management, Water Resources Division, U.S. Geological Survey, who assured the NAWDEX membership that the Survey would continue to give high priority and support to the NAWDEX program.

Mr. Edwards presented a status report on the NAWDEX activities during the preceding year-and-a-half and on projected future accomplishments. Presentations about new systems, services, and NAWDEX-related activities were given by Mr. Rob Rohrbough of HDR Systems, Dr. Carol Graves of MA/COM-Sigma Data Services Corporation, Mr. David E. Pingry, from the Economics Department at the University of Arizona and Mr. Owen Williams from the NAWDEX Program Office. Mr. Edwards, gave the charge to the workshops to make recommendations on how improvements could be made in these areas, taking into account that funding for the NAWDEX program could be curtailed because of tight financial constraints.

In the afternoon of the second day, June 9, short talks were given by, Mr. J. B. Burford of the Agricultural Research Service, USDA, Ms. Susan F. Zevin, National Weather Service, NOAA, and Mr. Robert R. Freeman, Environmental Data and Information Service, NOAA, on the activities and developing services available through their respective organizations. These were followed by the reports of the chairmen of the six conference workshops.

Mr. C. R. Baskin of TNRIS gave a brief summary of what he thought had been accomplished at this membership conference, and then invited all attendees to tour the TNRIS facilities the following morning, June 10. He noted that transportation to and from the hotel would be provided by TNRIS, and that the tour would last aproximately 3 hours. Mr. Edwards added a few comments of his own on the activities of the workshops, and thanked all those who participated in them, especially the persons who chaired the work groups. At 4:40 p.m., June 9, 1982, the conference was adjourned.

Sixty people attended this fourth membership conference including 27 people representing Federal organizations, 16 people representing State organizations, 8 representing other governmental organizations, 6 from private organizations and 3 from universities. A total of 49 NAWDEX member representatives from 26 member organizations attended. A list of the participants and a copy of the agenda are given in appendixes A and B respectively, of this report.

NAWDEX, TNRIS AND THE IMPORTANCE OF SUCH
(Opening Remarks to the Fourth NAWDEX Membership Conference)

Mr. Edwards, Program Manager, opened the fourth NAWDEX membership conference and welcomed all those in attendance. He stated that the conference was being cosponsored by the Texas Natural Resources Information System (TNRIS) and introduced two gentlemen who had been most helpful in arranging for the meeting--John Wilson, Manager of the TNRIS System Central, and C. R. Baskin, Chairman of the TNRIS Task Force. Mr. Edwards noted that Mr. Baskin also serves as Chairman of the Subcommittee on Water Data Exchange of the non-Federal Advisory Committee on Water Data for Public Use. This subcommittee, of course, serves in a monitoring and advisory capacity to the NAWDEX program. Thus, Mr. Baskin's leadership and support have been prominent in the development and implementation of NAWDEX. Mr. Edwards introduced Mr. Baskin as the keynote speaker and suggested that he introduce the other members of the TNRIS task force who were present.

Mr. Baskin introduced six members of the TNRIS task force who were present and then addressed the subject "NAWDEX, TNRIS, and the Importance of Such." He said that TNRIS was pleased to cosponsor the Fourth NAWDEX Membership Conference and that he hoped all those present would avail themselves of the opportunity to visit the TNRIS facilities on the last day of the conference. Over the past 5 years visitors from many foreign countries, the United Nations, the Council of State Governments, and others have visited the TNRIS facilities and found it very worthwhile and informative. He noted that TNRIS and NAWDEX are in some ways quite similar and in other ways somewhat dissimilar. A prime similarity is the goal of serving the data user. One dissimilarity is the scope and types of information and data with which the two entities are concerned. The beginning of TNRIS may be traced to 1967 when the Texas Legislature mandated the establishment of an hydrologic data bank. The subsequent, initial activities of the eight State agencies then acquiring or using water-related data included the cataloging of non-Federally collected water-related data in concert with the work that was being done at that time by the U.S. Geological Survey's Office of Water Data Coordination.

As the actual establishment of the Texas Water-Oriented Data Bank proceeded the then-emerging National Water Data Exchange concepts of the U.S. Geological Survey were explored and many of these were adopted. This led to the recognition, in the early 1970's, that a broader, more comprehensive system was needed in Texas, and the idea of a Texas Natural Resources Information System began to evolve. It's design was based upon a number of the NAWDEX concepts. TNRIS links together the users of natural resource and related data with those agencies and institutions which collect and store the data. Mr. Baskin noted that TNRIS is not an institution which seeks to centralize all natural resources data, but instead is a device which seeks to tie together the information systems existing within the State and elsewhere, in order to effectuate data availability, primarily for users in the State of Texas. He further explained that development and operation of TNRIS is guided by a Task Force which he has been privileged to chair since its establishment. The Task Force is made up of representatives from 15 State agencies having responsibilities in natural resources and environmental fields, plus ex officio representation from the Governor's Office. The Task Force came

into being in 1972, as an expansion of the earlier-mentioned effort involving eight agencies which had been working on the establishment of a water-oriented data bank. In TNRIS, the goal is to serve participating agencies in order to facilitate the carrying out of their legislative charges. TNRIS is an interagency entity having operating support housed in the Texas Department of Water Resources. In addition to supporting its participating agencies, TNRIS also serves other State agencies; Federal, regional and local governmental agencies; academic institutions; and the private sector. All services are rendered in accordance with a charging schedule approved by the Task Force.

Mr. Baskin stated that the TNRIS goal of serving the data user is shared by NAWDEX. The goal of both of these organizations is to manage information, not to impose management. Some have been tempted, when seeking to embark on establishing an information system such as TNRIS, to assume that they must prescribe, in depth, every detail of how the system must operate. For instance, in its early stages of development, there was a concern by a few that the Texas Water-Oriented Data Bank should seek to assure the reliability and authenticity of all the data which it held. However, careful analysis revealed that there were water-data files, such as water use, which everybody knew were not totally reliable or accurate, but which constituted important sources of the best information available in a given area, and, consequently, warranted inclusion in the Data Bank.

Basically the organizational concept of TNRIS may be described as: (1) a linked network of user entities acquiring and maintaining natural resources data; (2) a "Systems Central" staff providing a point of contact for information on data availability, procurement, and analysis; and (3) a centralized facility to handle storage, retrieval, processing and, where appropriate, presentation of natural resource data and information.

Mr. Baskin noted that those familiar with early NAWDEX design concepts will recognize the Texas Systems Central's terminology as coming from that source. TNRIS maintains a centralized facility with a variety of computer resources, including a large-scale computer and computer graphics and microfilm capabilities, thus providing a wide range of services and products. These capabilities are available, as needed, for interfacing with various Federal systems, such as the U.S. Geological Survey's NAWDEX, WATSTORE (National Water Data Storage and Retrieval System), NCIC (National Cartographic Information Center), and the EROS Data Center (EDC); the U.S. Environmental Protection Agency's STORET (Storage and Retrieval) system; the Department of Commerce's NTIS (National Technical Information Service), Bureau of the Census, and the National Oceanic and Atmospheric Administration, National Weather Service; and the Office of Water Research and Technology's Water Resources Scientific Information Center (WRSIC).

Many TNRIS data files are currently available through remote computer terminals using a computer system called the TNRIS Monitor which is designed to be used by persons with little or no background in data processing. Monitor users can automatically be connected to other automated data files. Thus, data from several different files on different computers is available to TNRIS users by means of a single session on the TNRIS Monitor.

Some of the operational capabilities and services of TNRIS include (1) computer-printed reports; (2) graphic outputs; (3) interface with remote terminals; (4) statistical packages; (5) computer-generated microfilm; (6) geocoding/geographic information handling; (7) analysis of remotely sensed data; (8) catalogs/indexes; (9) responses to inquiries concerning the availability of computerized data, aerial photography, satellite imagery/data, cartographic products, and technical publications; and (10) ordering services.

An additional service of TNRIS is the regular offering of courses to train users on getting the most from the System's various capabilities.

TNRIS endeavors to index sensed, monitored, measured, and collected data existing in both machine-processable form as computer cards, tapes, and disks, and in nonmachine processable form existing as documents, maps, and imagery. It also seeks to store selected data in a systematic manner to provide an information base. TNRIS disseminates data from the information base, refers inquiries to other data sources, adjusts and organizes data into forms suited to storage and(or) retrieval and analysis. It also functions in manipulating and processing data into graphic representations, models, and study plans. Its work may lead to the development of specifications and simulation systems for natural-resources management.

Included in its wide variety of different data types, TNRIS has a data base of more than 400 natural resources and related files, about half of which are automated. In one of the automated files there are in excess of 300 reels of magnetic tape. The nonautomated files incorporate both published and unpubished data. In addition, TNRIS maintains a very close working relationship with the State libraries in Texas. Recently, an inventory of nonmachine-processable data files held by TNRIS agencies has been conducted. The inventory has provided considerable input to an update of the TNRIS File Description Report. It is expected that the updated File Description Report will be published soon.

TNRIS does a lot of computer processing of data and also, as mentioned in the earlier comments, provides computer terminal access to various users through 29 Monitor terminals. In this latter area, the System is providing computer terminal access to some of the regional and local governments. Such access is being provided to several of the State's river authorities and councils of government, and some Federal agencies utilize the system.

A wide variety of map-related data is incorporated into TNRIS, some of which is stored in computerized form for analysis by the System. Also included under the Base Data category, as one of our major efforts, are remote sensing-related and cartographic activities. TNRIS remote sensing and cartographic activities can be classified into four areas; (1) indexing and cataloging; (2) data retrieval; (3) education and consultation; and (4) data analysis. As a State-level affiliate of the National Cartographic Information Center (NCIC), TNRIS has been engaged in an extensive indexing effort involving all known sources of imagery for the State, including Federal and State agencies, universities, and the private sector.

In its data retrieval activity in the remote sensing and cartographic area, TNRIS is assisting many users in procuring imagery and map data. The TNRIS computer terminal interface with the EROS Data Center and the 16 millimeter browse file of the Data Center's principal holdings are particularly helpful. This equipment makes several hundred thousand frames of imagery covering the State of Texas available to TNRIS users. In the data analysis area of its remote sensing and cartographic endeavors, TNRIS has been involved in a number of activities utilizing Landsat satellite data to assist Texas State agencies in natural-resources-related projects.

A total of 5,209 accesses of TNRIS files were made during the year ended February 28, 1982. These accesses were made by 935 different requesters. The major requesters, by percentage, were industries, 27.7; State Government, 44.8; individuals & private businesses, 8.4; educational institutions, 10.2; municipalities, 1.7; and the remainder among county governments, councils of government, river authorities, water districts, and the Federal Government.

In organizing the data files within TNRIS, the TNRIS Task Force has defined six categories of data. These include meteorological, water, socio-economic, biological, geologic and land, and base data resources. During the period of record noted above, TNRIS accesses by these categories were: Meteorological, 402; Water, 2,111; Socioeconomic, 338; Biological 12; Geologic and Land, 5; Base Data, 1,688; and multiple category or general information accesses, 653.

Periodically TNRIS, by means of a questionnaire, seeks input from its users on the degree to which the System has served their needs. Thus far, this type inquiry of users has been conducted three times. It is anticipated that it will likely be repeated sometime during the next year.

Mr. Baskin noted that although he had given a lot of detail about TNRIS, it was intended to serve as background for a question which the conference needs to address. What is the importance of entities such as TNRIS, NAWDEX, and the like, and the services they render? Are they more or less important today than they were several years ago? The existence of such entities, whether they be government or private, is justified only as they substantially help accomplish necessary, continuing, likely widely varying tasks, jobs, assignments, responsibilities, chores, work, or whatever you may want to call it. How they accomplish any and all such tasks determines their importance.

Costs can be reduced as overlaps are eliminated and as procurement of needed data and information is facilitated. Coordination, interface, and transfer of technology can be logical outgrowths of the operation of these entities. The climate in which we all work and do business today is pervaded by an extremely important and very demanding requirement. That requirement is to do more with less, and to do it better.

Mr. Baskin stated that he was strongly persuaded that entities such as NAWDEX and TNRIS have the potential of enabling us to meet the requirement of doing more with less and doing it better. That potential can be realized

only as the entities and their users communicate. The entities have the responsibility of communicating their capabilities to the users. I hope I have illustrated that by talking about TNRIS. The users, on the other hand, need to convey their needs and requirements to the entities.

This Fourth NAWDEX Membership Conference is intended to provide a forum for the communication that is so essential. You are urged to utilize it fully as such. In order to keep on keeping on, we need to share ideas. As a cosponsor of the conference, TNRIS expects to learn some helpful ideas from the participants. It would be our earnest hope to also share some helpful ideas with you. In closing Mr. Baskin reiterated his invitation to the attendees to visit TNRIS on Thursday morning.

STATUS OF THE NAWDEX PROGRAM

Mr. Edwards, Program Manager, reported on the status of the NAWDEX Program since the last membership conference held, in November 1980. He noted that the program has continued to expand and that 41 new members and one foreign affiliate have become formal participants in the program since that time. This brings the membership to 231 organizations; an increase of 21 percent. The budget has been less fortunate. During FY 82, the Program Office has received a reduction of 16 percent in its operating budget. Current budgeting is $1,023,000 for the year--14 percent below the FY 1981 budget. Funding for FY 83 is expected to be about the same level as that for this year. Staffing for the office has remained stable with a current staff of 12 full-time personnel, 3 part-time personnel and 1 seasonal employee.

Efforts to improve the public awareness of NAWDEX have continued. The program has been documented in a variety of newsletters, domestic and international directories, and other publications. In addition, displays were conducted at two national conferences and the NAWDEX staff has participated in a variety of workshops, technical meetings, and briefings for small groups and individuals. There is a growing interest in the NAWDEX concept in other countries. Through personal contacts, and the excellent cooperation of the U.S. Geological Survey's Office of International Hydrology, representatives from WMO, UNESCO, and 23 countries have been briefed on the program during the past year. Training within the program has suffered greatly. Only one course in the use of the NAWDEX data bases was conducted in FY 81. All training courses for 1982 have been cancelled. Lack of training has been attributed primarily to suspended travel authorities both within the Program Office and the membership.

The NAWDEX Advisory Subcommittees, the Federal Subcommittee on Water-Data and Information Exchange and the non-Federal Subcommittee on Water Data Exchange, were active during the period. They assisted the Program Office in the review of the FY 82 objectives; the development of selection criteria for Assistance Centers and guidelines for user charges within the program; and several other matters.

Our user-service program has also continued to show credible growth. One Assistance Center, the Great Lakes Regional Information Referral Center, was abolished during the year. Five new centers were, however, introduced to the program. The USGS Subdistrict office in Pittsburgh, Pa., HDR Systems, Inc., in Omaha, Nebr.; the South Carolina Water Resources Commission in Columbia, S.C.; the Sigma Data Services Corporation in Rockville, Md., and the General Software Corporation in Landover, Md., have joined as Assistance Centers. This brings the total number of centers to 64. The Assistant Centers reported over 85,000 requests and (or) response transactions during FY 81. This was an increase of 10 percent over the prior year. Eighty-one organizations have now been provided direct, online access through NAWDEX to the NAWDEX, WATSTORE, and STORET data systems at 158 remote locations. This is an increase of over 40 percent since our last conference. These organizations submitted over 5,000 jobs during FY 1981. However, over 4,700 jobs have already been submitted during the first 6 months of FY 82, indicating a substantial increase in "do it yourself" applications. In addition, the Program Office has assisted in several special projects including a series

of catalogs of hydrologic sites in coal areas of the United States, an inventory of water-data sites on forest lands in five States, a ground-water monitoring project in four States, and a statewide inventory of ground-water monitoring sites in the State of Florida. A national summary of indexed water data was also published and distributed, and the Water Data Sources Directory was made available for sale in both printed and microfiche forms. Work was completed in September 1981 on an automated user accounting system to be used for the tracking of requests and the compilation of statistics about the user-services program. Due to resource constraints, however, implementation of this system has been deferred to FY 83. For the same reason, recommendations for an electronic message system for the transfer of information between Assistance Centers has been indefinitely deferred.

Only minimal progress has been made in our national indexing program since the last conference. About 3,000 sites have been added to the Master Water Data Index and 55 organizations have been added to the Water Data Sources Directory. This slow progress is due to the fact that software used for the execution of interfaces between NAWDEX and the data bases of WATSTORE, STORET, and TNRIS has been inoperable for the past 18 months, due to redesign activities underway with the Master Water Data Index. This work is nearing completion and all interfaces are expected to be back on schedule by December 1982.

Several data-base and systems-development activities are underway that will improve our indexing program, expand our information resources, and improve our user-response capabilities.

Work which began in 1980 on the redesign of both the Water Data Sources Directory and the Master Water Data Index, is nearing completion. This has required revisions to all software systems associated with the two data bases. Changes to the Directory allow us more flexibility in the retrieval of information from the Directory, thereby, providing wider flexibility in information products. They also allow the documentation of liaison officials associated with our national indexing program, the activities of the Survey's Office of Water Data Coordination, and the activities of the Survey's National Water Use Information Program, and for the first time, the capability of providing information from the Directory in machine-readable form. Changes to the Master Water Data Index include an automated data-base capability for use with multiple sets of the Index, changes to improve the efficiency of operation of the data base, and the inclusion of several new information items including limited amounts of meteorological data, water use at the site, unit values, type of recording equipment and its recording frequency, and periods of record for the major subsets of water-quality information.

A Memorandum of Understanding was signed with the Electric Power Research Institute (EPRI) in October 1981 allowing for the transfer of the Water Supply Computerized Information Directory, developed and implemented by them, to NAWDEX for maintenance and operation. This Directory contains valuable information about the natural, technical, legal, and economic constraints of water supply, as well as detailed information about the water-data systems of over 400 organizations. This transfer is being made with unlimited license for use by NAWDEX with no reimbursement for developing costs. I would like to

express my grateful appreciation to the Institute for this valuable contribution to the program. Conversion of the Directory data base for transfer is scheduled to begin shortly and is to be completed by July 1983.

Work is nearing completion on computerized interfaces between the Master Water Data Index and the Unit Values File and the Ground Water Site Inventory File (GWSI) of the Survey's National Water Data Storage and Retrieval System (WATSTORE). Execution of the interfaces is scheduled to be completed by March 1983. It is significant to note that the interface with GWSI will add information to our index about more that 400,000 wells for which water-level, pumpage, or field water-quality data are available. This will supplement existing information available about water quality at about 200,000 wells and is a much needed addition to our information resources.

Contractual support jointly funded by the Geological Survey and the Environmental Protection Agency is underway for updating the contents of the USEPA River Reach File. A joint agreeement also has been agreed upon to implement the File on the Survey's computer. The NAWDEX Program Office will, at least initially, be responsible for the maintenance and management of the file. A subset of the file has been received by NAWDEX and is undergoing testing. Plans are to have the entire system operational for FY 83 and to begin to identify sites in the NAWDEX indexing system with river reach numbers in FY 84. We believe this to be an important addition to our systems capabilities.

Mr. Edwards noted that an expanded effort has been made during the past year to improve the graphic capabilities of our systems and to provide more analytical capabilities for our Master Water Data Index. During the year, HDR Systems, Inc., developed an interactive, graphics mappinng package for use with the Index. This allows the production of site-location maps overlayed with hydrologic unit boundaries. This package was contributed to the program at no cost to NAWDEX, and HDR provides product services with the system by serving as a NAWDEX Assistance Center. NAWDEX is very appreciative of this contribution to the program and for the generous support that HDR has given.

In order to make better analytical services available for water data stored in WATSTORE, STORET, and the NAWDEX Master Water Data Index (MWDI), NAWDEX announced, in June 1981, the availability of the User Prompted Graphic Data Evaluation (UPGRADE) system. This system was developed by the Council on Environmental Quality (CEQ) through the contributed support of the Sigma Data Services Corporation, a NAWDEX Assistance Center. Mr. Edwards expressed his appreciation to them for this valuable support. Through the contractual support of Sigma Data, software has been developed for the conversion of the MWDI data base to subsets executable by the Statistical Analysis System (SAS) available on the USGS computer. This procedure will allow the computation of summaries of information stored in the MWDI and their transport to UPGRADE, or its more modern counterpart known as DATAGRAF, for statistical analysis or graphic display. We hope to have this procedure fully operational during FY 1983.

These new systems and services essentially have not been utilized since their announcement. They will be discussed and presented in more detail during the conference and you are invited to take a look at their capabilities for possible use within your individual programs.

Once again, all of the objectives proposed at the last conference were not met. Mr. Edwards said he was satisfied, however, that the maximum possible had been achieved and that credible progress had been made within the resources available to us. Looking ahead briefly, he said he looked upon FY 82 and FY 83 is being major milestones in the program. For the past 6 years, we have been heavily involved in the development and implementation of the data bases, systems, and procedures necessary to operate the program. By the end of FY 83, this will have been mostly accomplished. We are, therefore, moving into a transition period; one in which our efforts will be focused primarily on the enhancement and expanded utilization of the tools we have provided. More attention will be given to improving our communication with the user community and bringing more cohesiveness into the program through better coordination, member support, and shared resources. Although we are facing very realistic budget constraints and reductions in other physical resources, these contingencies increase the value of a cooperative program such as NAWDEX rather than degrade it. I believe that this is a challenge for which NAWDEX is designed. Through the continued excellent support of the membership, I am confident that we can continue to improve and expand NAWDEX as a program that will be mutually beneficial to all of us and as a program in which we will all be proud to participate.

CURRENT WATER DATA COORDINATION ACTIVITIES

Mr. Porter Ward, Chief of the Office of Water Data Coordination for the U.S. Geological Survey, was introduced by the Program Manager who noted that Mr. Ward was also speaking in behalf of the Chief Hydrologist, who was on official duty in China and could not be there, and for Mr. Thomas Buchanan, Assistant Chief Hydrologist for Operations, and the Geological Survey's designated representative, who also was unable to attend.

Mr. Ward pointed out that he works very closely with Doug Edwards, the NAWDEX Program Manager. The reason is that the Office of Water Data Coordination (OWDC) was created as a result of the Office of Management and Budget's mandate which was issued as Circular A-67 in 1964. Among other things, this circular calls for the maintenance of an index to the catalog of information on hydrologic data. This index is what we now call the "Master Water Data Index," and it is maintained and kept current by NAWDEX under the direction of Doug Edwards. Because of that connection between these two offices, Mr. Ward stated that he is working very hard to strengthen the ties and to make the offices more mutually supportive.

One of the ways in which this is being accomplished is by means of a NAWDEX Coordinating Committee. It is chaired by Mr. Thomas Buchanan, the Geological Survey's Assistant Chief Hydrologist for Operations. The other members are Mr. James Biesecker who is the Assistant Chief Hydrologist for Scientific Publications and Data Management, Mr. Edwards, and myself. Mr. Edwards and I developed a coordinating document to pinpoint the ways in which our two offices should interact. This document, in turn was given to the Coordinating Committee who endorsed it completely; as did the Chief Hydrologist. The document is now in place and is working very well. It reaffirms and strengthens the relationship between our two offices. One of the things this agreement calls for is that an OWDC representative will be in constant liasion with NAWDEX, and that member, Mr. Warren Hofstra, is present this morning.

Mr. Ward went on to say that he would like to give a brief status report on a few of the traditional activities of OWDC, and then touch on several new and not-so-traditional activities. He noted that by traditional he meant those items required by OMB Circular A-67. First is the index to the catalog of information. No longer are we going to publish those large, heavy indexes; instead we are going to initiate some kind of streamlined State indices that will be heavy on computer graphics. This has been endorsed by both the Federal and non-Federal Advisory Committees. The second area is the Federal Plan, which is also mandated by A-67. This plan, as the name indicates, gives the plans of Federal agencies to acquire hydrological data. We are trying to get a little more meaning into the plans, including budget information. This has not been easy, but we're working on it and I think we are essentially there.

The third area of traditional activities is the "Handbook of Recommended Methods for Water Data Acquisition." This was not called for in circular A-67 but OWDC saw a real need for some kind of coordination or uniformity of

methods for the collection of hydrologic data. This handbook, as now envisioned, will have 12 chapters. Seven chapters have been completed or printed, and a few of them have already been updated. We plan to complete two more this fiscal year, but we do not have a timetable for completing the remaining ones; however all of them have been started. I believe the membership here would be particularly interested in the one on data handling and exchange. Some of you may even have worked on it and others of you may still be asked to provide technical review. This chapter should be out before too long.

The last item I would like to mention as one of the traditional OWDC activities is the hydrologic unit maps which, I believe, most of you are familiar with. These are of uniform scale and were developed to provide consistent coding systems for water and related land-use planning activities for which they are widely used. We have published all 50 of these maps for the 50 States, plus Puerto Rico, and we are now preparing a report giving the background of this project and where we might go from here. One possibility we are looking into is further breaking down the cataloging units into smaller basins. The reason for this is that several agencies, such as the Soil Conservation Service, the Forest Service, the Fish and Wildlife Service, and others have stated that they need to work with smaller areas. Three agencies, in fact, are currently developing their own system of subdividing units. We are trying to see that these systems are compatible. The hydrologic boundaries for the original units have now all been digitized and the digitized file is being linked with SASGRAPH and DISSPLA plotting packages to enable plotting of unit outlines, data station locations, density of stations by shading on basin outlines, and so forth.

Mr. Ward went on to describe some other new, nontraditional OWDC activities about which he is quite excited. One is a new umbrella-type agreement with EPA. An outgrowth of this agreement is a coordinating committee which is really needed, and a memorandum of understanding on hazardous waste. An area in coordination that, Mr. Ward believes, has been lagging, and which he is pushing is what he referred to as State-level information exchange meetings. The district offices of the Geological Survey's Water Resources Division have been holding these for a number of years and have been quite successful in it. Most States have had several of these. Another area in which the audience may be interested is that OWDC has recently acquired the Hydrology Subcommittee of the Water Resources Council. This committee is composed of representatives of all Federal agencies with water responsibilities and it provides technical advice and guidelines for the Federal and non-Federal community. This committee now functions under the auspices of the IACWD (Interagency Committee on Water Data).

Mr. Ward concluded by describing the Department of the Interior's new Office of Water Policy, headed by Tom Bahr. The objectives of this office are to provide policy analysis for the Department of the Interior. Some of the things they hope to achieve are (1) coordinate Department of the Interior (DOI) water policy; (2) relate needs of the States to policy and plans of DOI; and (3) promote analysis and problem-solving techniques for critical water issues. Mr. Ward stated that he felt this was the right way to go, and that OWDC and NAWDEX, as well as other USGS offices, should support the Office of Water Policy with good hydrologic information.

NEW ASSISTANCE CENTER SYSTEMS AND SERVICES

Digital Mapping and Timesharing Services

Mr. Rob Rohrbough, Senior Account Executive with HDR Systems, Inc., of Omaha, Nebr., and Mr. Rod Richardson, Senior Analyst of the Technical and Graphics Support Group of the same company, were introduced to the conference by the NAWDEX Program Manager, and together they gave an interesting presentation of the services available through HDR Systems. This company serves as a NAWDEX Assistance Center in Nebraska and, in addition to many other services, has developed the HCMapper program specifically for NAWDEX.

Mr. Rohrbough explained that HDR is an engineering, architectural systems, and sciences firm that has been operating since 1917. It has grown to national and international prominence, with 26 offices in various areas of the United States, from coast to coast. In the architectural field, HDR is the world's largest designer of health care facilities, among other types of structures. In the engineering field HDR is involved in several disciplines from power to energy to water resources and environmental concerns. He went on to state what his particular department has to do with HDR Systems, a division which is a computer services firm. This division recently merged with the Sciences Division of HDR whose work involves environmental impact analysis. As part of their work the sciences division was involved in the MX Project which is probably the world's largest environmental impact system. Mr. Rohrbough said that HDR Systems services now include applications services and consulting services which deal with data-base management systems and timesharing services. As a consulting service, HDR has been involved in things like systems design, including computer hardware, software, and banks of invitational systems. One area of specialty involves geographic-oriented analysis, or what we call geoprocessing.

Mr. Rohrbough explained that up until a year ago HDR had traditionally been a service firm, but at that point in time they decided to apply some of the expertise that they had accumulated over the years and develop an actual machine, or hardware product, which is, literally, a data base machine. This machine is designed to handle data so that noncomputer-trained professionals can access a data base in virtually any way they want. This kind of thing involves the technical aspect of using relational models. The service or value we provide is adding the user-friendly interface.

In timesharing, we follow a lot of the same tenets, in terms of being user friendly. We believe our clients' analytical activities culminate at the executive level, and the decisionmakers in many organizations need better access to data to help them make those decisions. We live in an environment today where it is no longer enough to be content with the products, activities, or tools that are presently available. It is necessary always to be looking ahead--to be ready for unanticipated situations which can come up more quickly than they have in the past.

Because HDR Systems is aware of these anticipated needs, we have identified analytical tools that apply both in the scientific and business areas and that apply to a broad range of industries in the private and public sectors.

We also have a number of services that are tailored toward specific industries, and we provide data bases and expertise to support both of these. We have a number of ways to forecast trends, whether they are business data, fish and wildlife data, or a number of other things that we might touch on briefly.

Mr. Rohrbough said that HDR has several data bases that relate to the activities of many of the people present and the organizations which they represent, such as a geoecology data base, as well as a lot of geographic information. We have regional socioeconomic data on every county in the United States. We have something like 40 or 50 different time series relating to different factors for each of these counties. So, as you see, we have extensive modeling capabilities in that area. Along that line, it should be stated that we try to keep our data bases very current; we have, for instance, access to 1980 census data.

In the field of geoprocessing, we can offer a number of things, such as government urban management activities, including land use models, site evaluation models, and population forecasting models. STRABO, at the top of the list, is a model, or a data management system, that takes geographic base files and links them to data to allow planning and tracking of any geographic data that relates to an urban environment, allowing not only data base management but mapping of that data as well.

HDR has a broad range of engineering applications, from civil to electrical, that definitely includes a lot of environmental data, as well as hydraulic and hydrological analyses. We have what we feel is one of the most advanced project management systems designed for program managers in the planning process.

Mr. Rohrbough introduced his co-speaker Mr. Rod Richardson, who is a senior analyst with the technical and graphics support group of HDR. Mr. Richardson gave a description of the HCMapper program which HDR developed for NAWDEX. This program takes hydrologic unit boundaries, MODEX sampling sites, county boundaries, and State boundaries and creates a plot of these. Mr. Richardson noted that sample copies of plots were available in the back of the room on a table. He said that his company is in the process of providing statistics for plotting sites anywhere in the United States at any place you might want. The program is geared as both an interactive or a batch program. In an interactive mode, it will prompt you, asking for example, what State you would like to plot. In a batch mode, you will have to answer questions in the order that they are expected but it is easy to go that way.

Mr. Richardson went on to explain the types and sizes of plots available and how you can specify the size of the paper (sheet) on which you want the plot printed. There are other variables for which you have options.

Mr. Edwards, NAWDEX Program Manager, interrupted Mr. Richardson at this point to say this system would allow you to retrieve any subset of information that is desired from the Master Water Data Index and interface it with the HCMapper format and thus select sites within any geographic areas that you desire to plot. Mr. Richardson noted that HDR has done exactly that for the

Program Office in Reston. The Program Office sent tapes of sites they wanted to be plotted, and HDR mailed back to them a plot of those sites, along with the hydrologic units--the labeling.

Mr. Richardson was asked what he meant by geographical sites and what the cost of obtaining a plot might be. Mr. Richardson noted that he was referring to geographical sites as they are recorded in the Master Water Data Index, which could be sites from just one agency or from multiple agencies. He cited a sample plot which he had recently obtained for the State of Pennsylvania, in which the hdyrologic unit boundaries, the county boundaries and about a thousand sites were plotted. The computer time for the job was approximately 10 seconds, and the interactive cost was on the order of $8.00 for a thousand sites in the State. Mr. Richardson noted that either Calcomp or Techtronix interfaces were presently available, but that interfaces could be made available for other plotters too. Several other questions concerning this plotting service were introduced before the NAWDEX Program Manager noted that the time was getting away and it was necessary to move on to other things.

UPGRADE Analysis and Graphics Services

Dr. Carol Graves, MA/COM Sigma Data, who was introduced by Mr. Edwards, gave a short talk on the services which are available through her company. She first explained that her company, which had previously been known as Sigma Data Services Corporation, was now MA/COM Sigma Data, as the company was acquired by MA/COM in October 1981. Telecommunications is the main focus of MA/COM, who acquired Sigma Data because they needed a software house.

Dr. Graves explained that in addition to her project Sigma Data manages several large computer facilities for NASA. They also have contracts with the Bureau of Labor Statistics and the National Institutes of Health.

Dr. Graves said she specifically wanted to talk about what her project does and some of the services they provide. She noted that they provide a variety of services, primarily in the environmental and health areas. They develop computer systems and data bases and have expertise in data retrieval. If data is needed out of, for instance, STORET, or NAWDEX, or the WATSTORE data base, Sigma Data can do it for you.

One of the projects they have done this past year for the U.S. Geological Survey is to develop a system which they call the WATSTORE Extraction System. The purpose of the system is to provide an easy way to get at WATSTORE data, so that interactively in a very user-friendly manner, you choose the data which you are interested in from the WATSTORE data base. If you are familiar with the hydrologic data base of WATSTORE you are familiar with the five-digit numeric parameter codes. The WATSTORE Extraction System uses these codes along with a couple of dozen header variables, such as date, time of sample collection, site code, and agency code. If you don't know the special header codes, ask for "Help," and the system will list the special header codes. It doesn't give you the list of parameter codes, but these are readily available elsewhere.

After choosing parameters, you can set up what are called logical comparisions. For instance, you may want certain sites for certain years, under certain conditions. The user-friendly WATSTORE Extraction System allows a person to select the data using comparison statements without overwhelming him or her by saying "Okay, now you are going to use Boolean selection," which will immediately give some users anxiety. Instead you use statements which anyone can understand and which are selective. These statements include some "ands," some "ors," and some "equals." Dr. Graves cited examples of qualifying or selective statements which might be used. In a case where you want to calculate a violation rate on cadmium, the acceptable standards depend on the hardness of the water. To select those samples in violation, you want to choose samples where the cadmium measured is greater than four milligrams per liter in soft water or greater than 10 mg/l in hard water, and samples for a given time period and for selected sites. And so you specify logical comparisons, and you qualify data selection by specifying variables, logical operators, and then values. Slides were presented illustrating the wording of the prompts and the resulting selection statements.

After you have set up your comparisons and made all the other choices that are available, you can verify and/or change selections. When you finally get the selection that you are satisfied with, then the retrieval submitted and carried out under batch mode.

Dr. Graves described another new system, or service, which her company has been developing and which they will be tying in with USGS work. This is the DATAGRAF system. This system, which is user friendly, evolved from the UPGRADE system which Sigma Data developed for the President's Council on Environmental Quality and several other systems developed by Sigma Data. Dr. Graves stated that her company feels that DATAGRAF is a very special system. Using DATAGRAF a user can access data, analyze the data, and display it. DATAGRAF is currently available on the Boeing Computer Services network. This network is available by local call in over a hundred cities around the country. DATAGRAF is on a large, mainframe IBM. It is currently under CMS, Boeing's own interactive commercial timesharing system. Dr. Graves explained that to make DATAGRAF and its general analysis capability available to USGS, they are going to put in on the Survey's AMDAHL V-7, a large mainframe and an IBM look alike. The problem is that AMDAHL operates under TSO, a different timesharing system. Therefore, the biggest part of the task will be converting from CMS to TSO. While we are doing that, Dr. Graves explained, "we're going to do a couple of other things". The WATSTORE extract that was described earlier is going to be incorporated into DATAGRAF. You will be able to go into DATAGRAF, select the WATSTORE extract option, and set up your data. You may want to do this on-line; then again, you may want to select your data and submit it as a batch job. Then you can come back later, sit down with DATAGRAF, and do the analysis.

Farther down the line, we are developing a version of DATAGRAF on an MV/8000. This work is being done for the U.S. Fish and Wildlife Service. This version will look to the user like the mainframe DATAGRAF, but it will have to operate a little differently on the 32-bit mini, as opposed to the mainframe. The primary focus of this mini version is to tie in with DATAGRAF the U.S. Fish and Wildlife geographic system called MOSS. Because some diversions of the U.S. Fish and Wildlife Service are NAWDEX members, the USGS should be interested in this.

Dr. Graves further explained that when you sign onto DATAGRAF, you get your choice of how you want to be prompted. In DATAGRAF, you can be asked questions in various levels of detail. Verbose gives you lots of detail and all of the helps. Standard prompting gives you the prompts, and you can ask for help when needed. The terse mode may give you only one word.

Dr. Graves explained that one difference between DATAGRAF and UPGRADE is that in DATAGRAF you have a table mode. If you're familiar with the system, by using table mode you can move through DATAGRAF a lot faster. Using the table mode, when you get an analysis setup that you like, for one State for instance, then you can save that table, come back later, change the name of the State, and use the same specifications to analyze data from other states. You don't have to go through the prompts to set up the analysis for

each State. Also, the user can go back and forth between the two modes, table and prompt. In this way DATAGRAF is more tailored to varying degrees of user expertise.

Dr. Graves ended her presentation by showing some slides of output from DATAGRAF. The slides illustrated various hardware devices which can be used with DATAGRAF for displaying the data. Some of the examples on the slides were maps, pie charts, bar graphs, or line graphs, all using various symbols. Some graphics were in color, as is the program. Some statistical capabilities of SAS have been incorporated into DATAGRAF. Other SAS procedures are not written into DATAGRAF in the user-friendly prompting, but there is programmer access to SAS and SASGRAF. If you know SAS and you've got your data in DATAGRAF, you can access all of SAS using this programmer interface. A number of the statistical capabilities in DATAGRAF are done via SAS, and the graphics are done using DISSPLA in some cases.

Dr. Graves said she hoped to have an on-line demonstration set up at lunchtime and would be very glad to talk to anyone who wants further information about the Sigma Data services.

REDESIGN OF THE NAWDEX DATA BASES

Mr. Owen O. Williams of the NAWDEX Program Office gave a presentation on the major changes that have been made in the Master Water Data Index (MWDI) and the Water Data Sources Directory (WDSD) as a result of the redesign of both data bases. Mr. Williams first described the Mater Water Data Index as a computerized index that identifies over 400,000 sites for which water data are available from over 400 organizations. Information available in the MWDI for each site consists of geographic location, data-collection organizations, the types of data available, the period of time for which data are available, the major water-data parameters for which data are available, the frequency of measurement of the parameter, and the media in which the data are stored.

With the aid of an overhead projector, and by referring to the MWDI hierarchical chart (see fig. 1) which had been distributed to attendees prior to the conference, Mr. Williams briefly described the structure and contents of the MWDI. He explained that the MWDI is a hierarchical data base that utilizes the System 2000 Data Base Management System software package. He further explained that each block on the MWDI hierarchical chart represented a schema record, that is, a group of components (data elements) related to the same subject.

Having briefly described the data base, Mr. Williams then explained in greater detail those components listed on the chart, that have been changed or added due to redesign of the data base. The changes and additions that have been made are as follows:

1. LATITUDE AND LONGITUDE (components 2 and 3 respectively) - Latitude and longitude have been changed from key items to non-key items. As key items their indexes were growing to such a size that efficiency was being lost both in updating and retrievals.

2. HYDROLOGIC UNIT (component 10) - The hydrologic unit code has been changed from a non-key item to a key item. Most retrievals using latitude and longitude as criteria were defining hydrologic units. The space required to index the hydrologic units is much smaller than that required for latitude and longitude, and retrievals of data within specified units have been simplified and are more efficient than utilizing latitude and longitude to define polygons.

3. WATER DATA SOURCES DIRECTORY OFFICE CODE (component 17) - The Water Data Sources Directory Office Code has been changed from a four-character code to a nine-digit code to identify the particular office within the organization responsible for data collection activities at the site.

   Previously the office code was comprised of the two-digit FIPS State code and a two-digit sequence number for offices within the same organization. Now it is comprised of the two-digit FIPS State code, the five-digit FIPS place code, and a two-digit number for offices within the same organization and place or city.

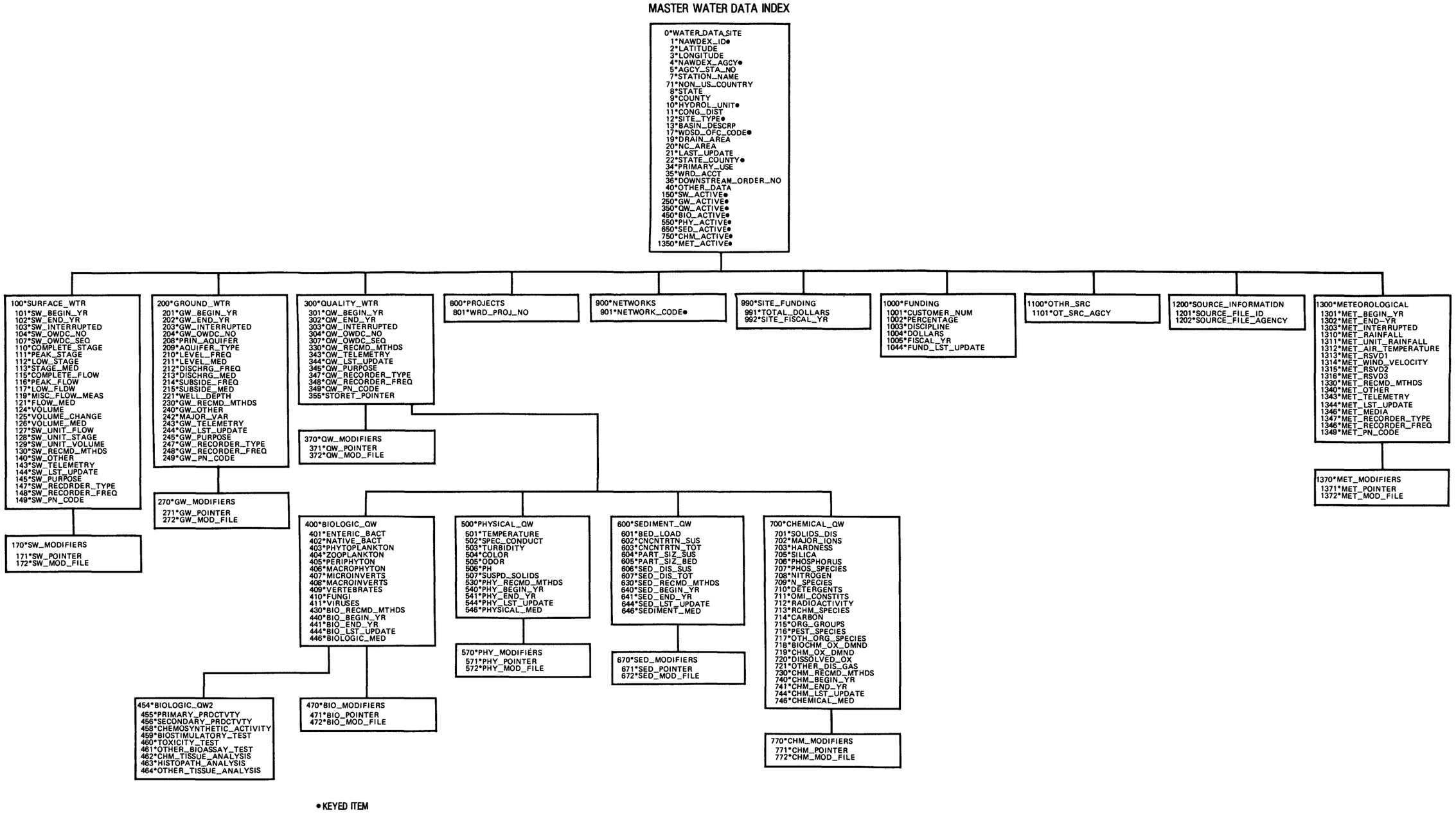

Figure 1.--Hierarchical structure and contents of the Master Water Data Index data base.

4. PRIMARY USE (component 34) - The primary use component has been added as a one-character, non-key code that indicates principle use of water from the site.

5. WRD ACCOUNT (component 35) - This data element was added to the MWDI for USGS sites as a one-character, non-key code to indicate whether or not the USGS provides funding for the operation of the site.

6. DOWNSTREAM ORDER NUMBER (component 36) - Previously the downstream order number was defined as a component in both the 100 schema record and the 300 schema record. It has been moved to the 0 schema record as a 15-digit, non-key component. The component has not been valued as yet, but is intended to be valued automatically from EPA's River Reach File by utilizing the River Reach Number.

7. SW ACTIVE (component 150), GW ACTIVE (component 250), QW ACTIVE (component 350), BIO-ACTIVE (component 450), PAY-ACTIVE (component 550), SED-ACTIVE (component 650), and CHM-ACTIVE (component 750) - These components were previously defined in the 100, 200, 300, 400, 500, 600, and 700 schema records, respectively, to indicate whether or not the corresponding data was currently being collected. In order to make retrievals more efficient, these components were moved to the 0 schema record.

8. MET-ACTIVE - (component 1350) - This component was added to the MWDI as a one-character, key component to correspondingly indicate whether or not meteorological data (a new schema record 1300) is currently being collected at the site.

9. UNIT FLOW (component 127), UNIT STAGE (component 128), and UNIT VOLUME (component 129) - These components have been added to the 100 schema record to indicate the frequency at which streamflow, stage, and lake or reservoir volumes are being collected at a site when observations are more frequent than daily.

10. RECOMMENDED METHODS (components 130, 230, 330, 430, 530, 630, 730, 1330) - These components have been added to their respective schema records as a one-character, non-key component to indicate whether or not the respective data record describes data collected according to the recommended methods described in The National Handbook of Recommended Methods for the Acquisition of Water Data.

11. LAST-UPDATE (components 144, 244, 344, 444, 544, 644, 744, 1344) - Orginally, the Last Update component was only described in the schema record; however, it has been added to the respective schema records in order to identify when each of the particular schema records were last updated.

12. RECORDER TYPE (component 147, 247, 347, 1347) - These components were added to the respective schema records as one-character, non-key components to indicate the type of recorder used at the site for the collection of data. (Examples are strip chart, digital, and crest-stage gage recorders).

13. RECORDER FREQUENCY (components 148, 248, 348, 1348) - These components were added to the respective schema records to indicate the frequency at which data are being recorded at a site (that is every minute, every 10 minutes, hourly, etc.).

14. STORET POINTER (component 355) - This component was added to the 300 schema record as a non-key, seven-character component to store the STORET computer address for the site to facilitate the future development of automated retrieval procedures between the two systems.

15. BEGIN YEAR (components 440, 540, 640, 740, 1340) - Orginally, the Begin Year was defined only for the 100, 200, and 300 schema records as components 101, 201, and 301 respectively. Now, the Begin Year has been added to the 400, 500, 600, 700, and 1300 schema records as a four-digit, non-key component to indicate the year when biologic, physical, sediment, chemical, and meteorological data collection began at the site.

16. END YEAR (components 441, 541, 641, 741, 1341) - Orginally, the End Year was defined only for the 100, 200, and 300 schema records. Now, the End Year has been added to the 400, 500, 600, 700, and 1300 schema records as a four-digit, non-key component to indicate the year when the corresponding biologic, physical, sediment, chemical, and meteorological data collection was discontinued at the site.

17. METEOROLOGICAL (Schema Record 1300) - As previously stated this entire schema record has been added to the MWDI to indicate the types of meteorological data collection activities performed, the years in which these activities took place, and the media on which the data for the site are stored.

18. SITE FUNDING (Schema Record 990) - This schema record has been added to the MWDI, but is applicable only to the Water Resources Division, U.S. Geological Survey, for indicating total site funding.

19. DOLLARS (component 1004), FISCAL YEAR (component 1005), LAST UPDATE (component 1044) - These components were added to the 1000 schema record to store USGS site funding information.

Having described the major changes to the MWDI, Mr. Williams proceeded to describe the Water Data Sources Directory (WDSD) and the major changes presently being made to this data base. He briefly stated that the WDSD is a computerized data base that identifies organizations that collect water data, locations within these organizations from which water data may be obtained, alternate sources from which an organization's water data may be obtained, the geographic areas in which an organization collects water data, and the types of water data collected and available. Over 700 organizations have been identified in the WDSD.

He then explained in greater detail those components underlined on the WDSD hierarchical chart (see fig. 2) which were the ones being changed or added due to the redesign of the WDSD data base. The changes and additions that are being made are as follows:

1. DIRECTORY TYPE (components 10, 118, 218, 418, 518, 1018, 1518, 1618) - These components are being added, respectively, to schema records 0, 100, 200, 400, 500, 1000, 1500, 1600 as components containing up to 10 characters. These components are required for retrieving specified types of directories, such as, Water Data Sources Directory, Water-Related Data Sources Directory, Directory of Liaison Officials, and others.

2. OFFICE CODE (component 102) - This component is being changed from a four-character code to a nine-digit code. The first two characters will consist of the two-digit FIPS State code, the next five characters will consist of five-digit FIPS place codes and the last two characters will consist of an arbitrary two-digit sequence number to uniquely identify multiple offices within the same city or place.

3. WATER USE (component 409) - This component is being added to the 400 schema record as a seven-digit, key component. This is the total number of sites or locations from which water-use data are being collected or monitored by the organization in the State (component 402) or county (component 401).

4. METEOROLOGICAL DATA (component 410) - This component is being added to the 400 schema record as a seven-digit, key component to represent the total number of sites at which meteorological data are measured or monitored by the organiztion in the State (component 402) or country (component 401).

5. OTHER SOURCE PHONE (component 518) - This component is being added to the 500 schema record as a 12-character, non-key component. This is the telephone number of the other source contact (component 511).

6. LIAISON OFFICIALS (schema record 1000), LIAISON STATES (schema record 1020), and LIAISON COMMENTS (schema record 1050) - These three schema records (1020 and 1050 are subschema records of 1000) are being added to provide information about individuals within the organizations that should be consulted on water data acquisition, coordination, and indexing activities. Information may also be provided about individuals that serve as liaison officials in other water-related matters as the need arises.

7. MWDI WATER USE (component 1509) - This component is being added for future use as a key, seven-digit component. Water Use data are not currently indexed in the MWDI.

8. MWDI METEOROLOGICAL DATA (component 1510) - This component is being added to the 1500 schema record as a seven-digit key component to indicate the total number of meteorological sites operated by the organization, located in the State identified by component 1502 (or country, component 1501), and indexed in the MWDI.

Mr. Williams pointed out that a sample copy of U.S. Geological Survey Open-File Report 82-327 "Definitions of Components of the Master Water Data Index Maintained by the National Water Data Exchange" was available to look at in the back of the conference room, and that distribution of this report would be made to NAWDEX members very soon. He also noted that the revised WDSD dictionary entitled "Definitions of Components of the Water Data Sources Directory Maintained by the National Water Data Exchange," was in process of being rewritten and the Program Office will get this published and distributed as soon as possible.

THE WATER SUPPLY COMPUTERIZED INFORMATION DIRECTORY

Dr. David E. Pingry, Acting Head of the Economics Department at the University of Arizona, gave an overview of the new computerized directory that NAWDEX is taking over from the Electric Power Research Institute (EPRI) of Palo Alto, Calif. It is the Water Supply Computerized Information Directory (WSCID), and NAWDEX will be operating this directory in conjunction with the Water Data Sources Directory. Dr. Pingry, along with Dr. J. Nunamaker, also from the University of Arizona, College of Business and Administration, developed this data base for EPRI, a nonprofit research institute which is supported by a group of members that consist mostly of the major electric power-producing facilities in the country. The project was started around 1976 and has been developed under a series of contracts with EPRI. Dr. Pingry explained that Dr. Nunamaker was delayed in Houston, but is expected to arrive for the conference later in the day. He also explained that Dr. Ed Altouney, who is currently the Director of this project at EPRI, was unable to attend the conference due to a scheduling conflict. Dr. Altouney extends his apologies for not being able to attend this meeting.

Dr. Pingry said that all persons connected with the development of the WSCID and the people at EPRI are very happy that the NAWDEX Program Office, of the U.S. Geological Survey, has decided to take over this data base and maintain it. He also pointed out that there were some brochures, a paper which describes the data base, and copies of sample outputs from the data base on a table in the back of the room which conference attendees were welcome to take.

Dr. Pingry explained that in developing the WSCID, the basic idea which had to be kept in mind was that if someone is interested in water supply, they ultimately have to answer this question: "Can water of a particular quantity and quality be delivered to a particular location for a specified time at an acceptable cost for the proposed use?" In other words, people are basically interested in water supply because they're interested in whether they can use it for something. In the case of the Electric Power Research Institute, they were interested in whether water was available for electric power production. And the reason they financed this data base originally was to both save money for their members, who were interested in building powerplants, and also to save contract money for themselves, because everytime they contracted to do a study, they were also paying for some sort of water aspect of that study. So, they were interested in getting a data base which would save them repetitive costs. We approached this data base development from the point of view that people are really interested in how they can use this water and whether it will be cost effective. Although it is a very complementary system to NAWDEX, it is a somewhat broader base than the NAWDEX system. It doesn't deal with as many details as NAWDEX and it addresses a somewhat different question. The major problems found in trying to accumulate data to do a water-supply study was that either the data were inappropriate or that the data were unbelievably decentralized in the water-supply area. Thus, it was felt that the appropriate thing to do was to create a data directory which could help people access data, not only in the area of streamflows and those sorts of things, but also in the area of economics, technical expertise, political-legal problems, and other things which relate to water supply.

Our major objective was to help people be able to answer the questions stated previously "Can water of a particular quantity and quality be delivered to a particular location for a specified time at an acceptable cost for the proposed use?"

In thinking about what this data base should look like, we said that it must account for all four types of constraints. There are natural constraints, such as streamflow, rainfall, etc.; technical constraints of technology associated with delivery, treatment, etc.; the economic constraints, such as how much it is going to cost; and the legal-political constraints which surround and sometimes seem to overwhelm the water-supply problem.

We observed that a useful data base has to include more than numbers. You have to be able to guide people to things like reports, legal references, and all the various things which can impact a water-supply decision. Thus, we set about creating such a directory. It was decided to implement the directory in two logical parts. One part, called a macro system is a bibliographic data base consisting of linked record types. Dr. Pingry went on to say what the various record types are: key words; laws; regions; data bases; organizations; bibliographic entries, such as State water plans and river basin studies; conferences in water areas; and journals. And, Dr. Pingry related, various lists can be created. For instance, using this system, we can get all the laws linked to a particular State, or we can get all organizations that have to do with water law, or as another example, we can get all the data bases which are linked with a particular State.

The key words are a very abbreviated list of major key words which can be used to create lists. Laws include both Federal and State. Data bases are both computerized and manual and are any kind of collection of data that might relate to water supply. Regions are both States and river basins. The organizations are all organizations, whether they have data or not, which may impact on water-supply decisions. An example of this kind of organization is a State Engineer's office, a research organization. Dr. Pingry stated that conference records are an attempt to keep track of current conferences, which is also another way of keeping track of current topics. And the journals are the published major water journals.

Dr. Pingry explained that the other portion of the system is called the micro system, which contains detailed descriptions of external data bases such as NAWDEX, the Water Data Storage and Retrieval System (WATSTORE), etc., and the organizations which maintain water-supply data. The first part of the micro system lists the information that is available on data bases. It has the name and address; a brief description of the data bases; the phone numbers of the contact person; last date of update of this material; frequency of update; and other information. It has, basically, everything you would want to know about a particular data base. Then at the very end we have, on-line, a file structure of that data base and the major parameter types that are in that data base. So in effect, you are able to search a data base without actually going out and talking to anybody that is associated with it. So this allows people to look at a whole set of data bases in a State, for example, to see which ones might have parameters that they are interested in. Parameters

could be laws or could be any kind of thing. There are various computerized data bases in water rights and other things which impact on water supply. They could also be bibliographic data bases. We index bibliographic data bases as well as numerical data bases. For example, many of the water rights files in various States are not computerized, but they are also indexed in our data base. The other major record type in the micro system which has more information on it is organizations. This detailed information includes the name, description, phone number, contact person, branch offices, organization type, and a detailed structure of the organization itself. That is, it's management structure. And, there are pointers between the organizations and the data bases so you can actually find, from our data base, which part of what organization has control over a particular data base. Dr. Pingry noted that it is like a guide to the water supply bureaucracy. It sort of traces the relationships between the various organizations and the data sources, which between the various organizations and the data sources, which are going to impact on a particular water-supply decision.

Dr. Pingry closed by saying that those who have-been involved with the Water Supply Computerized Information Directory feel that the addition of this broad view of water supply through the excellent detailed view of the natural supply, which is already offered by NAWDEX, will be very complementary, and that they are pleased that through Doug Edwards, NAWDEX will be able to maintain this Directory.

DISTRIBUTED INFORMATION PROCESSING SYSTEM OF THE U.S. GEOLOGICAL SURVEY

Mr. Charles R. Showen, Chief of the Data Management Section, Water Resources Division, U.S. Geological Survey, gave a brief description of the Survey's distributed information processing system and the benefits which are expected to be realized by the implementation of this system.

Mr. Showen noted that the Water Resources Division (WRD) has the principal responsibility within the Federal Government for providing water-resources information. Up-to-date scientific hydrologic information is essential to planners and managers if they are to initiate programs that will guard against continued depletion and degradation of the Nation's water supply.

WRD is heavily dependent for its mission management on information systems activity and data-processing support. The major national mission-related data-processing support for WRD is embodied in three very large data bases, that is, the National Water Data Exchange (NAWDEX), the National Water Data Storage and Retrieval System (WATSTORE), and the National Water Use Data System (NWUDS), which constitute the National Water Data System, and have evolved over the last 15 years in a batch processing environment supported by the general purpose computing center resources of the Survey. Field data are gathered, and data are input to the central system, either through Remote Job Entry (RJE) terminals or by mail; centrally produced extracts and reports for local consumption are returned either via mail or via the RJE terminals. The limitations of the present system are as follows: 1) remote batch oriented; 2) data not available for local decisions; 3) poor response time; 4) inefficient use of personnel; 5) inadequate communications service; 6) data preposessing not available; 7) inadequate data storage requirements; 8) lack of standardization; and 9) a variety of hardware and computer languages. Over the past 5 years, a considerable amount of local data-processing activity, unique to district offices, has grown up and is presently being supported in a variety of ways.

The management of the Water Resources Division has, after careful study, decided to redesign the large-scale national systems into a system which will provide distributed access for the processing of subsets of the National Data Base, as well as providing consistent data entry and edit capability for the very high volume of water-quality, water-use, and water-quantity data input daily from each field location.

History of Program

Mr. Showen stated that in June 1976, efforts began to acquire minicomputers for the WRD field and research offices. The Department of the Interior (DOI) recognized early that this action could lead to a potentially large purchase and required that a feasibility study be conducted to test the application of minicomputers to WRD's field programs. Subsequently, two minicomputers were procured and installed in WRD offices in Lawrence, Kans., and Albuquerque, N. Mex., so that the study of distributed data processing could be accomplished. The prototye systems procured were Harris S125 systems with 624 kilobytes of memory, 280 megabyte disks, a 9-track tape unit,

a 600 line per minute printer, a 300 card per minute reader, and an operator's console. These machines and results were evaluated over a 9-month test period. The prototype test discovered the following benefits: 1) more accurate data capture; 2) faster error correction; 3) faster access to local data; 4) faster turnaround; 5) increased responsiveness; 6) increased user control; 7) lower manpower costs; and 8) lower communications cost.

Proposed System Description

As a result of the prototype tests, the proposed system is a distributed information processing network dedicated to the processing, storage, retrieval, and dissemination of data of the National Water Data System. The network consists of all computer equipment configurations located at Water Resources Division offices. Each proposed equipment configuration consists of a central processing unit, main memory file (data) storage, communication lines, and the attached terminals. A compatible family of four hardware systems is planned, all using upward- and downward-compatible operating systems. For simplicity, these systems have been labeled S1 (the smallest system) through S4 (the largest system). A strong central processing unit (CPU) which is capable of running simulation programs, which may require large address space, is required at all sites. Sufficient disk storage will be required to store the local subset of the National Water Data System plus other working files and project data bases. The memory requirement will vary according to the anticipated number of interactive users, the simulation workload, the data base applications, and whether a virtual or nonvirtual operating system is offered. The number of communication ports will vary according to the anticipated number of simultaneous interactive users, other terminal devices such as graphics, and remote telecommunications connections.

Mr. Showen described the software for the proposed system which includes a data base management system and high level American National Standards Institute (ANSI) languages, such as FORTRAN 77, COBOL 74, and BASIC. The computer system utilities include assembler language, a text editor, and various file utility programs. The communications software will support both asynchronous and synchronous methods of communication.

The respective portions of the national data base will be distributed to each of approximately 60 nodes on the network for local processing. At weekly intervals, each local node will update the national data bases with information processed during the previous week. In this fashion, the national data bases will be maintained and updated at regular intervals.

Mr. Showen explained that the proposed distributed concept will require a complete restructuring of the applications processing methodology. This change in the mode of operation dictates a complete redesign of the existing applications processing software. This effort will encompass systems design, programming, documentation, and operational procedures development. The proposed distributed system will provide standardized hardware and software throughout WRD, thereby providing the means that will make program sharing possible. The expected benefits from the proposed system are as follows:

1. Satisfies WRD objectives better than alternatives.
2. Significantly lower cost than alternatives.
3. Interactive processing power provided to users.
4. Shorter response time.
5. Shorter communication lines.
6. Provides state-of-the-art technology.
7. Eliminates proliferation of nonstandard hardware and software.
8. Eliminates continued development of limited-use software.
9. Improved working environment for critical information delivery.
10. Reduction in contracts to outside vendors.

Implementation Plans

The acquisition of hardware is well underway and a contract is expected to be awarded by September 1982, and equipment delivery will begin in January 1983. The physical design of the distributed data base will be completed in July 1982. The system implementation plan which will address such items as programming standards, documentation standards, definition of central and local responsibilities, system security policies, auditing policies and procedures, and the like, is scheduled for completion by January 1983. The data base management system software redesign is scheduled for completion in July 1984. The application software redesign, which is to be done by various district personnel, is a continuing effort throughout a 2-year period. The telecommunications (packet switching) network will be designed by industry and a contract is expected to be awarded by the end of calendar year 1982.

Summary

In summary, Mr. Showen said that the existing centralized data bases are a very valuable national resource. However, the ability to process segments of the data bases in a decentralized mode will strengthen user awareness and increase effective activity against the data bases. However, as the number of decentralized nodes continues to grow, the management emphasis, which must ensure that the national data bases remain disciplined and intact, will also increase in importance. The effective utilization of the proposed hardware to support a very major systems redesign effort and its operation will be the focus of our energies now and for the foreseeable future.

CHARGE TO THE CONFERENCE WORKSHOP

Before adjournment of the first morning session of the conference, Mr. Edwards, NAWDEX Program Manager, announced that a total of six workshops, covering important aspects of the NAWDEX program, would be conducted that afternoon and the following morning and would be chaired by the following persons.

Workshop 1 - Program Administration and Operations:
Chairman, Porter Ward, U.S. Geological Survey Office of Water Data Coordination. Technical Support was provided by M. D. Edwards, NAWDEX Program Manager

Workshop 2 - Assistance Center Activities:
Chairman, Rob Rohrbough of HDR Systems, Inc. Technical support provided by John Wilson of the Texas Natural Resources Information System and by William Boning of the U.S. Geological Survey in Austin.

Workshop 3 - Data Indexing Activities:
Chairman, Stuart Ross, U.S. Environmental Protection Agency. Technical support provided by Owen Williams of the NAWDEX staff.

Workshop 4 - Recommended Methods and Hydrologic Data Standards:
Chairman, Melvin D. Edwards, NAWDEX Program Manager

Workshop 5 - New and Improved Information Products:
Chairman, Robert Freeman, National Oceanic and Atmospheric Adminstration, Environmental Data and Information Service. Technical support provided by Warren Hofstra, Office of Water Data Coordination, U.S. Geological Survey.

Workshop 6 - Systems Development and Data Base Activities
Chairperson, Susan Zevin, National Weather Service, NOAA. Technical support provided by Owen Williams, NAWDEX Program Office.

Mr. Edwards explained that the first three workshops would be held that afternoon, June 8, and gave the names and locations of the rooms in which they would meet. The last three would be held on Wednesday morning, June 9, and the location of the meeting were also given.

Mr. Edwards said he was pleased to have such a capable leadership for these workshops. He also said that although he had suggested topics for discussion which would be pertinent to each group, he did not want the leaders to feel constrained by his suggestions. Rather, he said he wanted the various groups to discuss those subjects that they believe have the most relevance to the current and near-future operations of the programs. He noted that in some cases, he had suggested more topics than could be discussed and he wanted the groups to place priority on those which they felt were most important. Mr. Edwards stated that from the results of these workshops, he would be developing the program objectives for fiscal year 1983.

Mr. Edwards also suggested that the keywords "constraint" and "reduction" be kept in mind, since it is obvious that we will all have to do more with less resources in the future if we are to achieve our individual program missions. He asked that each person, over the following 24 hours, give serious thought to how NAWDEX can be improved and used as a better mechanism for the sharing of data resources, systems, and individual expertise in the months ahead. He further announced that another general conference session would be convened on Wednesday afternoon and that several more papers on information sharing would be given and the results of the work groups would be presented by the respective chairpersons.

PRESENTATIONS OF NAWDEX MEMBER ORGANIZATIONS

Water Data Bank (ARS)-Update

Mr. Edwards, Program Manager convened the final general session of the conference on Wednesday, June 9, 1982, at 1:30 p.m., and introduced Mr. J. B. Burford, who is the head of Water Data Laboratory of the Plant Physiology Institute, Agricultural Research Service, U.S. Department of Agriculture. Mr. Burford gave a little background on the Agricultural Research Service, particulary in the area of watershed hydrology and traced the development of the Water Data Bank. The Watershed Hydrology Research Program started way back in the mid-1920's and early 1930's It was orginally an activity of the Soil Conservation Service, and then was transferred to the Agricultural Research Service (ARS) in the early 1950's. Hydrologic research studies on agricultural watersheds have been continuous at some locations since the early 1930's; studies have been made on more than 600 individual watersheds. At the present time there are 11 watershed hydrology research centers in operation which are located at University Park, Pa.; Coshocton, Ohio; Watkinsville and Athens, Ga.; Oxford, Miss.; Columbia, Mo.; Chickasha and Durant, Okla.; Temple, Tex.; Tucson, Ariz.; and Boise, Idaho. As of January 1, 1982, collectively, these centers were studying 172 individual watershed areas in the size range of less than 0.2 hectares (0.5 acres) to over 536 square kilometers (207 square miles). The lengths of record for these active studies range from 45 years to recent (1981) installations. Precipation and streamflow records are considered basic for all studies and are usually obtained continuously. Information on temperature evaporation, soil moisture, land use and cover conditions, together with topographic and geologic information are obtained as needed for each study.

Special programs that deal with data storage and dissemination of data are the responsibility of the Water Data Lab. There are two primary programs. These include (1) the compilation and publication of annual volumes of data summaries together with watershed characteristics, and (2) the development and operation of a centralized storage and retrieval system for the hydrologic data. Mr. Burford said that the latter program or objective is the one he wanted to talk about today.

That effort was actually initiated in 1969 and it took a while to get it going. Data is received from each of the watershed locations. There is no time frame or deadline. Their main objective is to get the research done. And of course, the data coming in is a by-product, so to speak, of that, and this is one reason why we are behind. We are just now working on 1974 and 1975 data. The data is reviewed and processed by our staff, put in standard format, stored, cataloged, and, of course, retrieved. At the present time, the data bank volume is made up primarily of precipitation and streamflow data. There are data logged in from 924 precipitation stations, representing 7,126 station years. And, of course, the reason for taking precipitation data is because it needs to go along with runoff data. And the runoff data came from 293 runoff stations, representing 4,062 station years of runoff data. These data were obtained from 32 geographic locations within 20 of the 48 conterminous States and Hawaii.

Breakpoint data (from continuous records) will be identified by study location, the gage in that location, the date of the particular reading, the time of day, intensity of rainfall, total amount of rainfall for that period, accumulations through the years, and certain codes and sequential numbers to keep up with it. Streamflow data are also continuous breakpoint records in which you have similar identification; date; time of day; flow depth and flow rates (both in cfs and inches per hour); accumulated runoff through the year; and another set of codes or sequential numbers. These precipitation and streamflow data can be used to reconstruct hyetographs and hydrographs.

Data retrieval procedures are designed for copying required data files to computer-compatible magnetic tapes which are sent to the requester. Attributes of the WCC (Washington Computer Center) computer facility provide the opportunity for tape formatting as required by most computer systems. Water Data Laboratory tapes may be used to fill requests on a returnable basis, or the requester may supply tapes. The requester should also expect to reimburse ARS for computer time required to load tapes.

The disadvantage of this system is that the Water Data Laboratory is out at Beltville, Md., and the computer is downtown, so we have to send user tapes down there. The tapes are sent by messenger to be loaded and then returned to us. You can never really guarantee how long a job will take, and sometimes the tapes get lost. So, there can be a 10- to 14-day delay in filling a request. There has been a need, particulary from those agencies that now have reimbursable agreements with the Computer Center, for direct access to the system. Mr. Burford stated that he particularly wanted to announce at this conference that they are now setting up a program of procedures for direct access. He said the people in his office are preparing the software for this interactive system--self-prompt, and they have obtained approval for the manual of instructions. The final touches are being put on it right now, so that it can be distributed. In using this system, a person can copy data direct to a user file, magnetic tape, or printout. You could list tables of longitude and latitude for stations, get an update of data, or plot hyetographs and hydrographs of precipitation and streamflow data, respectively, for selected periods of record.

Mr. Burford explained that in order to obtain access to their data bank, it would be necessary to have a reimbursable agreement with the USDA Washington Computer Center. Such arrangements can be made by contacting:

Resource Management Staff
USDA-Washington Computer Center
Room S-159, South Building
14th and Independence Avenue
Washington, DC 20250
Phone: (202) 447-3481

Other arrangements for data bank access are that you must have access to an interactive computer terminal compatible with the Washington Computer Center system and you would need to obtain a copy of the reference manual for operating procedures which has been developed for accessing the ARS water data bank. Copies of the manual will be available from the Water Data Laboratory.

Statement on Homs for NAWDEX Membership Conference and Workshop

Ms. Susan Zevin from the National Weather Service, NOAA, gave a brief talk about a new international water resources program called HOMS--the Hydrologic Operational Multipurpose Subprogramme. HOMS has become a major international activity that is making significant progress in assisting members of the United Nations (UN) family to solve their operational hydrology and water-resources problems.

As part of the UN-affiliated World Meteorological Organization's (WMO) Operational Hydrology Program, HOMS is a framework for the documentation, classification, referral, and implementation of operational hydrologic techniques around the work. And it provides a unique alternative or complement to the project-oriented methods of solving water-resource problems.

History and Background

Ms. Zevin told how the idea of HOMS was spawned by the leading hydrologists of WMO member countries in 1976. At that time, it was felt that a new systematic and user-oriented approach to water-resource problem solving was needed. Project methodology was and still is successfully used; and it will continue to be used by most water-resource engineers. But projects are often wasteful--engineers frequently are not aware of all the techniques available or necessary to do the job. They may not know how a technique performs under certain environmental conditions or that a technique has been applied successfully, or unseccessfully, in similar projects. With project-oriented methods there is no mechanism by which the knowledge gained in one project is translated to another, except through subjective interpretations and personal experience of the engineers.

HOMS is offered not to replace but to complement project methodology by documenting proven and oft-used hydrologic techniques including a history of performance and use.

Ms. Zevin said the HOMS program is organized for direct bilateral contacts among nations or for contact through the UN system. Of the 94 members of WMO's Commission for Hydrology, 53 have agreed to officially participate in HOMS by designating officials of their National Hydrological or Meteorological Service to be their focal point for HOMS activities. With such a focal point, an organizational mechanism is established for receiving, as well as exporting, operational hydrologic knowledge. These focal points and their activities are called HOMS National Reference Centers. Where countries do not have the resources or are not organized to set up a reference center, they may join with several other countries in the area of form a HOMS Regional Center. Regional centers provide the link between participant country projects so as to allow developing countries to benefit from eahc others' experience and achievements. Regional centers are now established in Bangkok, Thailand, and in Manila, the Philippines, to provide the systematic framework for the integration and organized transfer of the needed hydrologic techniques. Sixteen countries of Asia and the Southwest Pacific have joined to form these two centers. African Regional Centers for being established in Niamey, Niger; Nairobi, Kenya; and Kanduna, Nigeria, to foster exchange of hydrologic

techniques from the Nile Basin in the East to the Senegal Basin in the West and including some 20-24 countries. Other regional centers are being considered for Southern Europe (the Balkan States), the Arab Countries, and two possible centers in Latin America. A very successful regional center serves the Scandinavian Countries of Norway, Sweden, and Denmark.

The HOMS data base is the collection of descriptions of proven hydrologic technology and procedures offered by member countries. These are descriptions of network design, observations, collection, processing and storage of data, hydrologic modeling of catchments for real-time operations, and for planning and management of water resource systems. There are descriptions of instruments and instrument catalogues, software packages, and general guidance and detailed manuals on the use of various technologies under different conditions.

Each component or technique description is classified according to four criteria: (1) its general use or activity category, (2) its hydrologic subsection category (for instance ground water, water quality, etc.); (3) its complexity, mostly in terms of understanding, ease of use, and implementation; and (4) its numeric order among other components having the same classification.

Classification is given in a 10-character alphanumeric field. Components are sorted by use category (section) A-X, subsection 0-99, complexity 1, 2, or 3 (3 the most complex), and number 0-99. Classification of the components allows a user to consider the steps needed to solve a particular problem and to choose, in a systematic way, each technique or procedure to apply for each step along the way to the solution. These are known as sequences of components.

The HOMS data base is presented in three forms: (1) as a printed document in a loose leaf binder called the HOMS Reference Manual; (2) as a data set operating under the WYLBUR System at the International Computing Center in Geneva, Switzerland; and (3) as a storage and retrieval system operating under BASIC on a microcomputer at WMO headquarters, also in Geneva. There are more than 300 components contained in the first edition of the Reference Manual, contributed by 27 countries and international organizations. The WMO headquarters has handled 122 requests from 17 countries for transfer of components; and 40 of these requests have been fulfilled.

Ms. Zevin noted that the HOMS National Reference Center for the United States is located in the NOAA National Weather Service's Office of Hydrology. A Steering Committee of representatives who are delegates to the WMO's Commission for Hydrology direct overall policy and planning for the program. As a result of HOMS activities we have established closer operational ties with our Canadian neighbors to the north through two joint meetings (and with a third planned) of our respective HOMS National Reference Centers. Along with our Mexican neighbors to the south, we are mutually suppporting technology applications to resolve common problems.

The U.S. National Reference Center has accomplished the following:

- o sent 43 components for inclusion in the HOMS Reference Manual
- o fulfilled 15 requests for technical documentation of HOMS components
- o answered technical inquires on 7 components
- o sent more than 100 components descriptions requested from within the United States and abroad

Now that the program is under way, however, we encourage other major users of water resources technology to contribute to the program. We ask that each technique, model, gage, or any contribution be a proven operational procedure, and that it be fully documented. A component description is one page long with 10 short paragraphs that include purpose, description, input, output, operational requirements and restrictions, form of presentation, operational experience, originator and technical support, source availability, and conditions on use. Component descriptions are forwarded to the U.S. HOMS National Reference Center for review and approval.

Technology Transfer

The United States program hopes to transfer hydrologic knowledge not only through the mail, by responding to requests for documentation, but also through active participation in bilateral or multinational exchanges. To this end, the United States is:

- o participating in or well into planning for transfer of HOMS components in:

  - a real-time data reporting system for Mexico.
  - the HOMS Center in Beijing, China
  - real-time forecasting on the Yellow River, China
  - real-time data collection on the Yangtze River, China
  - tropical urban rainfall-runoff models in Malaysia

- o considering the transfer of HOMS components in

  - a ground-water observation program and/or tidal and salinity intrusion models in Thailand and Bangladesh
  - the analysis of hydropower requirements in Guatemala
  - a real-time hydrologic forecasting system in the Arenal Basin/ Rio Bebedero, Costa Rica

- o in enlisting the support of 22 Federal-State water resources research centers to provide technical expertise in transferring components

Consideration for the Future

Ms. Zevin stated that data bases are presently installed on separate computers--in Geneva as described above, in the U.S. on a microcomputer, and in Canada on a large commerical timeshare system as part of their WATDOC (Water Resources Document Reference Center) system. Computer data bases are being installed in Beijing, China and, hopefully, Niamey, Niger, and plans are to automate the operations of many of the centers around the world. It is planned to have standard mechanisms for updating the information by magnetic

tape or by floppy disk. And WMO has even given thought to linking some of the centers via communications systems. In the United States, we hope to be able to automate links from our users to our small but growing data base, perhaps even with a tie to NAWDEX.

Ms. Zevin believes that HOMS will prove a valuable means for documenting and exchanging knowledge of operational hydrology within this Nation's water-resources community as well as the international community. Our experience with HOMS clearly shows that WMO and the United States are only just beginning to see the benefits of this type of technology transfer.

The National Environmental Data Referral Service

Mr. Robert Freeman of the Environmental Data and Information Service, NOAA, gave a short talk on the plans for a new program called the National Environmental Data Referral Service. This is both a new program and, in a sense, a revitalization of a program that has existed for quite some time through the 1970's under the name of ENDEX (Environmental Data Index). Another predecessor is a more recent project which resulted in the publication of an Interim Climate Data Inventory that was published in January 1980, and that was a result of efforts to implement requirements of the National Climate Program Act.

Mr. Freeman stated that for some years, his office has followed the development of NAWDEX with great admiration and they are patterning many of the ideas they have for the National Environmental Data Referral Service (NEDRES) after features that already exist in NAWDEX. The purpose, or mission, of the program is to improve access to worldwide environmental data. In other words, the purpose of NEDRES is to allow people to determine whether data that they need exists someplace in the country, where the data can be found, and what are the characteristics of the data files. These characteristics should give you the ability to decide whether or not it is worth pursuing the data file, whether or not you want to contact the person or the Center that has the data file for further details, or whether it would be of any use to you.

The statutory and national program requirements are: (1) the requirements coming from the implementation of the National Climate Program Act dealing with improving the situation of collection, dissemination, and use of climatological data throughout the United States, and then (2) close affiliation and working together with the people at the National Oceanographic Data Center who are implementing an Ocean Pollution Data and Information Network as part of the implementation of the National Ocean and Pollution Research and Development and Monitoring Planning Act of 1978. The third component is to be a United States resource for interacting with similar activities that are beginning to develop in WMO under a new program referred to as INFLOCLIMA (for World Climatic Information Referral System), and in the Intergovernmental Oceanographic Commission, the Marine Environmental Data Information Referral System (MEDI), and others who are trying to do similar things on a global basis.

Mr. Freeman noted that in NEDRES the emphasis will be on documenting environmental data sets that are held by organizations in the United States, whether they refer to the United States as a location and site, or whether they refer to other locations. Eventually documentation of data sets pertinent to the United States but held in other organizations elsewhere may also be included. The primary means of doing the latter would likely be through interaction with these international data referral systems.

Next, Mr. Freeman reviewed the scope of what his organization considers to be environmental data for the purpose of NEDRES. These types of data are shown in the following table.

Types of Environmental Data Referenced by NEDRES

- o climatological and meteorological
  - standard surface and upper atmosphere
  - atmospheric radiation, physical, and chemical
  - air quality
- o oceanographic
  - physical, chemical, biological
  - ocean mineral and energy resources
  - ocean pollution*
- o geophysical and geological
  - geomagnetic and seismological
  - marine geological and geophysical
  - solar-terrestrial
  - glaciological
- o geographic
  - geodetic
  - cartographic
  - land use/ground cover
- o hydrological and limnological*
  - precipitation
  - surface and ground water
  - aquatic ecological
  - water quality

* NEDRES coordinates freshwater-related services with the National Water Data Exchange (NAWDEX) of the U.S. Geological Survey and marine pollution-related services with the Ocean Pollution Data and Information Network (OPDIN) of NOAA's National Oceanographic Data Center.

NEDRES is only concerned about the natural environment and the impacts on it by the activities of man. Mr. Freeman noted that in talking to a group of freshwater biological data managers from laboratories around the country at a NSF-sponsored conference at Michigan State University, there was considerable and growing interest in the last category. He said that just as the need for NAWDEX was felt in the water-data community, so also a need exists in the environmental data community for a similar service such as NEDRES.

There are four major objectives in developing NEDRES. The first is to develop a comprehensive, integrated data base. It is important to stress that this is a referral data base that contains descriptions of environmental data files and not the data files themselves. The intention is to describe environmental data files in terms of those criteria that were previously mentioned so as to allow users to determine the existence, locatioan, and characteristics. These descriptions include, for example, identification of which parameters were measured, frequency of measurement and other various qualifying criteria which, without going into any judgments of the quality of the data, give sufficient information to enable users to determine for themselves whether a particular data file would be of interest.

Mr. Freeman enumerated some of the other data elements that will be included in the data base. One is the equivalent of an abstract, that is, a textual description of the data file. It also will contain information about the contact, that is, who holds the data, who will make it available, and under what program or project it was collected. Mr. Freeman noted that the primary emphasis in selecting a system for the database is on making the information retrieval capability easy to learn and to use.

The second objective of NEDRES is the implementation of a plant for a national climate information clearinghouse which is called for by the implementation plan for the National Climate Program Act. And this is not to be confused with the National Climatic Center, which is a data center--the largest for climatic data in the world, and hundreds of times larger than NEDRES. The Climate Information Clearinghouse is essentially the climate aspects of the data referral system for NEDRES. It reflects that intention of NEDRES to provide special priority for the inventory of climatic data and a long-range plan for climate information referral, and for the interaction that is planned with the World Meteorological Organization.

The third objective is to establish a cooperative network of organizations that are interested in or have some stake in the exchange or dissemination of environmental data, either as collectors, processors, or disseminators of environmental data on one hand, or as active users of the data on the other hand.

The fourth objective is to provide assistance in using NEDRES for requesters. NEDRES is intended to provide information about environmental data to everyone who needs it. However, despite the wider availability and easy accessibility of a searchable data base of environmental data descriptions, there still are, or will be, for some years to come many people who don't feel comfortable with computer terminals or who do not have access to them. They would rather telephone or send a written request making for the identification of data files and have the results sent back to them. So we expect to provide that aspect through a central office of NEDRES, as well as a network of assistance centers.

Mr. Freeman then discussed how NEDRES might interact with and relate to data centers that are well developed and have inventories of their own data. The question could be raised "We've got an inventory of our own data, what more do we need?" But, Mr. Freeman noted, there is generally a lot of detail to these inventories--detailed to a degree that programmers would need, for example, to access a data file, and yet, refers only to the contents of that particular data center. In contrast, NEDRES provides less detail, but gives information for a broader, nationwide resource of environmental data.

Mr. Freeman concluded his brief description of the plans for NEDRES by saying that they are now experimenting with the two preexisting services that he mentioned (ENDEX and the Interim Climate Data inventory), but in the near future expect to start soliciting the interests and cooperation of organizations outside of NOAA to participate with them. He said he would be glad to provide more information to any interested person.

REPORTS OF THE NAWDEX WORK GROUPS

The reports of the six work groups that were convened during the membership conference were presented briefly by each of the respective chairpersons before the conference was adjourned. The reports were then submitted in final written form within a few weeks after the conference. These reports are presented in their entirety in appendixes C through H of this report.

CLOSING REMARKS

Mr. C. R. Baskin of the Texas Department of Water Resources (and Chairman of the Texas Natural Resources Information System) was asked to give a short summary of the membership conference by the NAWDEX Program Manager. Mr. Baskin said that if nothing else was accomplished, at least a lot of ideas and thoughts were generated. And, although all the recommendations that were made may not prove to be acceptable alternatives, they at least give the Program Manager some food for thought or some feedback with which to proceed in making short- and long-range plans for the NAWDEX program. In some cases, the work groups were never able to make concrete decisions concerning a course of action to be taken, but again it gives the Program Manager some food for thought. With all the ideas that were generated, whether they are feasible or not, any final decisions concerning program changes or additions will have to be made within the framework of the resources that are available.

Mr. Baskin said he believed that he had benefitted from his participation in the conference, and that TNRIS had also benefitted from it. He said he also hoped that it had been beneficial to the Texas Department of Water Resources. Mr. Baskin noted that in his keynote address he neglected to point out that although he was very much involved in TNRIS, he was, primarily, employed by the Texas Department of Water Resources and wanted that on record. He said that overall he thought it had been a very good conference and that in time the participants would be able to look back and see why certain suggestions and ideas had been adopted and implemented, and why others had not been.

Mr. Edwards, Program Manager, added a few comments before closing the conference. He agreed that it had been a very productive conference, and whether they knew it or not, each participant, member or nonmember, had made a contribution to the NAWDEX program in the last few days. He noted that he, as well as the rest of the NAWDEX staff, need these conferences to get fresh input and ideas.

Some of the ideas that were presented here have not been considered by the NAWDEX staff simply because they are too close to the problem. And, he said, all the suggestions and ideas presented would be looked at and the transcripts would be studied. He noted that the Program Office would try to get a newsletter out in the very near future which will summarize the major recommendations that came out of the conference. And then we will work toward producing a more complete proceedings, which, if things go well, you will be able to see next year.

He thanked everyone again for their support and attendance and said he hoped to see them all at the next conference. With that the conference was adjourned.

APPENDIX A

AGENDA
Fourth NAWDEX Membership Conference and Workshop
Austin, Texas
June 8-10, 1982

Monday, June 7, 1982

Registration, Conference Room, Hotel Mezzanine, 3-5 p.m.

Tuesday, June 8, 1982

8:00- 8:30 Registration, Conference Room, Hotel Mezzanine
8:30- 8:40 Welcome
8:40- 9:10 Keynote Address - NAWDEX, TNRIS and the Importance of Such - C. R. Baskin, TNRIS
9:10- 9:25 NAWDEX Status Report - M. D. Edwards, NAWDEX
9:25- 9:40 Current Water Data Coordination Activities - P. E. Ward, USGS
9:40-10:00 Coffee Break

10:00-11:00 New Assistance Center Systems and Services

10:00-10:30 Digital Mapping and Timesharing Services - Rob Rohrbough and Rod Richardson, HDR Systems, Inc.
10:30-11:00 UPGRADE Analysis and Graphics Services - Carol Graves, M/A-COM Sigma Data Services Corp.

11:00-11:20 Redesign of the NAWDEX Data Bases - O. O. Williams, NAWDEX
11:20-11:40 The Water Supply Computerized Information Directory - David E. Pingry, Economics Dept, University of Arizona
11:40-12:00 Distributed Information Processing System of the U.S. Geological Survey - C. R. Showen, USGS
12:00-12:15 Charge to the Workshops - M. D. Edwards, NAWDEX
12:15- 1:30 Lunch
1:30- 5:00 Conference Workshops (see summaries on next page).
6:00- 7:30 Social Gathering, Stephen Austin Room, Hotel Mezzanine

Wednesday, June 9, 1982

8:30-12:00 Continuation of conference Workshops
12:00- 1:30 Lunch
1:30- 2:30 Member Statements
-- Water Data Bank (ARS)--Update, J. B. Burford, USDA-ARS
-- Statement on HOMS (Hydrologic Operational Multipurpose Subprogramme), Susan F. Zevin, NOAA-NWS
-- The National Environmental Data Referral Service, Robert R. Freeman, NOAA-EDIS
-- Others as applicable
2:30- 3:15 Presentation of Workshop Results
3:15- 3:30 Coffee Break
3:30- 4:15 Presentation of Workshop Results -- continued
4:15- 5:00 Conference Summary
5:00 Adjournment

Thursday, June 10, 1982

8:30-12:00 Tour of the facilities of the Texas Natural Resources Information System (TNRIS).

The following six workshops were conducted during the afternoon of June 8 and the morning of June 9, 1982, and suggested topics of discussion are given for each group.

1. Program Administration and Operations.--Chairman, Porter E. Ward, Office of Water Data Coordination, U.S. Geological Survey

Subjects to be discussed include program objectives for FY 1983, NAWDEX response to an environment of diminishing resources, and the major roles of NAWDEX over the next 3-5 years.

2. Assistance Center Activities.--Chairman, Rod Rohrbough, HDR Systems, Inc.

Subjects to be discussed include methods for effecting better sharing of request-response workloads among Assistance Centers, procedures needed to improve awareness among centers of new systems and services, new products and services available via the NAWDEX Program Office, implementation of the NAWDEX User Accounting System, and the need for more complete information to be made available in the AC's Directory on data and services available for Assistance Centers.

3. Data Indexing Activities.--Chairman, Stuart C. Ross, U.S. Environmental Protection Agency

Discussions will include methods for improving coordination and communication in the information-gathering process, better conjunctive use of the Water Data Sources Directory, Master Water Data Index, and the Areal Investigations File, the continued software development of automated interfaces with member data systems, the expanded data indexing capabilities of the Master Water Data Index, and greater emphasis needed for indexing all ground-water data.

4. Recommended Methods for Water Data Handling and Exchange and Hydrologic Data Standards.--Chairman, M. D. Edwards, National Water Data Exchange, U.S. Geological Survey

A brief presentation will be made on the newly developed data-exchange formats and methods. Discussions will focus on the current and future roles of NAWDEX in the development and implementation of hydrologic data standards and recommended methods for the handling and exchange of water data.

5. New and Improved NAWDEX Information Products.--Chairman, Robert R. Freeman, Environmental Data and Information Service, NOAA

Discussions will focus on the type of data-base information products NAWDEX will need to produce over the next 3-5 years, recommended formats and contents of these products, the use of available indexing, digital-mapping,

statistical-summary analysis systems, and generalized graphics systems for producing computer-derived products. Attention will be given to improved utilization of UPGRADE, SAS, HCMAPPERS, and other systems available from NAWDEX members for the production of more informative, useful products.

6. Systems Development and Data Base Activities.--Chairperson, Susan F. Zevin, National Weather Service, NOAA

Discussions will be held on the concepts of distributed processing as applied to NAWDEX; the impact of the USGS Distributed Information Processing System on NAWDEX data bases and operations; the integration of the Water Supply Computerized Information Directory, the National Summary of Indexed Water Data, the River Reach File, and the Areal Investigations File into the network of NAWDEX information services. Attention will also be given to needs necessary to make the current NAWDEX data systems more user friendly and future data base and systems needs over the next 3 to 5 years.

APPENDIX B

ATTENDEES OF THE FOURTH NAWDEX MEMBERSHIP CONFERENCE

Sharon J. Balfour
Louisiana Office of Public Works
Baton Rouge, La.

Joy Bartholomew
Louisiana State Planning Office
Baton Rouge, La.

C. R. Baskin
Texas Natural Resources
Information System
Austin, Tex.

John Batterton
Texas General Land Office
Austin, Tex

James E. Biesecker
U.S. Geological Survey
Reston, Va.

C. W. Boning
U.S. Geological Survey
Austin, Tex.

Ted Brown
Texas Historical Commission
Austin, Tex.

Coan Bueche
Louisiana Office of Public Works
Baton Rouge, La.

J. B. Burford
Agricultural Research Service, USDA
Beltsville, Md.

John Burgin
Espey, Huston & Associates, Inc.
Austin, Tex.

George Chang
City of Austin Department
of Public Works
Austin, Tex.

Mary C. Christman
National Oceanographic Data
Center, NOAA
Rockville, Md.

B. R. Critendon
Texas Department of Water Resources
Austin, Tex.

John D. Croslin
National Weather Service, NOAA
Silver Spring, Md.

Dave Drury
Environmental Data and Information
Service, NOAA
Washington, D.C.

Melvin D. Edwards
U.S. Geological Survey,
National Water Data Exchange
Reston, Va.

Glendon Eppler
Texas Department of Health
Austin, Tex.

W. A. Evans, Jr.
Harris County Flood Control District
Houston, Tex.

Ro Freefield
U.S. Environmental Protection Agency
Dallas, Tex.

Robert R. Freeman
Environmental Data and Information
Service, NOAA
Washington, D.C.

John C. Glenn
Louisiana Office of Public Works
Baton Rouge, La.

Carol Graves
M/A-COM Sigma Data Computing
Corportation
Rockville, Md.

Steacy D. Hicks
National Ocean Survey, NOAA
Rockville, Md.

Warren G. Hofstra
U.S. Geological Survey
Reston, Va.

Dave Humphrey
Texas Department of Agriculture
Austin, Tex.

E. A. Imhoff
U.S. Geological Survey
Reston, Va.

Calvin M. Jackson
Soil Conservation Service, USDA
Fort Worth, Tex.

Raymond A. Jensen
Office of Water Research and
Technology, USDI
Washington, D.C.

Thomas Johnson
Virginia Water Resources Research
Center, VPI & State University
Blacksburg, Va.

Tommy R. Knowles
Texas Department of Water Resources
Austin, Tex.

Timothy A. Lewis
U.S. Geological Survey
Reston, Va.

James Machin
Radian Corporation
Austin, Tex.

Russell L. Masters
Edwards Underground Water District
San Antonio, Tex.

Kerry McAlister
Texas State Department of
Highways and Public Transportation
Austin, Tex.

Jerald F. McCain
U.S. Geological Survey
Reston, Va.

Robert McCarthy
Dallas Water Utilities
Dallas, Tex.

Wanda Meeks
U.S. Geological Survey
Atlanta, Ga.

Norman Miller
U.S. Soil Conservation Service
Lanham, Md.

John P. Monis
U.S. Geological Survey
Denver, Co.

John Moore
U.S. Geological Survey
Reston, Va.

Shelly Morrison
Texas Natural Resources
Information System
Austin, Tex.

Charles Newell
Texas Industrial Commission
Austin, Tex.

Jay Nunamaker
University of Arizona, College of
Business and Public Administration
Tucson, Ariz.

David Pimental
City of Austin, Dept. of Public Works
Austin, Tex.

David E. Pingry
University of Arizona, Department
of Economics
Tucson, Ariz.

Katherine A. Popko
Boyle Engineering Corportation
San Diego, Calif.

Tom Ray
Brazos River Authority
Waco, Tex.

Rod Richardson
HDR Systems, Inc.
Omaha, Nebr.

Ralph T. Roberts
Agriculture Research Service, USDA
Beltsville, Md.

Rob Rohrbough
HDR Systems, Inc.
Omaha, Nebr.

Stuart C. Ross
U.S. Environmental Protection Agency
Chicago, Ill

C. R. Showen
U.S. Geological Survey
Reston, Va.

Cindy Soule
San Antonio City Public Service
San Antonio, Tex.

Paul Summers
Bureau of Land Management
Denver, Colo.

Jack W. Tatum
Sabine River Authority
Orange, Tex.

Jimmy Walker
Railroad Commission of Texas
Austin, Tex.

Porter E. Ward
U.S. Geological Survey
Reston, Va.

Owen O. Williams
U.S. Geological Survey
Reston, Va.

John Wilson
Texas Natural Resources
Information System
Austin, Tex.

Susan F. Zevin
National Weather Service, NOAA
Silver Spring, Md.

ATTENDANCE BREAKDOWN

TOTAL ATTENDANCE: 60
Total Member Organizations Present: 26
Total Member Representatives Present: 49
Total Non-member Representatives: 11

Breakdown by organizations and representatives:

	Reps.	Agencies
Federal	27	10
State	16	10
Other government	8	8
Private	6	5
University	3	2

APPENDIX C

Report of Workshop on
Program Administration and Operations

Mr. Porter E. Ward, chairman of the workshop on program administration and operations noted that he had taken the suggested topics of discussion that the program manager had provided prior to the conference, added some thoughts of his own, and ended up with three major items which were discussed by the workshop.

I. A. Reduced resources for water-data monitoring activities will place a higher value on existing data, thereby potentially increasing the use of NAWDEX. In response to this, what changes, if any should NAWDEX make?

Discussion of this issue centered around the need of a better program for defining the quality assurance of data. NAWDEX should play a major role in this area. However, NAWDEX should in no way pass judgment on the quality of data; rather, NAWDEX should help users to identify methods of collection. It is recommended that the Program Office proceed with this activity.

During a climate of shrinking budgets, what recommendations do you have for the management and operation of NAWDEX on a short-term basis and on a long term basis?

1. <u>On a short term basis (2-3 years)</u>:

Eleven major recommendations were identified and discussed. They were, in their considered order of importance.

a. Develop a plan for coping with budget restrictions.
b. Increase reimbursements - NAWDEX should experiment with different methods of charges.
c. Make greater use of automation in information gathering processes.
d. Stress better communication and increased usage of NAWDEX. Maintain awareness levels.
e. Improve services - make online services easier to use.
f. Place more limitations on the user community and the level of service provided.
g. Detail personnel to NAWDEX from other agencies on a gratis basis.
h. Investigate the contribution of funds to NAWDEX by other agencies.
i. Publish fewer, or no, publications.
j. Identify data bases that may be discontinued. In doing so, managers who are willing to assume more data may be identified.
k. Continue the current programs, to the extent possible, with revenues available. This, of course, is not as simple as it sounds.

2. On a long term basis, (over 3 years)

Thirteen major recommendations were identified and discussed. These were, in their considered order of importance:

a. Develop a long-range plan (objectives, goals, etc.).
b. Emphasize greater cost recovery by experimenting with methods of charging.
c. Increase awareness of NAWDEX program.
d. Coordinate membership budget justifications.
e. Implement new technology only if near-term budgetary benefits can be clearly shown.
f. Increase marketable products.
g. Determine the feasibility of private operation of NAWDEX.
h. Investigate remote updating of data bases by data holders.
i. Obtain third-party evaluation of data.
j. Expand user services.
k. Eliminate some NAWDEX publications where feasible.
l. Carefully evaluate data prior to accepting it for indexing.
m. Continue the current program level if possible.

II. Is the membership conference an effective means of communication and can they be improved?

The Program office should get feedback from the membership to determine why more members do not attend the conference. It should also explore ways to improve attendance. This workshop believes that there should be more give and take at the conference with more information about services, products, etc., being passed on to the participants.

III. Since the last conference, three private organizations who are participating in NAWDEX have become Assistance Centers. What suggestions can you offer regarding management of this part of NAWDEX? Should we issue guidelines? Apply constraints?

It was decided that there would be a review of the current guidelines for selecting Assistance Centers. It is not felt that they adequately cover participation by private organizations. By "private organizations" means organization participation by the private sector in this capacity.

The Program Office should, however, seek legal counsel on this matter. There is particular concern about the ability of NAWDEX to place constraints on participation in this area where management believes constraint is warranted.

Respectfully submitted,

Porter E. Ward, Chairman

Participants:

Robert R. Freeman	Environmental Data and Information Service, NOAA
Raymond A. Jensen	Office of Water Research and Technology, USDI
J. B. Burford	U.S. Agricultural Research Service, USDA
David E. Pingry	University of Arizona, Department of Economics
Mary C. Christman	National Oceanographic Data Center, NOAA
J. F. McCain	U.S. Geological Survey
Dave Drury	Environmental Data and Information Service, NOAA
J. P. Monis	U.S. Geological Survey
Coan Bueche	Louisiana Office of Public Works
John C. Glenn	Louisiana Office of Public Works
C. R. Baskin	Texas Natural Resources Information System
Porter Ward	U.S. Geological Survey
Melvin Edwards	U.S. Geological Survey

APPENDIX D

REPORT FROM THE WORKSHOP ON ASSISTANCE CENTER ACTIVITIES

A questionnaire relating to the use of the NAWDEX data bases, the utility of NAWDEX publications, and proposed computer systems was distributed to all Assistance Center contacts in March 1982. The results of this survey are attached. They were used as a basis for the workshop discussions.

The first seven following topics were taken from a prepared list of discussion topics for the conference. An eighth topic was added, the Corps of Engineers Dams Inventory File.

1. In view of the low utilization of the NAWDEX Data bases, what can the Program Office do to improve the understanding and value of these data bases?

   It is felt that a lack of understanding exists as to what the NAWDEX data bases can offer. In most cases, paper copy is available for the answer and the accesses are made locally, at the State, not the NAWDEX level. Other concerns include high costs and the availability of direct access to the data such as via WATSTORE. Several activities may increase utilization:

   a. Widespread newsletter; specifically, a more frequent publication of the NAWDEX newsletter.
   b. A training session or self-teaching packages.
   c. Improving the program guide.
   d. The distributed processing approach should help.
   e. The Assistance Centers could forward the NAWDEX Newsletter to their users.

2. Based upon the appraisal of NAWDEX publications by the AC's (Assistance Centers), should some publications be discontinued? Can you suggest new publications or information products that would be of value in AC operations?

   No document was found which could be totally eliminated. Two possible consolidations of documents were found:

   a. Combine the Directory of Member Organizations with the Directory of Assistance Centers.
   b. Combine Operational Guidelines for Assistance Centers with Guidelines for Users Charges.

   The following two suggestions for additional publications met with limited acceptance within the User group:

   a. Catalog of information available in the indexed data bases.
   b. List by index key the information available in the data bases.

While no deletions of documents were recommended, the question was raised as to whether it was possible to eliminate paper copy for some documents and reproduce that information only in machine-readable form or in microfiche to reduce costs. No general reformatting comments were brought forth. Specifically, the new format for the Assistance Center Directory, which includes additional items such as the types of data available from each center, geographical coverage, storage media, media output, and data systems accessed, was generally thought to be useful, both in terms of format and in terms of content. The new changes in the Operational Guidelines for Assistance Centers also were well received.

3. What procedures are needed to improve AC awareness of new systems and services available through NAWDEX?

   While AC awareness in these areas is important, it is felt that users of water data also should be aware. This is of equal or greater importance. The following suggestions were made.

   a. The Program Office should use the newsletter to announce and document new procedures.
   b. AC's should make their users or potential users aware of the new services.

4. In view of the questionnaire response, should NAWDEX proceed with membership-wide implementations of:

   a. The Automated User Accounting System.

      If there has been significant development effort that has brought this close to completion, and the level of effort and cost of completion are small, followthrough should be considered.
   b. An automated message system. This project could be delayed indefinitely with minimal import.

5. Training for AC contacts has been cancelled the past 2 years because of budget constraints. How should the Program Office proceed with this training in the future, assuming continued budget constraints?

   It is felt that national training sessions and regional training sessions are generally unattractive because of travel budget curtailment. A possible exception is the training program in Denver, Colo. In recommending self-instructing courses as a solution, it is very important to consider the mode of training. Any form of paper should be complimented by:

   a. Video cassettes (if 70 to 80 percent of AC sites have video players).
   b. Audio cassettes (virtually all sites have playback equipment).
   c. Slides (35mm).
   d. Computerized instruction.

In choosing any of the above, a small user community should be used to test the effectiveness of the medium. It is felt that the Denver courses offered appropriate content. If, as suggested, a video cassette of a "live" training session is used, careful attention should be paid to the production quality of the session. All visuals must show clearly on the video tape. Also, a good test location (such as Denver) should be used.

6. What methods can you suggest for improving request-response workload sharing among AC's? Is this a problem?

   It is generally not a problem. Informal referrals are currently made at low volume and appear to work satisfactorily. A formal, written referral method would need to be very explicit. One participant mentioned a specific case where information was requested regarding the Freedom of Information Act as applied to STORET retrieval. The agency taking the request felt that another agency would have been better qualified to respond.

   It was felt that additional participation by Assistance Center users in this workshop would lend more perspective to this discussion.

7. Please consider, as time permits, the items under Item 5 of the questionnaire.

   Item 5 contains a list of suggestions to improve the operation of NAWDEX Assistance Centers. In summary, the workshop participants feel that many people contacting the Assistance Centers do not want to know how to extract data, but want only the answers. Typical users fall into two classes:

   a. Give me all water data for Texas.
   b. Give me the flow for Station #123 in Texas for 1980.

   The first user has no idea of what he needs to know. The second user knows exactly the information he wants. User number one must be guided by questions from the Assistance Center in finding the right questions to ask. A form to fill in would most likely be useless. User number two could access files himself if required. For instance, selection by year would be very helpful.

   A newsletter could contain very detailed information illustrating existing packages and improvement packages. This would become quite useful, on a practical basis, to the Assistance Center user.

8. The U.S. Corps of Engineers has announced that it is discontinuing its National Inventory of Dams as an active project. Mr. Jack Pickett of the Corps has informed the NAWDEX Program Office that the Corps will continue to maintain the inventory as a passive file (i.e., no updates or additions). The Corps receives an average of three requests per week. It was suggested that perhaps one of the NAWDEX Assistance Centers might be interested in providing user services for the file, either by accessing Boeing Computer Services or by loading the data base on their own system?

No volunteers to support the data base as either an active or passive data base came forward. Several people questioned the use of the data base, especially if it is historical in nature and many contact agencies and other data in the data base have changed recently.

Respectfully submitted,

Rob Rohrbough, Chairman

Participants:

C. W. Boning	U.S. Geological Survey
John Wilson	Texas Natural Resources Information System
Rod Richardson	HDR Systems, Inc.
Robert McCarthy	Dallas Water Utilities
Tom Johnson	Water Resources Research Center
Ro Freefield	U.S. Environmental Protection Agency, Region 6
B. R. Critendon	Texas Department of Water Resources
Cindy Soule'	City Public Service
Paul Summers	U.S. Bureau of Land Management
W. A. Evans, Jr.	Harris County Flood Control District
Ed Imhoff	U.S. Geological Survey
John E. Moore	U.S. Geological Survey
Wanda Meeks	U.S. Geological Survey
Timothy A. Lewis	U.S. Geological Survey

RESULTS OF THE
NATIONAL WATER DATA EXCHANGE (NAWDEX)
ASSISTANCE CENTER QUESTIONNAIRE
March 1982

49 (76.6%) of 64 Assistance Centers responded to the following:

1. a) How often do you use the following NAWDEX data bases in responding to requests for data?

	Frequently	Rarely	Not At All
Master Water Data Index (MWDI)	4 (8.2%)	27 (55.1%)	18 (36.7%)
Water Data Sources Directory (WDSD)	0	27 (55.1%)	22 (44.9%)

b) If you answer to the above is "Not At All," is it because:

- do not have direct access 3 (6.1%)
- have not been trained in their use 6 (12.2%)
- do not believe they are useful 2 (4.1%)
- Other (Numbers in parentheses indicate multiple responses):
  - -- Do not get the types of requests that the data bases can help with
  - -- Backfile summaries of WATSTORE are used instead of the NAWDEX data bases
  - -- (3) Most requests for data concern WATSTORE or local files. Occasional requests for other data are handled by phone or other sources
  - -- Printed WDSD precludes use of the data base
  - -- Requesters know what is available and ask for specific data
  - -- No time to become trained or familiar with the data bases
  - -- No requests received for data outside the office
  - -- (4) No call to use the WDSD (WDSD not necessary for response)

2. How useful have you found the following documents to be in responding to requests for data?

	Very Useful	Useful	Not Useful	Unfamiliar With
Water Data Sources Directory	3 (6.1%)	22 (44.9%)	14 (28.6%)	8 (16.3%)
Summary of the Water Data Indexed by the National Water Data Exchange	5 (10.2%)	27 (55.1%)	10 (20.4%)	6 (12.2%)
Operational Guidelines for Assistance Centers	3 (6.1%)	29 (59.2%)	9 (18.4%)	8 (16.3%)
Guidelines for User Charges	9 (18.4%)	23 (46.9%)	5 (10.2%)	10 (20.4%)
Directory of Member Orgs.	4 (8.2%)	26 (53.1%)	11 (22.5%)	5 (10.2%)
NAWDEX Newsletter	7 (14.3%)	22 (44.9%)	16 (32.7%)	4 (8.2%)
Directory of Assistance Centers	4 (8.2%)	26 (53.1%)	18 (36.7%)	4 (8.2%)
The NAWDEX Brochure: "NAWDEX: A Key to Finding Water Data"	6 (12.2%)	22 (44.9%)	12 (24.5%)	5 (10.2%)
The WATSTORE Brochure: "WATSTORE: A Water Data Storage and Retrieval System	10 (20.4%)	22 (44.9%)	9 (18.4%)	5 (10.2%)
The one-page NAWDEX flyer	2 (4.1%)	25 (51.0%)	11 (22.4%)	10 (20.4%)

3. How useful do you believe the following computer system will be when implemented?

	Very Useful	Useful	Will Not Use
An Automated User Accounting System for documenting and tracking requests	7 (14.3%)	14 (28.6%)	23 (47.0%)
An automated message system for referring requests between Assistance Centers	3 (6.1%)	20 (40.8%)	22 (44.9%)

4. Are you trained in the use of computers?

43 (87.8%) Yes 6 (12.2%) No

5. Please list and describe any systems, information products, publications, procedures, or activities, other than the above, that you believe would be helpful in improving the operation of NAWDEX Assistance Centers. (Number in parenthesis indicates multiple suggestion.)

- There should be more interfaces between data bases to keep the NAWDEX data bases current. Personnel and budget constraints prevent adequate updating.

- (3) Training needs to be offered for the NAWDEX AC contact.

- Standard Ground-Water Catalog formats are needed.

- File problems:
  a. Period of record by data type needed
  b. Complete flow implies other flows (ie: peak & low)

- Guidelines for data base updates:
  a. Update liabilities of Assistance Centers
  b. Update procedures and liabilities of the Program Office

- Communication between Program Office and Assistance Centers regarding updates.

- Devote space in the Newsletter or other publications about types of data retrievals with examples of required input and subsequent output that are available through member agencies.

- Most agencies or groups directly concerned with water data already know where to get the data from past experience. An effort should be made to advertise the existence of these directory files to those who have questions and concerns about water-related subjects.

- Have little need for particular features of NAWDEX. Most requests are handled from manual files or knowledge. Computer data acquired from WATSTORE. No requests for data from broad geographic areas. More effort could be expended in training AC contacts in accessing WATSTORE to answer requests.

- Use of the MWDI is increasing. Local presentations on NAWDEX have resulted in increased requests.

- An easy-to-use, inexpensive data retrieval software package which provides lists of NAWDEX information in response to user-specified criteria would be useful. More "advertising" about the facilities, rates, and access to data bases of each AC may provoke interest. Also, if NAWDEX provided more detailed information on each site's data coverage, more people might use it. Some categories of indexed data ("metal," "organics," etc.) are too general.

- Revised Form 9-1953 (attached) to correspond to the quarterly summary report form (attached).

- Most requests responded to from WATSTORE. Water data request forms are used to track request. An automated user accounting system would be useful but too expensive to use on the AMDAHL or MULTICS systems. Should be implemented on local minicomputers.

- Office is understaffed and underfunded. Retrievals are time consuming and expensive. Data bases are cumbersome and obsolete. No funds to travel for training. Program Office should handle all requests.

- Direct access manual to NAWDEX needed.

- Program Office should provide suggestions for the use of the NAWDEX system.

- Use of graphics should be expanded.

APPENDIX E

REPORT OF THE WORKSHOP ON DATA INDEXING ACTIVITIES

The Data Indexing Activities Workshop recommends the continued use of the WDSD directories and the Areal Investigation File (AIF) for improving communications and coordination of NAWDEX indexing activities. They should also play a larger role in the data indexing activities (NAWDEX). The WDSD (Water Data Sources Directory) is a viable alternative to indexing data in the Master Water Data Index (MWDI).

Specifically, the following recommendations were made to improve communication and coordination in the indexing activities:

1. Identify repository type libraries, such as State, University, Public etc., and transmit NAWDEX information documentation to these libraries. Ask these libraries if they would like to receive all NAWDEX publications.

2. A summarized version of the WDSD and the AIF should be sent to each agency as part of coordination cycle with the charge that they identify additional potential members of NAWDEX. This will give NAWDEX information for further solicitation.

3. The NAWDEX Program Office should establish a policy regarding entry of data into either the WDSD or the MWDI. Such a policy may be based upon organization type and size of geographical responsibility for data collection.

4. Care must be taken with an expanded use of the WDSD because this may tend to discourage entering specific data for the sites when indexing.

5. The types of data being collected by projects identified in the Areal Investigation File (AIF) should also be listed and stored in NAWDEX.

6. Abbreviated information be allowed to be stored into the NAWDEX Management Information System (MIS). This will answer agencies queries to NAWDEX indexing activity for the MIS file. An abbreviated form should be sent with the data to the requestor. If additional data is available, the requestor will know if the NAWDEX Program Office or Office of Water Data Coordination (OWDC) (whichever) has it and can contact them for further information.

7. Groundwater data should be indexed in the MWDI from the GWSI (Ground Water Site Inventory) file.

8. It was suggested that NAWDEX not index acid rain (precipitation) data, since it will eventually be indexed in the MWDI as a result of the STORET interfaces.

Respectfully submitted,

Stuart C. Ross, Chairman

Participants

Owen O. Williams	U.S. Geological Survey
Warren G. Hofstra	U.S. Geological Survey
Jack W. Tatum	Sabine River Authority of Texas
Charles R. Showen	U.S. Geological Survey
Calvin M. Jackson	U.S. Soil Conservation Service
Ralph T. Roberts	Agricultural Research Service
John D. Croslin	National Weather Service
Tommy R. Knowles	Texas Department of Water Resources
Katherine A. Popko	Boyle Engineering Corporation
Sharon J. Balfour	Louisiana Office of Public Works
Stuart Ross	U.S. Environmental Protection Agency
Joy Bartholomew	Louisiana State Planning Office
Susan F. Zevin	National Weather Service, NOAA
Steacy D. Hicks	National Ocean Survey, NOAA

APPENDIX F

REPORT OF THE WORKSHOP ON RECOMMENDED METHODS FOR
WATER DATA HANDLING AND EXCHANGE AND HYDROLOGIC DATA STANDARDS

Recommended Methods for the Handling and Exchange of Water Data:

1. A brief overview of the recommended methods was given. The workshop felt that the approach taken in the proposed methods is a feasible, precise approach and should prove to be highly beneficial.

2. The Office of Water Data Coordination (OWDC) has major responsibility for this activity. NAWDEX should not try to take a leadership role in fostering the use of and implementing the methods. Rather, NAWDEX should play a strong role in creating user awareness of the methods. Further, NAWDEX should openly endorse the methods and serve in a support role to OWDC in their use and implementation.

3. The workshop suggests that:

   a. It will be important that someone work with the potential users. Implementation will be slow and must have continuity. The Technical Work Group must play a major role in this area as well as playing a permanent role in the first important step of creating user awareness and "selling" the methods.

   b. OWDC should actively seek and acquire the endorsement and support of the methods by upper management of Federal agencies. These agencies should be encouraged to create awareness within their own programs by including the methods on the agendas of national workshops, and in other ways.

   c. OWDC should move forward quickly in the technical review and approval of the methods. Advancing technology requires their presentation to the user community as quickly as possible.

Hydrologic Data Standards:

1. Again, NAWDEX should not take a leadership role in this area but should take a steering role creating awareness of Federal Information Processing Standards (FIPS) and other standards available for use in hydrology. It should also take an active role in identifying problems associated with data standardization and in promoting the advantages of standards.

Respectfully submitted,

Melvin D. Edwards, Chairman

Participants:

Timothy A. Lewis	U.S. Geological Survey
Ed Imhoff	U.S. Geological Survey
Calvin M. Jackson	Soil Conservation Service
B. R. Critendon	Texas Department of Water Resources
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APPENDIX G

REPORT OF THE WORKSHOP ON NEW AND IMPROVED INFORMATION PRODUCTS

A. Products:

1. First half of the discussion focused on NAWDEX products defined as materials prepared in response to anticipated user needs and reproduced in sufficient quantities.

2. Especially considered the future of printed "catalogs of information on water data" in light of the recommendation of the Interagency Advisory Committee on Water Data that such catalogs are obsolete and should be discontinued.

The working group agreed that catalogs may be obsolescent, but should be phased out only after careful consideration of the need, the alternatives for making the information available to various user groups, and the resources available for continuing them. This is related to the question of whom NAWDEX seeks to serve, by which means, and through what methods of financing.

Catalogs were considered to be losing their utility because:

a. Users need the most current information available and computer data bases are easier to keep up to date.

b. Catalogs are "user unfriendly"--it is too difficult to provide flexible search capabilities in tabular presentations on paper.

c. They are too expensive to print and distribute.

3. Recognizing that there may be a need for some catalogs, the group considered criteria for deciding which ones and for keeping cost down, especially noting that NAWDEX is considering producing State catalogs of data.

Regarding cost reduction in printing catalogs:

- NAWDEX should consider being more selective in its distribution. It may not be necessary to send every product to every address.

- NAWDEX should consider selling printed catalogs directly or possibly through NTIS (National Technical Information Service).

- NAWDEX should consider distributing needed catalogs in microfiche or other microform, provided hard copy-backup is available for those who need it.

Regarding criteria for publishing catalogs:

The group noted that NAWDEX had produced some products on its own initiative that were little used. The only means for deciding what to publish is the tracking of inquiries made by users. If State catalogs are to be produced, NAWDEX needs a means of obtaining advice on which ones are needed and in which order of priority.

- o NAWDEX should consider soliciting input from Assistance Centers and from other State government organizations on whether catalogs are needed for a State and how they should be organized.

- o NAWDEX should work up a matrix of criteria for decisions based on such factors as importance of water-related problems, recognition of need by the States, and others.

- o NAWDEX should consider giving States or Assistance Centers the option to print catalogs at their expense from camera copy produced by the U.S. Geological Survey and other cost-sharing methods.

4. General consensus was that all manuals and guides designed to facilitate input and use of NAWDEX, as well as the operation of Assistance Centers, are needed and useful. Likewise, the publicity materials are essential to increasing the use of NAWDEX. In particular:

   - o The Directory of Assistance Centers should be distributed more widely or else the green brochure should be expanded to include addresses of assistance centers.

   - o The Newsletter might be published on a regular basis. It is useful for keeping everyone informed on system changes and as a training vehicle for Assistance Centers. But do not let it get voluminous. It is better to publish it more frequently but keep it short.

5. The Water Data Sources Directory could be more useful if the data base were interactively searchable. Also, NAWDEX should consider photocomposition to make it more readable and less voluminous.

B. Services

We defined services as NAWDEX tools that permit response to individual user requests.

As to existing services, there was some feeling that the present computer search system could be more user-friendly than at present. If NAWDEX direct services are to expand, users should not require extensive or detailed knowledge of the data base structure or coding system.

The major conclusion on services was that NAWDEX should accelerate the development of graphics techniques and services to permit users to summarize data in the NAWDEX data base. In particular, legislators and their staffs and State planning offices need graphics rather than numbers as a way of providing easily understood information to their clientele.

We discussed three types of services that employ graphic outputs:

- o Graphics showing where sites are located;
- o How the situation has changes; and
- o What might happen if some event happens.

The group's general feeling is that NAWDEX should:

- o Continue to provide standards analysis packages, such as SAS, that are available on the USGS computer system;
- o Provide a referral service to organizations that have analytical services capabilities to available models; and
- o Provide these advanced services on a cost-recovery basis.

NAWDEX should not:

Develop software specifically for NAWDEX.

Respectfully submitted,

Robert Freeman, Chairman

Participants:

Warren Hofstra	U.S. Geological Survey, OWDC
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Rob Rohrbough	HDR Systems, Inc.
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Norman Miller	Soil Conservation Service, USDA
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C. R. Baskin	Texas Natural Resources Information System
Porter Ward	U.S. Geological Survey, OWDC
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John Wilson	Texas Natural Resources Information System
Joy Bartholomew	Louisiana State Planning
Robert Freeman	Environmental Data and Information Service, NOAA

APPENDIX H

REPORT OF THE WORKSHOP ON SYSTEMS DEVELOPMENT AND DATA BASE ACTIVITIES

Summary to Topics, Conclusions, and Recommendations:

1. A brief description of the current NAWDEX interfacing structure was given by Mr. Owen Williams. The workshop noted in particular the necessity for developing a separate interface program to convert new NAWDEX data base formats into a format readable by NAWDEX programs, and the large costs of such work. A discussion ensued on ways to cut such costs resulting in several proposed alternatives.

   Recommendations:

   a. The NAWDEX office should use some of the money earmarked for interface development to pay the data base developer to write the interface as part of the data base design; or

   b. the NAWDEX office should use some of the money earmarked for contracts to have personnel from the agency contributing the data base to work on the interface at the USGS; or

   c. the NAWDEX office should redesign the NAWDEX interfacing software such that it can read many different formats; or

   d. the NAWDEX office should pursue design of standard data formats among contributors.

2. The workshop participants discussed possibilities of making the NAWDEX system more user friendly, and of expanding the data base access capabilities of users.

   Participants were well aware of budget limitations on the NAWDEX Program Office. However, it was decided to discuss an ideal NAWDEX configuration, and from that, to consider interim steps and more feasible improvements to the present system which may someday lead to the ideal.

   Recommendations:

   a. The NAWDEX Program Office should consider technological improvements which have high initial costs with low recurring costs. The premise was that at some time the low recurring costs will justify the high initial costs and replace the high maintenance and continuing development costs associated with the present NAWDEX system.

   b. The workshop agreed that an ideal NAWDEX configuration would allow a user automatic access (retrieval) to all NAWDEX-interfaced data bases. It was mentioned that such capability is being developed for a system of data bases in the field of chemistry. Auto-dial capability is a well-known technique in computer to computer interfaces.

c. Interactive capability should be added to NAWDEX for access to the Ground Water Site Inventory (GWSI) file.

d. The system documentation should be improved such that a user will not have to consult a separate manual for each kind of access made. A software "HELP" package callable by the user would prove very beneficial and alleviate the need for special training courses. Contact can be made with EPA to find out about a software "front end" package for their Drinking Water Data Base which significantly aids the user in searching a System 2000 data base. (This was verified with EPA's A. W. Marks in a telephone conversation subsequent to the NAWDEX conference. Mr. Marks can be reached at 202-426-9805 and Mr. Larry Weiner is at 202-382-2799.)

3. Discussion took place on whether NAWDEX should consider development of a distributed processing system similar to that proposed for WATSTORE. The workshop noted such a system might be a step toward the ideal situation described in 2(b) above. However, at the present, there seems no reason, economic or user-oriented, to plan for such a system.

   Recommendations:

   a. The NAWDEX Program Office need not consider converting to a distributed configuration.

   b. A distributed WATSTORE system will require a well-thought out and designed interface to the NAWDEX central system.

4. Recommendation: The NAWDEX program should expand the use of the Areal Investigations File of the Geological Survey's Management Information System to improve communication among users and to enhance indexing activities.

5. The workshop agreed that there needed to be communication and coordination among the workshops and workshop chairmen during membership conferences. For example, many discussion items related to cost-cutting technological improvements could have been considered by Workshops 1 and 6 of this conference.

Recommendations:

a. In future conferences, workshop chairmen should meet to discuss common topics prior to submitting their reports to the general session.

b. For this particular conference, special attention should be given to the recommendations of Workshop 6 on Systems Development and Data Base Activities in light of recommendations of Workshop 1 on Program Administration and Operations.

Respectfully submitted,

Suzan F. Zevin, Chairperson

Participants:

Owen Williams	U.S. Geological Survey
Bill Boning	U.S. Geological Survey
John D. Croslin	National Weather Service
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Tom Johnson	Water Resources Research Center
Susan Zevin	National Weather Service, NOAA
Ralph T. Roberts	Agricultural Research Service USDA
C. R. Showen	U.S. Geological Survey, WATSTORE
Raymond A. Jensen	Office of Water Research & Technology, USDI
Ro Freefield	EPA, Region 6
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Katherine Popko	Boyle Engineering Corp
Coan Bueche	Louisiana Office of Public Works

APPENDIX I
ACRONYMS COMMONLY USED BY NAWDEX

AC's - NAWDEX Assistance Centers
ARS - Agricultural Research Service
CEQ - Council on Environmental Quality
DATAGRAF - Data Graphics System
EDIS - Environmental Data and Information Service
EPA - Environmental Protection Agency
EPRI - Electric Power Research Institute
GSC - General Software Corporation
HCMAPPERS - Hydrologic Code Mapping System
LAWRIC - Louisiana Water Resources Information Data
MWDI - Master Water Data Index
NAWDEX - National Water Data Exchange
NEDRAS - National Environmental Data Referral Service
NOAA - National Oceanic and Atmospheric Administration
NUAS - NAWDEX User Accounting System
OPDIN - Ocean Pollution Data and Information Networks
OWDC - Office of Water Data Coordination
OWRT - Office of Water Research and Technology
SAS - Statistical Analysis System
STORET - Storage and Retrieval System
SYSTEM 2000 - A Data Base Management System
SYS2K - SYSTEM 2000
TNRIS - Texas Natural Resources Information System
UPGRADE - User Prompted Graphic Data Evaluation System
UNESCO - United Nations Educational, Scientific, and Cultural Organization
WDSD - Water Data Sources Directory
USGS - U.S. Geological Survey
WATSTORE - National Water Data Storage and Retrieval System
WMO - World Meteorological Organization
WRD - Water Resources Division
WRSIC - Water Resources Scientific Information Center
WSCID - Water Supply Computerized Information Directory