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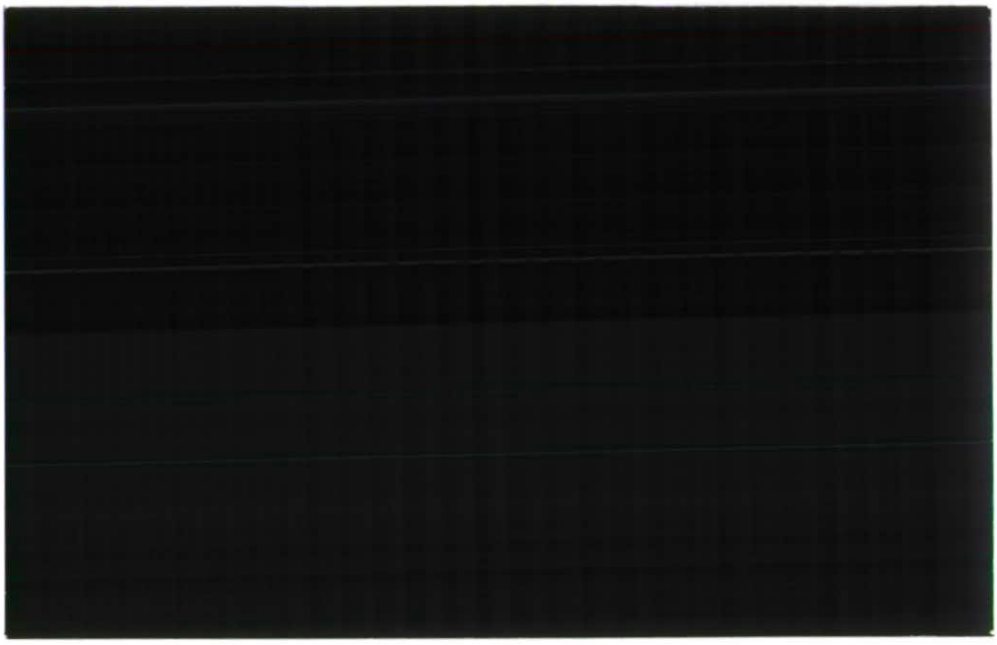

Natural Environment Research Council

Migration of data from HYDATA and GRIPS to WAMS

Logical and Technical Specification

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INTRODUCTION

Two NRA regions (Northumbria and Yorkshire, Anglian) currently use Institute of Hydrology database software to store some of their primary hydrological data. The systems used are called HYDATA and GRIPS and are both based on personal computers. The datasets generated using these systems will need to be transferred to WAMS before WAMS becomes fully operational. Table 1 summarises the locations and types of data to be transferred.

This document describes how these transfers will be achieved. In WAMS terminology, it provides the Logical and Technical specifications for these transfers. Topics discussed include the amount of data to be transferred, the software which will be used and the organisations who will perform the transfers. The methods which will be used to validate the transfers are also described.

This final version of the Logical and Technical specification supersedes the draft version which was prepared for a regional WAMS review meeting in Leeds on 19 Jan 1995, and the revised version submitted on March 4 1995 which incorporated the comments arising from that meeting (refs. 1 and 2). The main change from these previous versions is that, following delays in implementation of WAMS, data from HYDATA and GRIPS will now be downloaded into Hydrolog 2 DTF format (see Appendix A) rather than directly into a combination of the NTF and WAMS Gateway formats as previously anticipated. The DTF files will then be subsequently converted to Gateway format and loaded onto WAMS by the NRA regions as required.

SCOPE

Northumbria and Yorkshire region

HYDATA has been used for several years as the main database for storing river level and flow data in the former Northumbria region. All of the datasets are kept in the Newcastle office. Records are stored for some 60 stations. HYDATA is also used for storing some digitised rainfall data and river water temperature data. Most of these datasets were recorded on automatic loggers at 15 minute intervals. To allow for conversions from levels to flows, the database also contains rating curve equations for each station and a small number of current meter discharge measurements. The rating equation coefficients will need to be loaded onto WAMS but the discharge measurements are copied from another archive in Leeds and will need to be loaded separately by the NRA. All historical daily mean flow records for the former Northumbria region, which date back to the 1950s, are also archived. A separate HYDATA database is used to store reservoir daily mean inflow and abstraction data for about 23 stations.

GRIPS is used as the main database for storing borehole water level records for the former Northumbria region. Again, the database is kept in the Newcastle office. Records are stored for about 140 stations together with text information for some of these stations describing well construction details and lithological logs. Data values are stored at a variety of time intervals, depending on whether readings were made manually or by logger. A single record of barometric pressure is also kept on this archive and will also need to be transferred to WAMS. Some additional water chemistry data are also stored on GRIPS but are copied from

Region	Contact	Location	System	Data type	Interval	No of stations	Typical period or no. of values
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	River levels	15 minute	~60	1982-1994
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	Rainfall	15 minute	20	1982-1992
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	River flows	Daily	~60	1956-1994
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	Rainfall	Daily	~20	1982-1994
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	Reservoir abstractions/ inflows	Daily	23	~4 years
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	Reservoir storage	Daily	23	Up to 15 years
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	Rating equations	Not applicable	~60	A few per station (max)
Northumbria & Yorkshire	Dave Archer	Newcastle	HYDATA	River water temperature	Hourly	9	2 years
Northumbria & Yorkshire	Paul Butler	Newcastle	GRIPS	Borehole water levels	Hourly	~20	From 1993
Northumbria & Yorkshire	Paul Butler	Newcastle	GRIPS	Borehole water levels	8 hourly	40-50	From 1969
Northumbria & Yorkshire	Paul Butler	Newcastle	GRIPS	Borehole water levels	Daily	16	From 1969
Northumbria & Yorkshire	Paul Butler	Newcastle	GRIPS	Borehole water levels	Monthly	50	From 1969
Northumbria & Yorkshire	Paul Butler	Newcastle	GRIPS	Barometric pressure	Daily	1	From 3/12/93
Northumbria & Yorkshire	Paul Butler	Newcastle	GRIPS	Borehole construction details	Not applicable	140	A few pages of text
Anglia	Glen Watts	Peterborough	HYDATA	Naturalised flows	Daily	~30	1932-1994
Anglia	Mark Huband	Ipswich	HYDATA	River levels	Hourly	5-10	10-15 years
Anglia	Mark Whiteman	Brampton	HYDATA	Misc. flows	Daily	~6	~10 years
Anglia	Ian Gray	Lincoln	HYDATA	River levels	15 minute	~6	Up to 1 year

Table 1 *Summary of data to be migrated from HYDATA & GRIPS to WAMS (Northumbria & Yorkshire and Anglia regions)*

another database system which is the primary source for these data. These datasets will be transferred directly from the original archive and this will be performed by the NRA under a separate project.

Anglian region

Anglian region operate HYDATA systems in their Peterborough, Ipswich, Lincoln and Brampton offices. The entire contents of the database in Peterborough will need to be transferred to WAMS. In the remaining cases, only a limited set of flow and level records will require transfer. The Peterborough database contains some 30 daily flow records dating back to the 1930s which are being used in the Essex flow naturalisation study. This study will continue after WAMS is implemented so there may be a continuing requirement to use analysis facilities in HYDATA which are not initially available in WAMS. In the remaining Anglian offices, HYDATA is used mainly to analyse records copied from the regions's mainframe flow processing system. These records will be transferred directly from the mainframe system by the NRA as part of another project. However, a few records are kept on HYDATA in cases where the data are waiting for validation checks or are non-standard. In the Ipswich office, this consists of 5-10 sites with 10-15 years of hourly river level data. In the Brampton office, this consists of about 6 stations each containing about 10 years of daily mean flow records and, in the Lincoln office, there are a few months of 15 minute records for about 6 stations.

'Cleaning up' of data required

Two areas have been identified where some cleaning up may be required before datasets are transferred to WAMS. The first concerns the HYDATA datasets in the Northumbria and Yorkshire region. Due to the limited hard disc space available when the system was purchased, the data for different periods are distributed amongst a main system and 4 removable hard discs (called Bernoullis). These 5 datasets, and possibly the separate reservoir database, will need to be merged into a single database before the transfers to WAMS can be started. Since HYDATA datafiles are both encrypted and accessed via pointers, merging can only be done by exporting and reimporting the data via ASCII datafiles, or more effectively by using the low level routines within HYDATA. It is proposed that the initial merge is performed at the Institute of Hydrology using low level routines and that the merged database is then installed in Newcastle on the network server.

The second area concerns the borehole water levels entered onto the GRIPS system used by Northumbria and Yorkshire region. Values are entered as 'depth to water' relative to a datum, where the datum level is sometimes changed as often as several times a year. Each time the datum is changed, GRIPS corrects all values on the database for that station to the new datum value. However, values are stored on GRIPS as water level elevations relative to sea level. These elevations can be printed, plotted etc but there is no facility to write out these values to a datafile to allow easy transfer to WAMS. The GRIPS software will therefore need to be modified to include this facility, or a simple utility program could be written to extract these values from outside the database.

CONSTRAINTS

No constraints known at present except possibly that:

(a) HYDATA is designed for operation on stand-alone (single user) personal computers so some experimentation may be required to install the merged Northumbria and Yorkshire databases on the network server. However, HYDATA has been operated successfully on several Novell networks overseas so it should hopefully be possible to devise a successful way of operating HYDATA in this case.

(b) All of the information available at present suggests that conversion of 'depth to water' values to elevations on GRIPS should be possible automatically. However, this will only be proven once the new software has been written. If automatic conversion is not possible, some manual intervention may be required to apply correction factors to the data resulting from datum level changes.

DESCRIPTION OF HISTORIC DATA REPOSITORY

HYDATA and GRIPS are both produced by the Institute of Hydrology. HYDATA is designed for the storage and analysis of surface water data whilst GRIPS is designed mainly for groundwater data. Northumbria and Yorkshire region use both HYDATA and GRIPS whilst Anglian region only use HYDATA. HYDATA systems are used in Newcastle, Peterborough, Ipswich, Brampton and Lincoln whilst GRIPS is only used in Newcastle.

Both HYDATA and GRIPS use a data storage system developed by the Institute of Hydrology. Data values are stored in compressed form in a series of encrypted datafiles. Index files give the location of each dataset and so provide access to the data. Values are identified using the following hierarchical structure:

Data type (e.g. flow)
Measurement location (station number)
Period (usually a range of years)
Value (at a given date/time)

Some data types can have data flags associated with each data value (e.g. 'estimated'). GRIPS can also store a considerable amount of descriptive data such as borehole construction details. For GRIPS, access to the data can only be obtained via the software system itself. For HYDATA, there is the additional option of using a range of utility programs and FORTRAN subroutine libraries supplied with the system.

DESCRIPTION OF HISTORIC DATA FILES

For both HYDATA and GRIPS, data values are stored in an encrypted form which will not be recognised by WAMS. Data values will therefore need to be written to ASCII (i.e. normal text) datafiles on personal computer before handing over for loading on WAMS. It is proposed that each data file will normally contain the complete record for a single location and data type e.g. all the flow records available for a site since records began. A simple naming convention will be used for files identifying the station and type of data. For example, the entire flow record for Northumbria and Yorkshire station 24008 (Wear at Witton Park) might be stored in a file called Q24008.DAT where Q indicates a flow record. However, for HYDATA records, the option will also be provided to extract part of a record; for example all the values in a given period.

Table 1 gives an estimate of the number of data files which will be created for transfer. A useful measure of the quantity of data to be transferred is the number of station years. For example, 2 stations each with 15 years of data would contribute 30 station years of data. Table 2 summarises the estimated volume of data in each category. The estimates of disk storage space are based on the assumption of 35 bytes per data value, which should be sufficient to accommodate all of the types of data stored on HYDATA and GRIPS together with date and time entries against each value. These values are calculated for the NTF format suggested in the March 4 version of this specification; for the final format adopted (DTF; see later) the volumes should be lower although in some cases (e.g. daily data) may increase slightly since there is a requirement to write a date header record at the start of each new day of data in DTF.

DIFFERENCES BETWEEN HISTORIC AND WAMS DATA

HYDATA is primarily a storage system for time series data and only has limited facilities for storing descriptive information relating to each dataset. The general approach taken will therefore be to extract only the time series data on the assumption that the NRA regions will supply and load any supplementary information at a later date (if required). This also ties in with the Regional Migration strategy being adopted by Northumbrian and Yorkshire region (ref. 2).

In HYDATA, datasets are identified by the data type, station number and period. For time series data, the information which can be extracted from HYDATA for a given series consists of:

a) Station descriptor (name)
b) Basin number
c) Latitude/longitude
d) Altitude
e) Catchment area
f) Max/min permitted values
g) Max change allowed between successive values
h) Data flag names (e.g. estimate)

However, discussions with the NRA regions suggest that it will be more efficient to load these entries manually onto WAMS using the on-line Gateway input facility (or some other suitable method). In part, this is because the entries on HYDATA (and GRIPS) may not be sufficiently precise for transfer to a GIS based system. For river level data, HYDATA also stores the parameters of the rating equation to be used in converting levels to flows and these may be in a suitable form for automatic transfer to WAMS.

The bulk of the HYDATA data consists of time series values at regular intervals in time. Dates and times will be supplied against each data value as recommended by the national WAMS team (ref.2) and as required in DTF format. Most of the data on GRIPS also consists of time series values and will be transferred using the same basic approach as for the HYDATA data. The main difference with HYDATA is that some readings of water level may not be at equal intervals in time. GRIPS also contains some limited information on borehole construction details and lithological data which will need to be transferred. Discussions with the NRA suggest that, since this information is only present for some

Interval	No of values per year	Estimated no of station years	Estimated volume (Mb)
15 minute	35,040	1,006	1,233.8
Hourly	8,760	152	46.6
8 hourly	1,095	1,170	44.8
Daily	365	5,405	69.0
Monthly	12	1,300	0.5
Occasional			<0.1
Total			**1,394.8**

Table 2 *Estimated volume of data to be transferred*

stations, and in some cases may be incomplete, it will probably be more efficient for the Newcastle office to load these entries manually rather than to try and automate this procedure.

THE MIGRATION PROCESS

For both HYDATA and GRIPS, the basic procedure used will be to download data values from each database into ASCII (normal text) datafiles in DTF format. For each type of data (e.g. levels, flows) the usual option will be to download all of the data available for each station into single data files. Using the standard DTF format, each file will contain a small amount of header text sufficient to uniquely identify the source, type and period of the data. Missing entries required by WAMS will then be generated by Input Catalogues set up by the NRA regions when required. Depending on the size of the datafiles, the data will probably be supplied either on tape or floppy disc to the WAMS project team for loading onto WAMS.

The migration will be achieved as a collaborative effort between the Institute of Hydrology, the NRA offices and the WAMS project team. The Institute of Hydrology's main role will be to write software to make the transfers as straightforward as possible. For HYDATA, this will mean writing a menu driven program which prompts for the dataset(s) required and the file(s) into which the data will be written. The program will be designed to run in batch mode i.e. the user will be able to specify everything required for a run, and then leave the software to follow through the set of instructions unattended. The files produced will be valid DTF load files requiring no further editing by the user. It will not be possible to produce any Gateway 3 files from the information stored on HYDATA or GRIPS and these will need to be loaded manually by the NRA regions. For Northumbria and Yorkshire region, the Institute will also merge all five (possibly six) HYDATA databases into a single database before the transfers to WAMS are started.

For GRIPS, the downloading software will only be used at most a few times so a simple (non menu) utility program will be prepared to dump all of the time series data on the Newcastle GRIPS system into DTF datafiles. If possible, a facility will also be provided to extract water level data as elevations rather then depths to water. User documentation will be supplied for both the HYDATA and GRIPS data extraction software.

The main work of selecting the datasets to transfer, generating the DTF transfer files and documenting and validating the transfers will be performed by the NRA. They will also set up the WAMS Input Catalogue entries, the WAMS data load software and procedures, and any remaining Gateway entries (particularly Gateway 3 entries) which will supply the information which cannot be obtained from HYDATA and GRIPS.

ACCEPTANCE CRITERIA

It is anticipated that the main acceptance testing will be performed by the NRA regions when the DTF files are loaded onto WAMS. Because of the large volume of data, it is suggested that the main validation of WAMS entries is done using various statistical summaries. For time series data, the most valuable check will be on cumulative total values, such as total annual rainfall or mean annual flow. If the annual values generated by WAMS agree throughout the period of record with those on HYDATA or GRIPS, then this is a good indicator that the individual data values agree. Maximum and minimum monthly or annual

values (and the times they occurred) could also provide a useful check. The following types of printout might be generated to assist in the validation work:

(a) Monthly mean or total summary tables for the whole record (daily records only)
(b) Annual mean or total values (time series records)
(c) Annual maximum and minimum values together with the times at which they occurred (15 min, hourly, 8 hourly data only)
(d) A list of dates/times, say 2 per year, generated at random with the associated data values (daily or less time series data)

For the low volume types of data (e.g. borehole construction details, lithological logs), the actual values stored on HYDATA and GRIPS could also be printed out for manual entry onto WAMS by the NRA regions. Using these printouts as a guide, the NRA regions could then generate the equivalent tables from WAMS and check that they agree with the originals generated from HYDATA and GRIPS.

TECHNICAL SPECIFICATION

Figure 1 summarises the Migration process. The individual tasks which need to be performed are labelled according to the organisation responsible for each component and are as follows:

IH1 - Write Logical and Technical Specification
IH2 - Download Northumbria and Yorkshire GRIPS database to DTF format
IH3 - Write program to extract data from HYDATA in DTF format
IH4 - Merge Northumbria and Yorkshire HYDATA databases

NRA1 - Prepare WAMS data load procedures and Input Catalogues
NRA2 - Generate DTF transfer files for loading onto WAMS
NRA3 - Load data onto WAMS and document transfers
NRA4 - Validate output from WAMS

(IH=Institute of Hydrology; NRA = National Rivers Authority)

Task IH1 was preparation of this document. The methods to be used for the remaining IH tasks are described in detail below. Some guidance notes are also given for the NRA tasks, although it will of course be the responsibility of the NRA regions and the WAMS team to determine the details of how these tasks will be performed.

The following sections describe the work to be performed under each heading:

Task IH1 - Write Logical and Technical Specification

Task IH1 was preparation and approval of this document after consultation with the WAMS project team and the NRA regions.

Task IH2 - Download Northumbria and Yorkshire GRIPS database to DTF format

A simple program will be written to download the Newcastle office's GRIPS database in a single operation. The data types accessed will be restricted to those which are to be transferred to WAMS by datafile (i.e. times series of water levels and barometric pressure

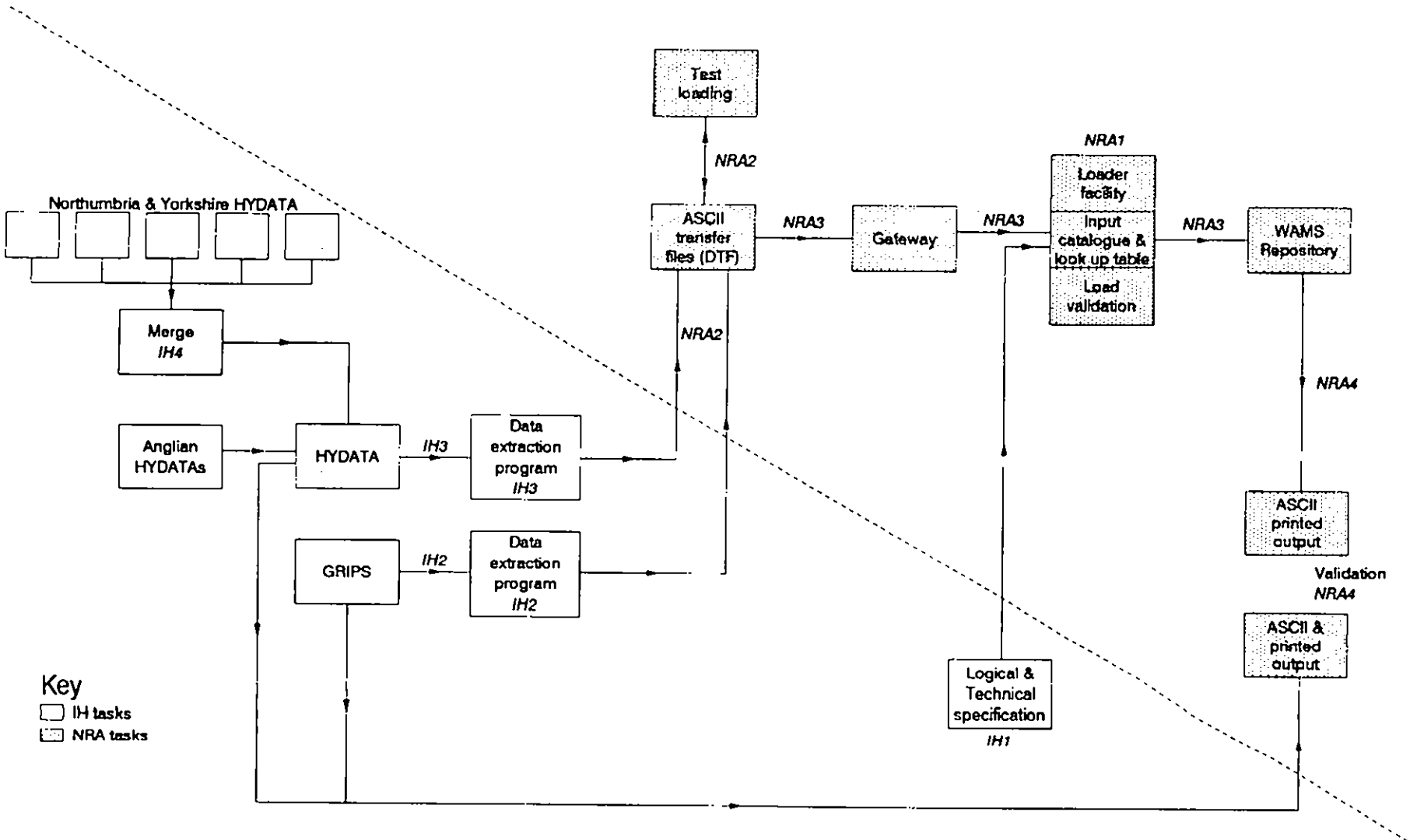

Figure 1 Schematic of migration approach for HYDATA and GRIPS time series data to WAMS via DTF

only; not construction details, lithological logs or water chemistry data). This program will probably use low level routines to access the data directly from outside the GRIPS database. The GRIPS software will also be modified at this stage to try and obtain depths to water in terms of elevation as required. The fallback position if this is not possible will be to supply the values exactly as currently stored on the database but with the option to apply a time varying datum correction to each value. These datum correction series would need to be generated by the NRA and stored in the form of ASCII data files.

It is anticipated that a test run of this program will be performed in Wallingford at the earliest possible opportunity using a copy of the database held in the Newcastle office. Assuming that this is successful, a copy of the executable version of the program will be provided to the Newcastle office to run as required (and immediately before each extraction of data for transfer to WAMS). Since this program will only be used a few times at most, it will not be particularly 'user-friendly' i.e. any questions will be at the DOS prompt and any documentation supplied will be the bare minimum required for successful operation. The ASCII files produced will be in DTF format as described in the following section.

Task IH3 - Write program to extract data from HYDATA in DTF format

This is the program which will extract data from the HYDATA databases for transfer to WAMS. Access will be via a set of FORTRAN subroutines which can read data directly from the database. The program will be menu driven and will prompt the user for the information required for the type of transfer being undertaken; for example, the data type (e.g. flow), the station identifier (e.g. 24008), the data period and the destination for the data. The user will also be able to select a subset of the stations on the database via a batch control file together with any changes to the periods of record required and any other information required for the transfer. The program will include an option to select and run batch files of this type, thereby allowing data extractions to be performed in a single operation (e.g. overnight). It is not intended to include any help screens within the programs but sufficient documentation will be prepared for users to operate the programs unassisted. However, the program will display error messages to indicate any incorrect or inconsistent user actions or entries (e.g. 'no valid database in directory selected').

The main output from the program will be a set of ASCII datafiles in DTF format Each file will normally contain the entire record for a single station and data type (e.g. all the flow data for station 24008). However, the option of supplying only part of a record will be possible to permit ongoing transfers from HYDATA to WAMS after WAMS becomes operational. The datafiles will be written in Hydrolog 2 Data Transfer File (DTF) format Version 1.02. Appendix A contains the specification for this file structure. This structure should be suitable for all the types of time series data being considered and, possibly, for the transfer of rating equation coefficients.

It is proposed that, before finalising the data transfer program, some sample datafiles are prepared for each type of data to be transferred from HYDATA and GRIPS to WAMS. These will then be checked by Northumbria and Yorkshire NRA region to ensure that they conform to DTF version 1.02 format. The specification for this program will be frozen on successful completion of this stage and any further changes will be an additional task to be agreed between the NRA and IH.

Task IH4 - Merge Northumbria and Yorkshire HYDATA databases

HYDATA databases are most easily merged using low level routines which were developed at the Institute of Hydrology. These provide access to specific fields in the database and allow information to be copied between directories and/or merged in computer memory. The procedure used will be to assign the current main database as the target database; the merge utility will then be used to read each of the remaining databases in turn, verify and combine the values in memory and write the combined fields to a temporary directory. Once all six databases have been combined in a temporary directory, this new database will be checked for integrity and, if satisfactory, will be designated as the final, merged main database.

This merging operation will be quite lengthy to perform and may require some experimentation or manual intervention so it is best performed at the Institute of Hydrology. It is proposed that the six databases will be collected (on tape or hard disc), merged in Wallingford and then returned to Newcastle for installation on the network server. The final merge operation will be performed at a mutually agreed time, and will start with the archived Bernoulli files so that the interruption to work on the current HYDATA database is as short as possible (probably only 1-2 days).

NRA tasks

The following sections give some guidance notes which may help in planning and specifying how to perform each task:

Task NRA1 - Prepare WAMS data load procedures and Input Catalogues

The DTF files produced under Tasks IH2 and IH3 will need to be converted into a format that WAMS recognises. Input catalogues and/or look up tables will therefore be needed to map the header information in these files to their WAMS equivalents, and to map station identifiers to their national WAMS equivalents. Most of the mapping issues regarding data types should be easy to resolve once the full list of Business names becomes available. Table 3 summarises the minimum mappings which will be required for the data to be transferred from HYDATA and GRIPS (i.e. as specified in Table 1).

The question of reference numbering systems is not yet fully resolved and will require the NRA regions to fully decide which stations they plan to transfer, and whether they will continue to use local id's (aliases) or convert to the national system. At present, it seems that most HYDATA station numbers conform to the national system, although may possibly require a leading zero to conform to national standards (e.g. 24008 becomes 024008). However, at least some of the Anglian records are derived data and have their own reference numbering system. This is probably also the case for the GRIPS datasets held in the Newcastle office. **Note that it is not planned to specify any spatial information (e.g. the site grid references, station names, altitudes or datums) in these transfers and these will need to be loaded separately into WAMS by the NRA regions.** Although some of this information could be obtained from HYDATA or GRIPS it seems more efficient for the NRA regions to review and redefine these entries to ensure that they conform with the regional and national conventions in WAMS and are to the accuracy required by WAMS. For example, WAMS may require grid location data to a higher accuracy than held on HYDATA or GRIPS and the existing station names may not appear sensible when merged into a national database system (e.g. repeated use of 'River .... at .....' identifiers for river flow stations).

Table 3. *Summary of data types and attributes for transfer from HYDATA and GRIPS to WAMS (based on current usage by Northumbria and Yorkshire and Anglian regions)*

System	Data type	Units	Periodicity	Statistic	Description and/ or usage
HYDATA	LEVEL	metres above datum	15 min. Hourly	Instantaneous Instantaneous	River levels River levels
HYDATA	FLOW	cumecs	Daily	Mean	River flows Reservoir inflows and abstractions Naturalised flows
HYDATA	GENERAL	°C	Daily	Instantaneous	River water temperatures
HYDATA	RAIN	mm	15 min. Daily	Total Total	Rainfall Rainfall
HYDATA	STORAGE	Mm^3	Daily	Total	Reservoir storage
HYDATA	RATING	None			Rating curve coefficients (5 entries/curve)
GRIPS	LEVEL	metres above mean sea level	Hourly 8 hourly Daily Monthly	Instantaneous Instantaneous Instantaneous Instantaneous	Borehole water levels
GRIPS	PRESSURE	mbar	Daily	Instantaneous	Barometric pressure

Task NRA2 - Generate ASCII transfer files for loading onto WAMS

This work will be performed entirely by the NRA regional offices who will select the datasets to transfer and then perform and document the transfers. The transfer software prepared under Tasks IH2 and IH3 will be supplied with detailed operating instructions. The software will run in batch mode but, in the case of the Newcastle office, several batch runs may be required due to the large volumes of data to be transferred (i.e. relative to the hard disk capacity of current personal computers). Files will probably need to be transferred either by tape or by network for loading onto WAMS.

NRA3 - Load data onto WAMS and document transfers

Methodology/timing to be decided by the NRA (regions or national ?) and presupposes DTF read facility implemented in WAMS as planned.

NRA4 - Validate output from WAMS

Again, the level of testing required should be determined by the NRA regions. The notes given in the Acceptance Criteria section (see above) give some indication of the types of check which could be performed.

REFERENCES

1. WAMS - Migration of data from HYDATA and GRIPS to WAMS. Comments on IH Draft specification. NRA (Northumbria and Yorkshire) Memorandum DA/HS, 18/1/95.

2. WAMS: Feedback from review of regional Interface and Migration strategy and products with the national WAMS team. Workpoints and points of information from WAMS review - 18th and 19th Jan 1995. NRA Memorandum A:\DN950120.WPD, 7/2/95.

Appendix A

Data Transfer File structure

HYDROLOG 2 'DTF' (DATA TRANSFER FILE) STRUCTURE

Version 1.02, 4 August 1992

File naming convention

The files should be named as follows :-

site reference .DT *file number*

where site reference may be any alphanumeric text,
and file numbers range from 0 to 9, A to Z.

eg. KINGSFLD.DT0

File structure

NB - If there is more than 1 field in a record then each field should be separated by a comma.

Text shown in quotation marks is comment which must be written to the file exactly as shown.

Record	Field Type	Description/Comments	
1	String	"HYDROLOG DTF VERSION 1.02 COPYRIGHT HYDRO-LOGIC LTD"	
2	String	"=========="	
3	String	"DATA SOURCE "	)
	String	36 character alphanumeric text	)
4	String	"DATE CREATED"	) Reserved for user
	String	8 character alphanumeric text as DD/MM/YY	) information only) as file header
5	String	"TIME CREATED"	)
	String	8 character alphanumeric text as HH:MM:SS	))
6	String	"----------"	ASCII character 45 Marks start of a log
7	String	"SITE REF "	
	String	20 character alphanumeric reference no. in any format with spaces padding to fill field	
8	String	"LOGGER ID "	
	String	20 character alphanumeric reference no. in any format with spaces padding to fill field.	
9	String	"PARAMETER "	
	String	12 character alphanumeric name with spaces padding to fill field. eg. For a water level record the parameter name would be WATER LEVEL	
10	String	"UNITS "	
	String	12 character alphanumeric name, with spaces padding to fill field. eg. For a water level record the unit name would be mAOD or mBDAT for above ordinance/below datum records respectively.	
11	String	"START DATE "	
	Integer	Year no. of log start date as YYYY	
	Integer	Month no. of log start date as MM	
	Integer	Day no. of log start date as DD	

12 String "START TIME "
Integer Hour of log start time as HH
Integer Minute of log start time as MM
Integer Second of log start time as SS

13 String "END DATE "
Integer Year no. of log finish date as YYYY
Integer Month no. of log finish date as MM
Integer Day no. of log finish date as DD

14 String "END TIME "
Integer Hour of log finish time as HH
Integer Minute of log finish time as MM
Integer Second of log finish time as SS

Readings/day marker block:

15 Integer = 1 Reading code indicates day marker
Integer Year of start date as YYYY) Must be same date
Integer Month of start date as MM) as record 10
Integer Day of start date as DD)
Real = 0

16 Integer = 7 Reading code indicates start of log
Integer Hour of log start as HH) Must be same time
Integer Minute of log start as MM) as record 11
Integer Second of log start as SS)
Real = 0

All other readings in the block will be of the same form with the reading codes and other fields as follows -:

Either:

j Integer = 0 Reading code indicates logged reading
Integer Hour of logged reading or observation as HH
Integer Minute of logged reading or observation as MM
Integer Second of logged reading or observation as SS
Real Reading recorded at this time

or :

k Integer = 1 Reading code indicates day marker
NB - Day markers are required for every single day of the log.
Integer Year of start date as YYYY
Integer Month of start date as MM
Integer Day of start date as DD
Real = 0

or :

n Integer = 9 Reading code indicates end of log
Integer Hour of end of log or observation as HH
Integer Minute of end of log or observation as MM
Integer Second of end of log or observation as SS
Real Checksum total of all readings in this log

NB - The last (nth) record in the block must start with a reading code =9 and contain the log end time, which should be identical to record 14.

After each data block there are three terminating records defined as follows:

17 String "DAY MARKERS "
Integer No. of lines with first field =1, a midnight day marker
18 String "NO READINGS "
Integer No. of lines with first field =0, a recorded reading
19 String "**********" Marks end of log

EXAMPLE OF 'DTF' FILE STRUCTURE

```
"HYDROLOG DTF VERSION 1.02 COPYRIGHT HYDRO-LOGIC LTD"
"=================================================="
"DATA SOURCE ","NEWLOG Logger                "
"DATE CREATED","04/08/90"
"TIME CREATED","09:41:47"
"----------"
"SITE REF    ","KING              "
"LOGGER ID   ","439               "
"PARAMETER   ","WATER LEVEL "
"UNITS       ","mAOD       "
"START DATE  ",1990,03,21
"START TIME  ",10,14,04
"END   DATE  ",1990,03,22
"END   TIME  ",09,14,04
1,1990,03,21,0
7,10,14,04,0
0,10,14,04,69
0,10,29,04,81
0,10,44,04,81
0,10,59,04,80
0,11,14,04,85
0,11,29,04,81
0,11,44,04,84
0,11,59,04,89
0,12,14,04,88
0,12,29,04,87
0,12,44,04,93
0,12,59,04,91
0,13,14,04,91
0,13,29,04,95
0,13,44,04,95
0,13,59,04,90
0,14,14,04,97
0,14,29,04,97
0,14,44,04,99
0,14,59,04,98
0,15,14,04,100
0,15,29,04,103
0,15,44,04,95
0,15,59,04,96
0,16,14,04,98
0,16,29,04,101
0,16,44,04,94
0,16,59,04,99
0,17,14,04,96
0,17,29,04,96
0,17,44,04,98
0,17,59,04,94
0,18,14,04,96
0,18,29,04,97
0,18,44,04,90
0,18,59,04,90
0,19,14,04,93
0,19,29,04,94
0,19,44,04,93
0,19,59,04,94
0,20,14,04,92 0,20,29,04,87
0,20,44,04,91
```

```
0,20,59,04,91
0,21,14,04,85
0,21,29,04,88
0,21,44,04,90
0,21,59,04,87
0,22,14,04,90
0,22,29,04,90
0,22,44,04,87
0,22,59,04,87
0,23,14,04,87
0,23,29,04,89
0,23,44,04,88
0,23,59,04,90
1,1990,03,22,0
0,00,14,04,90
0,00,29,04,88
0,00,44,04,90
0,00,59,04,88
0,01,14,04,88
0,01,29,04,90
0,01,44,04,89
0,01,59,04,89
0,02,14,04,88
0,02,29,04,89
0,02,44,04,90
0,02,59,04,93
0,03,14,04,89
0,03,29,04,95
0,03,44,04,94
0,03,59,04,92
0,04,14,04,95
0,04,29,04,90
0,04,44,04,97
0,04,59,04,94
0,05,14,04,93
0,05,29,04,93
0,05,44,04,92
0,05,59,04,93
0,06,14,04,93
0,06,29,04,90
0,06,44,04,92
0,06,59,04,92
0,07,14,04,94
0,07,29,04,96
0,07,44,04,92
0,07,59,04,90
0,08,14,04,93
0,08,29,04,90
0,08,44,04,95
0,08,59,04,92
0,09,14,04,95
9,09,14,04,8500
"DAY MARKERS ",2
"NO READINGS ",93
"**************"
```


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