A SYSTEM OF COMPUTER PROGRAMS (WAT_MOVE) FOR TRANSFERRING DATA AMONG DATA BASES IN THE U.S. GEOLOGICAL SURVEY NATIONAL WATER INFORMATION SYSTEM

By Gary D. Rogers and Barbara K. Kerans

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ACRONYMS USED IN REPORT

ADAPS	Automated Data Processing System
CPL	Command Procedure Language
FTS	File Transfer System
GWSI	Ground-Water Site Inventory
NWIS	National Water Information System
QW	Quality of Water
WATSTORE	Water Data Storage and Retrieval System

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ABSTRACT

This report describes WAT_MOVE, a system of computer programs that was developed for moving National Water Information System data between U.S. Geological Survey distributed computer data bases. WAT_MOVE has three major sub-systems: one for retrieval, one for loading, and one for purging. The retrieval sub-system creates transaction files of retrieved data for transfer and invokes a file transfer to send the transaction files to the receiving site. The loading sub-system reads the control and transaction files retrieved from the source data base and loads the data in the appropriate files. The purging sub-system deletes data from a data base.

Although WAT_MOVE was developed for use by the Geological Survey's Hydrologic Investigations Program of the Yucca Mountain Project Branch, the software can be beneficial to any office maintaining data in the Site File, ADAPS (Automated Data Processing System), GWSI (Ground-Water Site Inventory), and QW (Quality of Water) sub-systems of the National Water Information System. The software also can be used to move data between data bases on a single network node or to modify data within a data base.

INTRODUCTION

Background

Since 1982, each District office of the U.S. Geological Survey has maintained distributed computer data bases that, in combination, compose the NWIS. The Hydrologic Investigations Program of the Yucca Mountain Project Branch is a regional, interdisciplinary program that requires data from several States. Consequently, NWIS data used by scientists of the Hydrologic Investigations Program were maintained on various District computers--notably, Prime[1] computers in the California, Colorado, and Nevada Districts. When the Hydrologic Investigations Program obtained its own computer, that office recognized the need for retrieval of data from the various other sites. Further, because the data were subject to change, a means was needed to update and maintain a current, valid data base. As a result, the Hydrologic Investigations Program, in cooperation with the Nevada Operations Office, U.S. Department of Energy, supported development of the WAT_MOVE system.

As the system was being developed, it became apparent that the software would have application beyond the needs of the Hydrologic Investigations Program and could be beneficial to managers of NWIS nationwide. In addition, the concepts and techniques employed in the software could be useful for developing data-transfer software for data-base systems other than NWIS.

Purpose and Scope

This report describes WAT_MOVE, the system developed to meet the specialized needs of the Hydrologic Investigations Program. Specifically, the report describes

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[1] The use of firm names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

the three major sub-systems of WAT_MOVE: retrieval, loading, and purging. The report also describes the files processed by WAT_MOVE, the QW Index File maintained by WAT_MOVE, and the distribution of WAT_MOVE software.

Although the report refers to the Hydrologic Investigations Program, the WAT_MOVE software can be used to transfer NWIS data between any nodes on the computer network used by the Geological Survey to process water-resources data; in fact, the source and destination nodes could be the same. This feature provides the capability to move data from one data base to another. In addition, WAT_MOVE can be used to modify NWIS data. The user can process all or a subset of the NWIS files.

The WAT_MOVE software operates on the current (1991) NWIS implementation, NWIS-I. The software will likely be of use in the conversion of data from NWIS-I to NWIS-II, which is under development.

Data Security

The user needs to be careful not to use WAT_MOVE in a manner that will introduce data-management problems such as:

- Duplicate data in multiple data-base environment.
- "Orphan" records that have no related site-file record.
- Inadvertent deletion of data.

Even though security provisions of NWIS-I will not be bypassed by this software, access needs to be restricted to data-base administrators.

MAJOR SUB-SYSTEMS OF COMPUTER SYSTEM WAT_MOVE

Three major sub-systems comprise the WAT_MOVE system: the retrieval sub-system, the loading sub-system, and the purging sub-system. These sub-systems are described in the following sections.

Retrieval Sub-System

Function

The WAT_MOVE retrieval sub-system, operating on the source data base, performs two functions:

- Creates transaction files of retrieved data for transfer. As an option, the retrieved records may be only counted, which is a feature that could be used for estimating disk space requirements. The program provides a listing of the NWIS files accessed, the number of records retrieved, and the size of the transaction file created. Also, the total number of disk records required is estimated.

- Invokes the Prime File Transfer System to send the transaction files (if any) to the receiving node and deletes the transaction files from the originating node after successful transfer.

Structure

The installed retrieval sub-system consists of two files:

- GETNWIS.CPL--This CPL controls the retrieval process. It clears the transfer directory, invokes XTRNWIS to perform the retrievals, and executes file-transfer commands to move the transaction files. Instructions for changing parameters defined in this CPL are contained in the following section "Operation."

- XTRNWIS.RUN--This file contains an executable version of the Fortran program XTRNWIS.F77.

Installation

The WAT_MOVE retrieval software is distributed in the directory WAT_MOVE>WAT_GET. This directory contains the following files:

- BXTR.CPL--This CPL compiles and binds the Fortran program XTRNWIS.F77 to create the executable program XTRNWIS.RUN. The installer must have .DBA access to the NWIS WATSTORE directory to run this CPL. Only read access is necessary after the installation.

- XTRNWIS.F77--This file contains the Fortran source code for the retrieval software.

- XTRCOMM.INS--This is an insert file for XTRNWIS.F77. An insert file is one that contains a set of Fortran statements to be included in a Fortran program during compilation. Insert files generally contain statements common to two or more programs.

- GETNWIS.CPL--This CPL controls the retrieval process. The following section "Operation" provides information about changes that may be required in this CPL.

In addition, the installation requires files in the directory WAT_MOVE>LIBRARY. The section "Distribution of WAT_MOVE Software" contains information about this directory.

If water-quality data are to be retrieved, a QW Index File may be required. The section "QW Index File Maintained by WAT_MOVE" provides further information about this file.

Any user invoking GETNWIS.CPL must have a valid ADAPS user file record. That means that the user must previously have used the ADAPS system.

Operation

To retrieve data, the user must first build two files: a file listing the sites to be retrieved and a file indicating which of the NWIS files are to be processed. These two files are defined as follows:

- SITE_LIST--This file consists of a list of sites, one site per record, with agency code in columns 1-5 and site number in columns 6-20. Both the agency and the site number are left justified within their fields. Information contained after column 20 is ignored and may be used for commentary. This list of sites is used to drive the retrieval process.

- FILE_LIST--This file indicates which of the NWIS files are to be processed. Additional information is given in the section "File Selection."

These two files are retained after complete transfer to document the transfer and to provide historical tracking. These files also will be required if the transferred data are ever returned to the original data base.

The CPL, GETNWIS.CPL, controls the retrieval process. Several statements in this CPL establish values for various parameters associated with the retrieval. These statements are:

```
&SET_VAR DBNUM := 01
&SET_VAR START_YEAR := 1901
&SET_VAR END_YEAR := 9999
```

```
&SET_VAR SLPATH := *>SITE_LIST
&SET_VAR FLPATH := *>FILE_LIST
&SET_VAR XFRDIR := WAT_MOVE>DATA
&SET_VAR QXPATH := WATSTORE>DATA>QWINDEX
&SET_VAR DSTNOD := XXXXXX
&SET_VAR DSTDIR := WAT_MOVE>DATA
&SET_VAR MODE := W
```

The parameters defined in these statements are:

- DBNUM--This is the number of the data base from which the NWIS data are to be retrieved--a number between 1 and 99.

- START_YEAR--This is the begin water year[2] for retrieval of data in the ADAPS datum-corrections, shifts-by-time, shifts-by-stage, and unit-values files. The entire period of record is retrieved in all other NWIS files.

- END_YEAR--This is the end water year for retrieval of the four ADAPS files. If this parameter is set to "9999," then the current water year will be selected as the ending year.

- SLPATH--This is the pathname of the site-list file described above.

- FLPATH--This is the pathname of the file-list file described above.

- XFRDIR--This is the pathname of the directory that temporarily holds the transaction files created for transfer. The user must create the directory and ensure that sufficient space is available to hold the transaction files created during the retrieval. The best way to estimate disk space requirements is to run the retrieval process with MODE = C (see below). If MODE = C, no transaction files will be written, but a count of records retrieved, together with file size, for each NWIS file will be provided. Also, the total number of PRIMOS disk records required will be estimated. For efficient processing, especially if much data are to be retrieved, this directory needs to reside on a disk drive that is different from the source NWIS files.

- QXPATH--This is the pathname of the QW Index File, which is maintained by WAT_MOVE to ensure that primary keys for the QW File are unique. Further information about this file is given in the section "QW Index File Maintained by WAT_MOVE." This file is required only if water-quality data are retrieved and if WAT_MOVE software was previously used to store the water-quality data retrieved. The CPL must include the statement defining a pathname for the QW Index File even if the file does not exist.

- DSTNOD--This is the node (Geological Survey Prime computer site) to which the transaction files are to be transferred. If the files are not to be transferred to another node but will, instead, be used on the local node, this parameter is set to "XXXXXX." Then, no attempt will be made to transfer the files to another node.

---

[2]A water year is the 12-month period October 1 through September 30. It is designated by the calendar year in which it ends.

- DSTDIR--This is the pathname of the directory, existing on the destination node DSTNOD, to which the transaction files are to be transferred. If the files are to be transferred to another node, the user must ensure that this directory exists, that the FTS phantom has access to add and write files, and that disk space is sufficient to hold the transferred files. Efficient processing necessitates that this directory reside on a disk drive that is different from the drive containing the destination NWIS files.

- MODE--This parameter indicates whether retrieved records are to be written (MODE = W) or if the records are to be only counted (MODE = C).

This CPL may be invoked in one of three ways: interactively, as a phantom, or as a batch job. A file, GETNWIS.COMO, containing a log of the retrieval processing, is created in the directory from which GETNWIS is invoked.

Two types of files are created during retrieval: a control file and one or more transaction files. These files are defined as follows:

- Control files are named xxxxxx.CTRL where xxxxxx is the name of the source node. The control file consists of one record indicating the date-time when the data were retrieved as well as one line for each NWIS file from which data were retrieved. This line includes the file identification, the file name, and the number of records retrieved.

- Transaction files are named xxxxxx.yyyy where xxxxxx is the source node and yyyy is the file identification. A list of the file identifications used is given in the section "File Identification and Description." One transaction file will be available for each NWIS file from which data are retrieved.

The subroutine MOD_XTR may be used to modify data after retrieval and before transfer to the destination data base. This subroutine, which may be modified by a skilled Fortran programmer, is called with the following statement:

```
CALL MOD_XTR(NODE,GNAME,BUFF,*)
```

where the arguments are defined as follows:

- NODE--This is the 6-character node name of the source (current) node.

- GNAME--This is the 2- or 4-character identification of the file being processed. The file identifications used are listed in the section "Files Processed by WAT_MOVE."

- BUFF--This is a variable-length character string containing the data actually retrieved.

- *--This is an alternate return to be used for rejecting records before transfer.

MOD_XTR is invoked by WAT_MOVE immediately after retrieval of each NWIS data record. The version of MOD_XTR distributed with the WAT_MOVE software simply returns to the calling program, performing no data modification. The section "File Identification and Description" provides information about the record formats of the various NWIS files that would be required to modify the MOD_XTR subroutine.

Loading Sub-System

Function

The WAT_MOVE loading sub-system reads the control and transaction files retrieved from the source data base(s) and loads the data in the appropriate NWIS files. This loading sub-system operates on the destination data base.

Structure

The installed loading sub-system consists of two files:

- PUTNWIS.CPL--This CPL controls the loading process. It invokes BLDNWIS to perform the loading of the NWIS files. Instructions for changing parameters defined in this CPL are contained in the following section "Operation."

- BLDNWIS.RUN--This file contains an executable version of the Fortran program BLDNWIS.F77.

Installation

The WAT_MOVE loading software is distributed in the directory WAT_MOVE>WAT_PUT. This directory contains the following files:

- BBLD.CPL--This CPL compiles and binds the Fortran program BLDNWIS.F77 to create the executable program BLDNWIS.RUN. The installer must have .DBA access to the NWIS WATSTORE directory to run this CPL.

- BLDNWIS.F77--This file contains the Fortran source code for the loading software.

- BLDCOMM.INS--This is an insert file for BLDNWIS.F77.

- PUTNWIS.CPL--This CPL controls the loading process. The following section "Operation" provides information about changes that may be required in this CPL.

In addition, the installation requires files in the directory WAT_MOVE>LIBRARY. The section "Distribution of WAT_MOVE Software" contains information about this directory.

If water-quality data are to be loaded, a QW Index File must exist. The section "QW Index File Maintained by WAT_MOVE" provides further information about this file.

Any user invoking PUTNWIS.CPL must have a valid ADAPS user file record. That means that the user must previously have used the ADAPS system.

Operation

To load data, the user must first build two files: a file listing the source node(s) from which data were retrieved and a file indicating which of the NWIS files are to be processed. These two files are defined as follows:

- NODE_LIST--This file consists of a list of nodes, one node per record, with the node name in columns 1-6. Only data for the nodes in this list will be processed. If no retrieved data exist for a node, that node will be skipped and processing will continue with the next node in the list.

- FILE_LIST--This file indicates which of the NWIS files are to be processed. Additional information is given in the section "File Selection."

The CPL, PUTNWIS.CPL, controls the loading process. Several statements in this CPL establish values for various parameters associated with the loading.

These statements are:

```
&SET_VAR DBNUM := 01
&SET_VAR NLPATH := *>NODE_LIST
&SET_VAR FLPATH := *>FILE_LIST
&SET_VAR RCVDIR := WAT_MOVE>DATA
&SET_VAR QXPATH := WATSTORE>DATA>QWINDEX
```

The parameters defined in these statements are:

- DBNUM--This is the number of the data base into which the NWIS data are to be loaded--a number between 1 and 99.

- NLPATH--This is the pathname of the node-list file described above.

- FLPATH--This is the pathname of the file-list file described above.

- RCVDIR--This is the pathname of the directory that holds the control and transaction files that were created and transferred during retrieval.

- QXPATH--This is the pathname of the QW Index File, which is maintained by WAT_MOVE to ensure that primary keys for the QW File are unique. Further information about this file is given in the section "QW Index File Maintained by WAT_MOVE." The CPL must include the statement defining a pathname for the QW Index File even if the file does not exist.

This CPL may be invoked in one of three ways: interactively, as a phantom, or as a batch job. A file, PUTNWIS.COMO, containing a log of the loading processing, is created in the directory from which PUTNWIS is invoked.

When loading retrieved data, WAT_MOVE will ADD records if a record of the same primary key does not exist. It will REPLACE entire records if a record of the same primary key does exist.

The subroutine MOD_BLD may be used to modify data before loading in the NWIS files. This subroutine, which may be modified by a skilled Fortran programmer, is called with the following statement:

```
CALL MOD_BLD(NODE,GNAME,BUFF,*)
```

where the arguments are defined as follows:

- NODE--This is the 6-character node name of the destination (current) node.

- GNAME--This is the 2- or 4-character identification of the file being processed. The file identifications used are listed in the section "Files Processed by WAT_MOVE."

- BUFF--This is a variable-length character string containing the data to be stored.

- *--This is an alternate return to be used for rejecting records before storing.

MOD_BLD is invoked by WAT_MOVE immediately before each NWIS data record is stored. The version of MOD_BLD distributed with the WAT_MOVE software simply returns to the calling program, performing no data modification. The section "File Identification and Description" provides information about the record formats of the various NWIS files that would be required to modify the MOD_BLD subroutine.

After the user is satisfied that the loading process was successful, the control and transaction files in the receive directory are deleted so the directory will be available the next time data are to be moved. Clean-up of this directory is left to the user to ensure that the loading was successful before any files are deleted. Care needs to be taken to ensure that this directory is properly cleared or that saved files are renamed prior to making further retrievals from the same node. Files transferred into this directory will over-write existing files of the same name.

Purging Sub-System

Function

The WAT_MOVE purging (deletion) sub-system deletes NWIS data for the site(s) specified by the user. Deletion of data in the source data base may be required after a successful transfer if the transferred data are to be maintained only in the destination data base.

Structure

The installed purging sub-system consists of two files:

- PRGNWIS.CPL--This CPL controls the deletion process. It invokes DELNWIS to perform deletions in the NWIS files. Instructions for changing parameters defined in this CPL are contained in the following section "Operation."

- DELNWIS.RUN--This file contains an executable version of the Fortran program DELNWIS.F77.

Installation

The WAT_MOVE purging software is distributed in the directory WAT_MOVE>WAT_PURGE. This directory contains the following files:

- BDEL.CPL--This CPL compiles and binds the Fortran deletion program DELNWIS.F77 to create the executable program DELNWIS.RUN. The installer must have .DBA access to the NWIS WATSTORE directory to run this CPL.

- DELNWIS.F77--This file contains the Fortran source code for the deletion software.

- DELCOMM.INS--This is an insert file for DELNWIS.F77.

- PRGNWIS.CPL--This CPL controls the deletion process. The following section "Operation" provides information about changes that may be required in this CPL.

In addition, the installation requires files in the directory WAT_MOVE>LIBRARY. The section "Distribution of WAT_MOVE Software" contains information about this directory.

If water-quality data are to be deleted, a QW Index File may be required. The section "QW Index File Maintained by WAT_MOVE" provides further information about this file.

Any user running PRGNWIS.CPL must have a valid ADAPS user file record. That means that the user must previously have used the ADAPS system.

Operation

To delete data, the user must first build two files: a file of sites for which data are to be deleted and a file indicating which of the NWIS files are to be processed. These two files are defined as follows:

- SITE_LIST--This file consists of a list of sites, one site per record, with agency code in columns 1-5 and site number in columns 6-20. Both the agency and the site number are left justified within their fields. Information contained after column 20 is ignored and may be used for commentary. This list of sites is used to drive the deletion process.

- FILE_LIST--This file indicates which of the NWIS files are to be processed. Additional information is given in the section "File Selection."

If the user is deleting site records, records for all other NWIS files for a site also need to be deleted. This operation will avoid the possibility of "orphan" records in NWIS files; that is, records with no corresponding record in the Site File.

The CPL, PRGNWIS.CPL, controls the deletion process. Several statements in this CPL establish values for various parameters associated with the deletion.

These statements are:

```
&SET_VAR DBNUM := 01
&SET_VAR START_YEAR := 1901
&SET_VAR END_YEAR := 9999
&SET_VAR SLPATH := *>SITE_LIST
&SET_VAR FLPATH := *>FILE_LIST
&SET_VAR QXPATH := WATSTORE>DATA>QWINDEX
```

The parameters defined in these statements are:

- DBNUM--This is the number of the data base from which the NWIS data are to be deleted--a number between 1 and 99.

- START_YEAR--This is the begin water year for deletion of data in the ADAPS datum-corrections, shifts-by-time, shifts-by-stage, and unit-values files. The entire period of record is deleted for all other NWIS files.

- END_YEAR--This is the end water year for deletion of data in the four ADAPS files. If this parameter is set to "9999," then the current water year will be selected as the ending year.

- SLPATH--This is the pathname of the site-list file described above.

- FLPATH--This is the pathname of the file-list file described above.

- QXPATH--This is the pathname of the QW Index File, which is maintained by WAT_MOVE to ensure that primary keys for the QW File are unique. Further information about this file is given in the section "QW Index File Maintained by WAT_MOVE." This file is required only if water-quality data are deleted and if WAT_MOVE software was previously used to store the water-quality data to be deleted. The CPL must include the statement defining a pathname for the QW Index File even if the file does not exist.

This CPL may be invoked in one of three ways: interactively, as a phantom, or as a batch job. A file, PRGNWIS.COMO, containing a log of the deletion processing, is created in the directory from which PRGNWIS is invoked.

The subroutine TST_DEL may be used to test individual records to confirm that deletion should occur. This subroutine, which may be modified by a skilled Fortran programmer, is called with the following statement:

```
CALL TST_DEL(NODE,GNAME,BUFF,*)
```

where the arguments are defined as follows:

- NODE--This is the 6-character node name of the current node.
- GNAME--This is the 2- or 4-character identification of the file being processed. The identifications used are listed in the section "File Identification and Description."
- BUFF--This is a variable-length character string containing the data actually retrieved.
- *--This is an alternate return to be used for retaining records before deleting.

TST_DEL is invoked by WAT_MOVE immediately before each NWIS data record is deleted. The version of MOD_XTR supplied with the WAT_MOVE software simply returns to the calling program, performing no testing. The section "File Identification and Description" provides information about the record formats of the various NWIS files that would be required to modify the TST_DEL subroutine.

FILES PROCESSED BY COMPUTER SYSTEM WAT_MOVE

File Identification and Description

The NWIS files that are processed by the WAT_MOVE system are identified in table 1. The Maximum Size column indicates the maximum record length, in bytes, for the files. The Insert File column indicates the name of a file containing Fortran statements that define the record format. The insert files for ADAPS are in the NWIS directory WATSTORE>ADAPS>REV85.1>ADRSRC>INSERTS, whereas the insert files for GWSI, QW, and the Site File are in the directory WATSTORE>SUPPORT>INS.DIR.

File Selection

The FILE_LIST file indicates the NWIS files that are to be processed. If a FILE_LIST file is not available, all 20 NWIS files will be processed. If a FILE_LIST file is available, it will be read to determine which files are to be processed. The file consists of 20 records, one for each of the files listed in table 1. A Y in column 1 indicates that the file is to be processed, whereas any other character in column 1 indicates that the file is to be bypassed. All data after column 1 are ignored. A suggested format for this file is:

```
Y  Site File
Y  ADAPS datum corrections file
Y  ADAPS data descriptor file
                .
                .
N  GWSI State water-use file
Y  QW File
```

Note that processing of the GWSI State water-use file is suppressed in this example. The 20 NWIS files will be processed in the order listed in table 1.

Table 1.--*Files processed by the WAT_MOVE system*

Identification	Description	Maximum size (bytes)	Insert file
SITE	Site File data	550	SITECOMM.INS
ADDC	ADAPS datum-corrections data	870	INS.DCDATA.85
ADDD	ADAPS data descriptor	238	INS.DDDATA
ADDV	ADAPS daily values	2,268	INS.DV_DATA
ADIN	ADAPS instruments	2,026	INS.INSTRUMENT_DATA
ADMS	ADAPS measurements	216	INS.MSDATA
ADPR	ADAPS processor	5,538	INS.PROCESSOR_DATA
ADRT	ADAPS ratings data	1,076	INS.RATING_DATA
ADST	ADAPS shifts-by-time	870	INS.STDATA.85
ADSV	ADAPS shifts-by-stage	2,870	INS.SVDATA.85
ADUV	ADAPS unit values	17,364	INS.UV_DATA
GWCO	GWSI construction data	160	CONSCOMM.INS
GWDI	GWSI discharge	100	DISCCOMM.INS
GWGE	GWSI geologic logs	200	GEOHCOMM.INS
GWHY	GWSI hydraulics	120	HYDRCOMM.INS
GWLE	GWSI water levels	50	LEVCOMM.INS
GWMI	GWSI miscellaneous	90	MISCCOMM.INS
GWOB	GWSI observation headings	75	OBSCOMM.INS
GWST	GWSI state water use	110	STWUCOMM.INS
QW	Water-quality data	4,200	QWCOMM.INS

Utility Programs

The utility programs and CPL's described in this section may be useful when installing or operating the WAT_MOVE system. In general, they are used to create the various files required for NWIS or to delete all the data in existing NWIS files. Also, for the QW system, a capability for creating the "NUMBER" record is provided. These utility programs are distributed in the directory WAT_MOVE>UTIL.

Unless otherwise specified, all following programs accept an argument of the data-base number (for example, R CHECK_NWIS 2). If no argument is given, the default data base is number 1. For protection, most of the programs display the data base being used. They also allow the user to exit the program if the data base is not the desired one.

The programs use the NWIS GPATH facility, which defines the proper pathnames for the various NWIS files. These names must be defined in the master GPATH file before any of the WAT_MOVE applications may be run. If a file pathname is missing, or if the requested data base does not exist, the program will fail.

The following utility programs operate on all NWIS files processed by WAT_MOVE:

- CHECK_NWIS.CPL--Invokes the Usage function of Prime's CREATK command. This CPL may be useful for checking the current count of records of the various NWIS files.

- ZERO_NWIS.CPL--Deletes all data from all NWIS files, while retaining the structures (templates) of the files. This routine will also cause the "NUMBER" record contained in the QW File to be deleted. Instructions for rebuilding the QW NUMBER record are given below.

The following utility program is available for maintaining ADAPS files:

- ZERO_ADAPS.CPL--Deletes all data from ADAPS NWIS files for the specified data base, while retaining the structures of the files.

The ADAPS system provides capabilities for creating and maintaining ADAPS files (ADAPS MA menu) so no utility programs for these functions are necessary.

The following utility programs are available for creating and maintaining the GWSI files:

- CREATK_GW.CPL--Creates all GWSI files for the specified data base.
- DELETE_GW.CPL--Deletes all GWSI files for the specified data base.
- ZERO_GW.CPL--Deletes all data from GWSI files for the specified data base, while retaining the structures of the files.

The following utility programs are available for creating and maintaining the NWIS QW File:

- BNUM.CPL--Builds the executable version of BLDNUM, BLDNUM.RUN.
- BLDNUM.F77--Fortran source code for BLDNUM that creates the "NUMBER" record required by the NWIS QW File. The QW NUMBER record contains information used by the QW system for allocating sample numbers to new water-quality records. This program must be run when a new QW File is created, or when the QW File indexes have been "zeroed."
- BLDNUM.RUN--Executable version of BLDNUM. This file is created by resuming BNUM.CPL.
- CREATK_QW.CPL--Creates the NWIS QW File for the specified data base.
- ZERO_QW.CPL--Deletes all data from the NWIS QW File for the specified data base, while retaining the structure of the files. This process will also delete the QW NUMBER record held in the QW File. The program BLDNUM is used to restore this record before repopulating the QW File.

The following utility programs are available for maintaining the NWIS Site File:

- CREATK_SITE.CPL--Creates the NWIS Site File template for the specified data base.
- ZERO_SITE.CPL--Deletes all data from the NWIS Site File for the specified data base, while retaining the structure of the file.

QW INDEX FILE MAINTAINED BY COMPUTER SYSTEM WAT_MOVE

Description

The QW File is unique among the NWIS files processed by WAT_MOVE in that the primary key for the data records is not some function of the agency and site number. Instead, it is an arbitrary number of the form yyyssssss, wherein yyy is the last 3 digits of the water year and sssss is a sequence number. Thus, water-quality data retrieved from two different nodes can have the same QW sample number. To ensure that each sample is stored with a unique identification on the destination node, a new file--the QW Index File--was created. This file consists of four fields: the data-base number, secondary key 7 from the associated water-quality record, the original sample number, and a new QW sample number. The secondary key 7 of the QW File is a string composed of several fields, including the agency code and site number. This key provides unique identification of QW File records. New

sample numbers are provided and entry made in the QW Index File if duplicate sample numbers occur from two or more different sources. The file, which is keyed on the first two fields, is maintained automatically by the WAT_MOVE software. The QW Index File is used as follows for the three sub-systems of WAT_MOVE:

- Retrieval. When water-quality records are retrieved, the QW Index File is checked to see if the original sample number was replaced during a previous loading using WAT_MOVE. If so, the original sample number is restored when the transaction record is written. The QW Index File need not exist for retrievals. If it does not exist, the QW sample numbers will not be checked.

- Loading. When water-quality records are stored, they are first checked using the sample number and secondary key 7 to ensure that the sample number is unique. If not, a new sample number is substituted and an entry is made in the QW Index File.

- Purging. When water-quality records are deleted, the QW Index File is checked to see if there is any associated entry. If so, the entry is removed from the QW Index File as the water-quality record is deleted. The QW Index File need not exist for deletions. If it does not exist, the QW sample numbers will not be checked.

Utility Programs

Two CPL's are provided for creating and initalizing the QW Index File: CREATE_QWINDEX.CPL and ZERO_QWINDEX.CPL. These CPL's, which are distributed in the directory WAT_MOVE>UTIL>QW, are described as follows:

- CREATE_QWINDEX.CPL--Creates the QW Index File, which is used by WAT_MOVE to ensure unique primary keys for the QW File. The pathname for this file is not defined in the GPATH software and is hard-coded in this CPL. The default--and recommended--pathname for this file is WATSTORE>DATA>QWINDEX. If the file is to be placed elsewhere, this CPL must be edited.

- ZERO_QWINDEX.CPL--Deletes all data from the QW Index File, while retaining the structure of the file. The pathname for this file will need to be edited if it is not WATSTORE>DATA>QWINDEX.

DISTRIBUTION OF COMPUTER SYSTEM WAT_MOVE SOFTWARE

This software may be obtained by contacting the U.S. Geological Survey, Montana District, Helena, Montana 59626. The software is normally distributed by transfer over the U.S. Geological Survey network GEONET. A CPL program is furnished which, when invoked, performs two functions: builds the directory structure required for WAT_MOVE and initiates transfer of the files that comprise the WAT_MOVE software. Installation and use of the software require coordination with the District System Administrator, who will assign disk space and establish access rights to the software and data.

The directory WAT_MOVE contains all the software and documentation of the system for moving NWIS data between data bases. The directory contains two files:

- INFO--Information similar to that in this section.

- FILE_LIST--Sample file-list file. Further information about this file is given in the section "File Selection."

The directory WAT_MOVE also contains seven sub-directories:

- DATA--Can be used to contain transaction files retrieved or transferred. Other directories can be used for retrieval or transfer by modifying the appropriate software in the WAT_GET and WAT_PUT directories. Directory access must be set to allow the FTS phantom appropriate rights.

- DOC--Contains documentation of the system.

- UTIL--Contains software for creating and maintaining NWIS files. This sub-directory contains four lower-level directories:

  SITE - Utilities associated with the Site File
  ADAPS - Utilities associated with ADAPS
  GW - Utilities associated with GWSI
  QW - Utilities associated with QW

- WAT_GET--Contains software for retrieving NWIS data from the source node(s). A copy of the retrieval software needs to reside on each node from which data are to be retrieved.

- WAT_PUT--Contains software for storing NWIS data at the destination node.

- WAT_PURGE--Contains software for deleting NWIS data.

- LIBRARY--Contains software common to the three sub-systems of WAT_MOVE. The files included are:

  I_RETR.F77--Opens or closes the GWSI and QW files.

  QWXCOMM.INS--Insert file containing Fortran statements defining certain variables associated with the QW Index File.

  QWXIO.F77--Handles all input and output for the QW Index File.

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