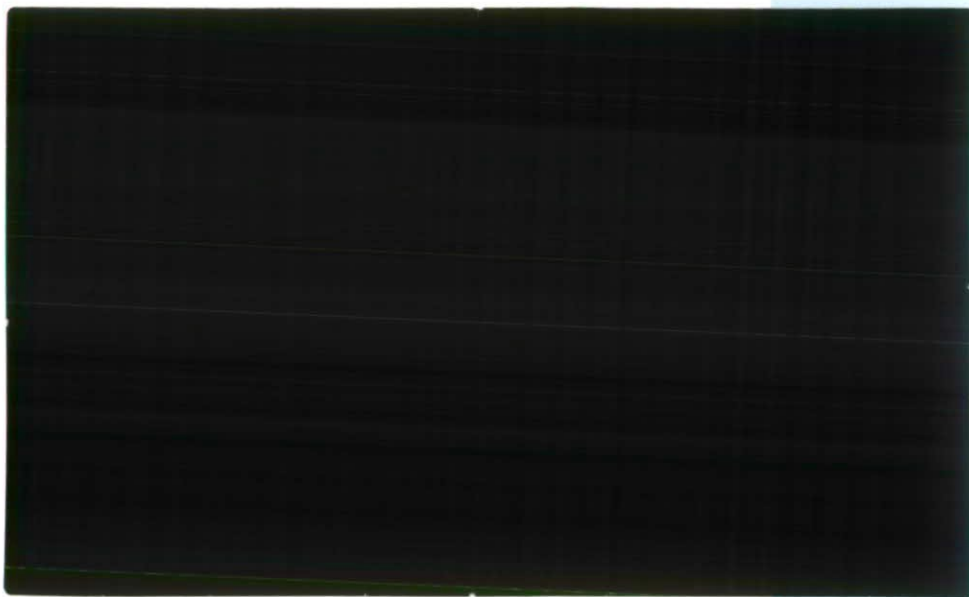The

Centre for Ecology & Hydrology

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NATURAL ENVIRONMENT RESEARCH COUNCIL

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Direcção Nacional de Águas
Ministério da Energia e Águas

HYDATA v4.2 training course
and database upgrade

Luanda, Angola
18-27 March 2003

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April 2003

Summary

The HYDATA data processing and analysis system, developed by the Centre for Ecology and Hydrology, is used in more than 50 countries world-wide, and is the national database system for surface water data in more than 20 countries. In Angola, a DOS-based version of HYDATA was used in the mid-1990s. A new Windows version of HYDATA was released in August 1999, and provides several improvements over the original DOS-based system. Version 4.1 of this Windows software was provided to Direcção Nacional de Águas (DNA) in 2001 but the main database was not upgraded at this time. The Norwegian funded NVE project allowed for the transition of the national database from DOS to Windows, including database upgrade, translation of the software into Portuguese, writing of bespoke data management software to standardise the methods of importing data, and for training for DNA staff. Between 18 and 27 March 2003, a workshop for staff from the Hydrological Data Management Department of the National Directorate of Water was held at their offices in Luanda. Staff learned how to use the Windows version of HYDATA, and how to install the software and import new data files. This report provides a record of the workshop, the software and training provided, and the database upgrade.

Contents

1 Introduction

1.1 BACKGROUND TO THE USE OF HYDATA IN ANGOLA

Hydrometeorological data are used in all aspects of water resources planning, management and operation. These include the design of irrigation schemes and river training works, flood warning and post-event analyses of heavy tropical rainfall and floods, low flow analyses, particularly in relation to river intakes for water supply and irrigation, and investigations of soil loss and sediment runoff. The Centre for Ecology and Hydrology's HYDATA software is a purpose-made personal computer-based database and analysis system for processing hydrometeorological data. HYDATA includes many facilities, including those to develop rating curves, to perform hydrological analyses such as flow duration curve derivation and low flow analysis, and to produce yearbook presentations of data. The first version of HYDATA was produced in the mid-1980s, and ran under the DOS operating system using the mainframe database system in use at the time for the UK national surface water archive. Since then, HYDATA has been upgraded several times, the final DOS version (v3.21) was released in the mid-1990s and a Windows version (v4) was released in 1999, the current edition is v4.2.5. This and earlier versions of HYDATA have been used in more than 50 countries world-wide, and form the national database system for surface water data in more than 20 countries.

The impetus to use HYDATA in Africa has come from several sources. Since its initial release, it has been used independently in several countries, either for the national database or in support of hydropower, water supply and other projects. Since 1990, with support from WMO (World Meteorological Organisation) and DFID (UK Department For International Development, formerly Overseas Development Administration), more than 100 African hydrologists and hydrometeorologists have received training in HYDATA and hydrological database techniques at a series of courses held annually at the Institute for Meteorological Training and Research in Nairobi, Kenya.

Since 1992, again with DFID support, HYDATA has provided the database system for the Southern Africa FRIEND project. FRIEND (Flow Regimes from International Experimental and Network Data) is a contribution to the International Hydrological Programme (IHP) of UNESCO, and is one of two cross-cutting themes in IHP VI "Water interactions: Systems at Risk and Social Challenges". Since 1998, HYDATA has also provided the database system for the SADC (Southern African Development Community) component of the WHYCOS project. WHYCOS (World Hydrological Cycle Observing System) is a long-term project supervised by WMO which aims to strengthen the technical and institutional capacities of hydrological services to capture and process hydrological data, and meet the needs of their end-users on the status and trend of water resources. SADC-HYCOS is a major regional project covering the 11 countries of Southern Africa.

The National Directorate of Water (DNA) within the Ministry of Energy and Water in Luanda is responsible for the collection and publication of river flow data in Angola. The first hydrometric stations were opened in 1951 and, up to 1965, some 60 stations were operated, increasing to 240 by the time monitoring ceased in 1975. Levels were generally measured using Ott chart recorders, with charts replaced at monthly intervals. Flows were generally estimated from the standard ISO form of rating curve calculated on the basis of occasional discharge measurements made using Ott flow meters operated from bridges, boats or cableways. Due to the war, operation of almost all of these stations ceased, many immediately at its outbreak in 1975. Level and flow records are stored within DNA. In the late 1980s, a PC system was adopted based on the HYDATA and in 1996 staff from what was then the

Institute of Hydrology travelled to Luanda to install the Portuguese version of the DOS HYDATA v3.1. All hydrometric data was imported into this system and training was provided in its use. The software was used and maintained until 2003. In 2001 the SADC-HYCOS project provided the Windows software HYDATA v4.2 of the software and some staff were given training in particular aspects of its use as part of this project and the Southern Africa FRIEND project. A decision was made not to transfer the national database to version 4.2 because of the lack of a Portuguese translation and the lack of a full training course for all staff. The Windows version was used for the HYCOS project, which used a separate database, for storing and validating data from the two stations that had been installed, downloaded from the website. The NVE project aims to resurrect gauging stations and build capacity within DNA. CEH was involved in the data management side of this and assisted with five main issues:

- Upgrading the National database to Windows and integrating the HYCOS database.
- Providing a Portuguese version of the software
- Developing bespoke software to provide a simple data transfer mechanism
- Training more staff in the use of HYDATA
- Providing ongoing support for an agreed period of one year through a phone / fax / email help line

The first four of these were accomplished during a visit to Luanda between 18 and 27 March 2003.

NVE and DNA staff have currently resurrected two stations, the Cuanza at Bom Jesus where stage data are recorded with an Ott limnigraph and an Ott logger, and the Bengo at Cabiri where stage data are currently being recorded with an Ott logger. A SADC-HYCOS station was located at Cabiri with data available for some of 2001 and 2002.

1.2 THE HYDATA V4.2 SOFTWARE

HYDATA is a hydrological database system designed to store the types of data most commonly required in water resources studies, including river levels and flows, reservoir, dam and lake levels and storages, rainfall and other meteorological data. HYDATA also includes facilities for developing rating curves relating river levels to flows and reservoir, dam and lake levels to storages. Output is provided in the form of "yearbook" style tabulations and graphs, and there are also powerful data transfer facilities. Options are provided for routine hydrological analyses, such as the derivation of flow duration curves and calculation of low flow statistics. HYDATA meets the need for a modern computer-based data archiving and retrieval system, which can be used by staff with little experience of computers, and yet is powerful enough to use for holding national records and for advanced hydrological analysis work.

A new version of HYDATA, which runs under Windows, was released in 1999. As well as being used as the database for the SADC-HYCOS project, it has also been adopted as the national database by six Caribbean and seven Southern and Eastern African countries, and by several other countries both for project work and as the national database. The Windows version maintains the functionality of the DOS version, as well as offering many new features under a standard Windows interface. For example, there is complete flexibility in data types, intervals and units, allowing users to define data types, the intervals at which they are measured and the units in which they are stored and displayed. Units used for storage and output need not be the same, and data may be stored at irregular intervals. A flexible time series data structure such as this solves the problems of storing non-regular time intervals of water level data or the zero levels which can occur through much of year in tropical countries. In addition, the gaugings and ratings editor has been improved, and now uses a novel fitting procedure in which the approximate positions of the rating curves can be defined by the user

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before calculating the optimum parameter values following ISO procedures. Power law and polynomial ratings are supported, as are multi-part ratings and ratings that shift with time. The reporting facilities have also been upgraded, and there is now full user control over fonts and character sizes, and a screen preview option standard for most types of output. There is also optional map-based access to the data. Although the map-front end is currently relatively limited, the inclusion of a map opens the way for more advanced functionality in later versions. This is supported by feedback from users which suggests that a more powerful map interface is desirable. Many other minor improvements have also been incorporated, based on suggestions from existing users of the DOS version.

2 Upgrading the DOS database

The upgrade to the Angolan national database was performed mainly prior to the visit by CEH staff. All hydrometric data had been entered into the previous DOS version of HYDATA and so the upgrade could be made directly from this database. Initial problems occurred due to the errors in the DOS database, mainly concerned with the storage of data in inconsistent units but these problems were rectified.

2.1 SET UP OF STATIONS AND TIME SERIES

Following this upgrade the database consisted of 288 stations, with a new, non-language specific naming scheme below:

[Catchment -] River name – Station name (Station number)

e.g.

BENGO - LAGOA - LUMANGO (601813)

for the River Lagao at Lumango (601813), in the Bengo catchment

or

CUANZA - BOM JESUS (601902)

for the River Cuanza at Bom Jesus (601902), where the catchment is the same as the river name.

Attached to these stations were 129 daily mean flow series, 13 monthly mean flow series and 155 series storing gaugings and/or ratings and 265 daily water level time series.

The recently installed Ott loggers store stage data at 1 hour intervals and so time series at these stations were edited to allow this data to be stored. When further stations are resurrected to use this equipment this alteration must be applied before the data can be stored.

The HYCOS stations store data from a SERPE logger, including meteorological and water quality parameters. These stations were edited on the national database to allow this data to be stored. The following time series were added to the Bengo at Cabiri (601804) and the Cunene at Xangongo:
- 1 hour water level (logger)
- Irregular rainfall (logger)
- 1 hour air temperature (logger)

- 12 hour water temperature (logger)
- 1 hour total direct solar radiation (logger)
- 1 hour relative humidity (logger)
- 1 hour wind direction (logger)
- 1 hour wind speed (logger)
- 12 hour water turbidity (logger)

If further HYCOS stations are installed, the appropriate time series should be added to the database.

Data management software was written to incorporate the SADC-HYCOS software that loaded the data logger data directly into the database, see section 3.

2.2 LANGUAGE ISSUES

HYDATA 4.2 stores all strings used within the software in a table in the database. There is an option to store multiple languages within this table and to allow each user to select the desired language.

All of these strings were translated to produce a Portuguese version of HYDATA and the database installed at DNA could be used in Portuguese or English.

However some of the information in the database is entered by the user and cannot be stored in multiple languages, including:
- Station names
- Time series names
- Time series types
- Interval names
- Measurement types
- Data flag names

This information was also translated into Portuguese and a program written, as a macro in a spreadsheet called 'Language conversion.xls', to allow these strings in the database to be translated between the two languages. It is recommended that this is not a frequently performed operation, but that the database remains Portuguese unless specific reports or exports are required in English. The language strings were edited to create the most appropriate format for the annual yearbook reports. If strings within the database require further changes, these can be made through this spreadsheet.

2.3 PC AND NETWORK SETUP AT DNA

The HYDATA database was installed on a Windows 2000 server within the hydrological resources management office at DNA. The HYDATA software was also installed on 4 high-spec Windows XP machines (2GHz processors, 128MB RAM) on the existing Windows 98 SADC-HYCOS PC and on a further Windows XP laptop. The network ran at a speed of 100 Mbs which provided for very fast access to the database from all PCs. One PC was set up to allow the digitising of limnigraphs and this PC was therefore dedicated to data processing. One problem occurred whereby graphs from Windows XP machines could not be printed on a specific printer on the Windows 2000 server. This was though to be due to HYDATA's graphics component but was not considered to be too serious as every PC could print to at least one printer within the office.

3 Data loading software

Bespoke data loading software was written to allow all data from the various sources available to be imported within a consistent framework.

The three types of data file to be imported were:
- Ott logger files, 1 hour stage data
- Ott limnigraph files, digitised from a tablet, irregular stage data
- SADC-HYCOS project SERPE data loggers with numerous parameters at 1 and 12 hour intervals as well as irregular rainfall

Software was written to allow the user to select the file to be imported and the type of file and to reformat the file into the standard HYDATA TRANSFER FILE (HTF) format for automatic loading by the HYDATA Data Loader Module.
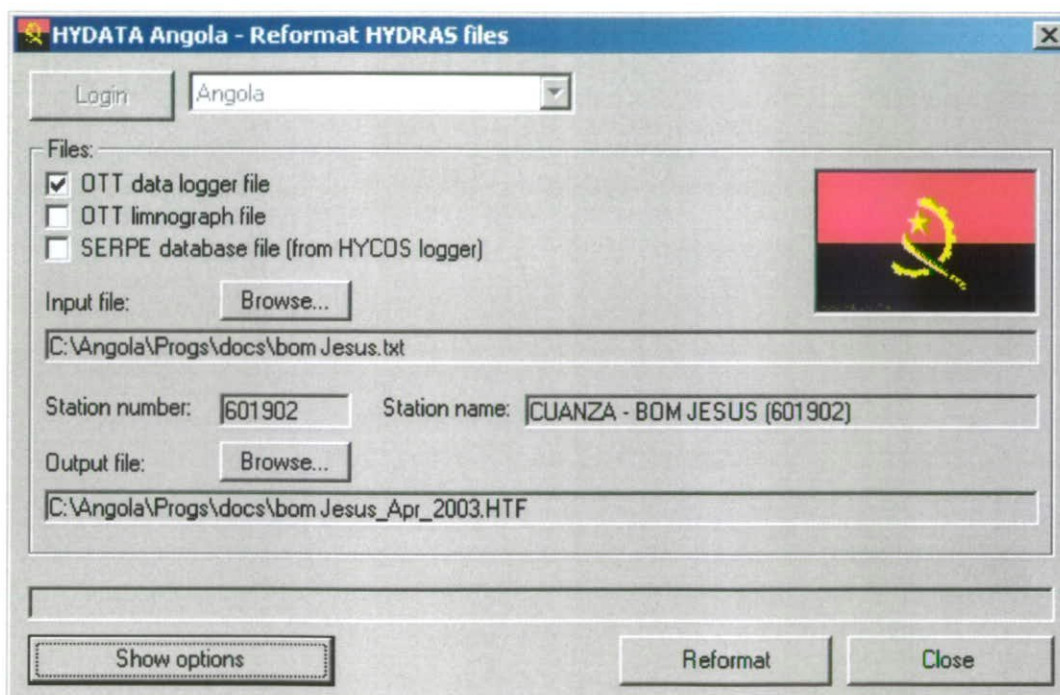
Notes on the use of the software were written and have been included in Appendix C Data Management Software Manual.

In order for the software to translate the HYCOS numbers from the SERPE logger data file into the National numbering system, the national database was altered so that the numbering system was set up to store National and HYCOS numbers for each station. Those stations within the HYCOS project must have their HYCOS number entered as the secondary number in order for the data loading to work.

e.g.

Station name	National number	HYCOS number
Bengo at Cabiri	601804	66163

4 HYDATA training

4.1 TRAINING WORKSHOP

The HYDATA v4.2 workshop was held in the offices of the Hydrological Resources Management Department in the DNA buildings between 18th and 27th March 2003. The computers previously mentioned were used for the training. No overhead projector facilities were available, but discussions and lecture sessions were held on some aspects of the software.

The workshop was attended by 6 members of the DNA staff, including some potential new members of the hydrological resources management department (Appendix A). Staff were trained on all aspects of the use of HYDATA as well as the bespoke data management software. The time available for training during the visit was shortened due to the difficult circumstances, and some key staff members were not available for the entire length of the training.

Levels of familiarity with computers and Windows varied amongst the group. HYDATA 4.2 has Windows-like functionality and its successful use depends quite heavily upon the ability to use Windows. To assist those lest accustomed to working with Windows, extra exercises were written to demonstrate the essential skills of running programs, editing documents, cutting and pasting text and copying files.

Staff were each provided with a complete set of the course material, which included colour paper copies of the overhead transparencies, and copies of the set of 19 prepared exercises covering all aspects of the software around which the training is based. At the end of the workshop, the staff were each presented with a certificate to formally record their attendance.

The main aim of the training was to give staff as much practical experience as possible in using HYDATA v4.2. A course programme was prepared which concentrated on both the more routine aspects of operation and more advanced topics, and this was followed fairly closely (Appendix B). The morning and afternoon sessions typically comprised a short presentation on the day's topic followed by prepared practical exercises on the computers. Each exercise comprises detailed instruction on how to carry out a particular operation, suggestions of alternative approaches or more advanced options, and questions to check understanding. The interactive nature of the workshop allowed staff ample opportunity to ask supplementary questions and discuss particular problems.

The full Angolan database was available to staff and was used in addition to the training databases to test the skills learnt on real data.

Training was focussed on the core aspects of data input and data management, though several DNA staff spent time learning how to fit and edit rating curves and how to use the more advanced analysis tools.

On the final day, NVE staff demonstrated the use of the data management system: downloading data from logger modules and digitising chart records, using the bespoke software to reformat the data files, and loading the files using the HYDATA Data Loader Module. The system seems to be well thought out, and with further practice under the direction of NVE staff, DNA staff should be competent in managing data within this system.

4.2 IMPORTANT ISSUES

With the addition of new stations and the resurrection of abandoned stations, it is expected that there will be much work required in the area of taking gaugings and fitting new rating curves. This are was covered during the workshop, but it is recommended that further training of staff in the theory and practice of this difficult subject is provided.

Another issue is that of data security. DNA are well placed to maintain a secure database, with a well established network and raw data and station description information sensibly documented and stored. This database represents an enormous investment in terms of time spent entering and checking data. It is therefore important to safeguard the data in as many ways as possible. It is also important to keep up-to-date anti-virus software on the computers to protect against viruses received over the network, the internet or simply from an infected floppy disk, and to restrict access to computers and the HYDATA database. HYDATA contains security features to restrict access to the data, in the form of user names and passwords for three different user levels.

Linked to the issue of data security is the final suggestion, for procedural improvement concerned database backups. Regular backups of the databases can be made by copying to another place on the file server, or to another computer. Overwriting previous backups immediately should be avoided. The recommended procedure is for an archive of previous backups to be generated, so that at least two recent backups of the database exist at any one time. This provides extra security for the database. After a specified period of time, to free up space, archived backups could be copied to CD/tape/zip-disk and deleted from the server. Periodically, backups may be sent to a secure repository for database archiving in the established Data Disaster Recovery Service at the Centre for Ecology and Hydrology which maintains copies of national databases in case of hardware failure, fire, war, etc in the host country. Under this scheme, data backups are regularly taken out of service and sent to CEH to be stored in case they are ever needed in the future. These data are held in strict confidence and no release or use of any information is permitted unless authorised by the parent body, in this instance DNA.

4.3 OTHER ACTVITIES

Staff may need to access both raw and processed data in the HYDATA database for further analysis work. They may also be increasingly asked for records by other organisations, such as other government departments, consultants and development agencies. For instance, Angola is a member of Southern Africa FRIEND and SADC-HYCOS, and there may be a need to exchange hydrological data with national hydrological agencies in other countries of the FRIEND project. The standard HYDATA system provides several basic methods for retrieving data e.g. copy and paste to spreadsheet or word document, export to CSV file. System management staff were also trained to use two HYDATA utility programs called the Data Loader and the Data Exporter to expand the range of options for transferring data into and out of HYDATA, by providing more flexibility in the formats in which data can be loaded to and retrieved from the database.

During the visit, and in subsequent communications, two other freely-available items of software were identified which may be of use to DNA: a drought analysis package specifically designed for Africa called ARIDA (Assessment of the Regional Impact of Drought in Africa) and a flood frequency analysis package called IHFLOODS.

ARIDA was developed as part of the UNESCO IHP Southern Africa FRIEND project (Tate *et al.*, 2000). The software applies a suite of drought analysis methods to daily flow series,

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stored on a HYDATA database. Each method uses a different definition of drought to provide indices of drought seriousness within the flow record. This context is then used to track the seriousness of an ongoing drought, placing the current situation into the long-term historical context. Time for training on this software was, however, unfortunately not available, but the software and manual were provided on a CD for future reference.

IHFLOODS was developed as part of the World Flood Study (Meigh & Farquharson, 1985; Meigh, 1995). The software is used to store and analyse annual maximum peak flows observed at river flow gauging stations, and information on the physical and climatic characteristics of the associated catchments. The analyses functions include the ability to fit several different frequency distributions to the data at a single site. However, IHFLOODS also includes facilities to select groups of stations by a number of different approaches, and to fit regional flood frequency distributions to the grouped data. It can therefore be used to develop regional flood frequency curves which can be used to make flood estimates at both gauged and ungauged sites in the region studied. This software was also provided on the CD.

Further discussions with NVE were had concerning the application of CEH's HYDRA software for small-scale hydropower potential estimation in developing countries. A copy of the demonstration version of this software, together with a manual and estimates of the likely scale of preliminary studies that would be required for its application in Angola, were provided.

5 Summary and recommendations

The HYDATA v4.2 software has been provided to the Direcção Nacional de Águas and a 1-week workshop for 6 staff has been conducted. During the 1-year software support period, telephone, fax and email support on technical problems relating to successful operation of the system are provided and also, should the need arise, advice on reinstating the system following computer failures or virus problems.

The new HYDATA 4.2 database has been established on a server within DNA and is available from 6 PCs on the local network. Data management procedures have been introduced that should be sufficient to allow the easy input of new data into the database as stations are established and more data is received. Bespoke software has been written to allow incoming data in all formats to be reformatted and loaded by the HYDATA Data Loader. Time series from the SADC-HYCOS project database were integrated within the national database to allow HYCOS data to be imported within the same framework, thus making HYCOS stations an integral part of the Angolan hydrometric network.

A fully Portuguese version of the database and software is now available, users can switch between English and Portuguese versions of the software very simply and all time series names, station names and other 'fixed' strings are in Portuguese to provide fully Portuguese reports, suitable for annual yearbooks. A program was provided, within a spreadsheet, to convert these 'fixed' strings between the two languages should this be required.

Although the training provided will enable staff to operate and maintain HYDATA and process data effectively, adequate training is essential to develop both technical capabilities and provide the necessary institutional strengthening to support the hydrological services in the future. Training should be seen as a continuing requirement, and some means found to repeat training at intervals in the future, in order to maintain staff development and provide sustainability. Such training can be on-the-job training of junior staff by more experienced senior staff. The area of gauging measurement and rating fitting will be of increasing importance over the coming years, and it is hoped that DNA staff will be provided with further training in this area in particular.

It is recommended that DNA plays a large role in any future SADC-HYCOS projects, to encourage the success of this project and thus assisting in the maintenance of these stations. It is hoped that a more active role in other regional hydrological projects, for instance Southern Africa FRIEND, will follow, and CEH applauds the efforts of this project to provide English language training to enable this.

The IT infrastructure within the hydrological data management group at DNA is now of a very high quality and it is recommended that efforts are made to maintain these standards.

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Appendix A List of workshop participants

Ms Luzia da Conceição
Mr Paulo Emilio Mendes
Mr Francisco Fernando Miguel
Mr Paulo Vompha
Mr Rui João Quivota
Mr Simão Sobrinho
Mr Olav Osvoll (NVE)

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Appendix B Workshop programme

Wednesday 19th March
Meeting to discuss programme for visit
Installation of HYDATA 4.2 software and database across the network
Creation of Portuguese language version of National database

Thursday 20th March
Windows familiarisation
Introduction to the principles of HYDATA
Reporting
Time Series Editor

Friday 21st March
Time Series Editor continued
Station and time series setup
Data analysis

Monday 24th March
Data analysis continued
Gaugings and ratings

Tuesday 25th March
Gaugings and ratings continued
Data conversion

Wednesday 26th March
Data management

Appendix C   Data Management Software Manual

The 'Angola Reformat' software was written to allow DNA to import water level and other data from all of the available sources into the HYDATA system. Source data files are processed and rewritten in the HYDATA Transfer File (HTF) format used by the HYDATA Data Loader Module software for controlled loading onto the database.

The following is a brief description of the software and instructions on its use.

Description of the Angola Data Management software and data files used

The Angola National database has data incoming from two principle sources.
- Stations on the national network
- Stations on the SADC-HYCOS network

The national network stations provide data in two formats:

- as data files digitised from charts
- as data files downloaded from Ott loggers

The SADC-HYCOS stations provide data as files downloaded from Serpe loggers.

All of these data files can be loaded into the HYDATA system.

HYDATA Transfer File

The HYDATA Transfer File, or HTF, format is a simple text file format of data files that stores all information necessary to HYDATA to store the data, and also additional descriptive and contextual information to allow data files to be read and their origins and meanings understood.

A HTF file applies to a single HYDATA database but within a file there can be data from many stations and many time series.

An example HTF file can be seen in figure A.1. At the top of the file is a 'File header' that describes the file and the database to which the file belongs. This contains information such as the date of creation of the file, the data flags used within the database, and a description of the data contained in the file.

Each different time series is stored in a 'record' and each 'record' also has a header. This is information pertinent to the context of the data within the HYDATA database, for example, station details (name, number), time series details (name, interval, time series type), as well as more descriptive information, appropriate to the time series.

The data is then listed in the file as columns with a format:
Date, Time (where appropriate), data value, flag, comment

```
HYDATA TRANSFER FILE
CREATED BY
DNA Luanda
METHOD CREATED

DATE CREATED
10-Apr-2003
TIME CREATED
16:32:20
NAME OF FILE
C:\Angola\Progs\docs\bom Jesus.txt
DESTINATION
C:\Angola\Progs\docs\bom Jesus.htf
CONTENTS
Hourly water level data from OTT loggers
TIME SYSTEM
Local
DATA FLAGS
Missing Data = 1
Start gap = 2
End gap = 4
Trace of moisture = 8
Estimated Value = 16
Interpolated Value = 32
Dubious Value = 64
Model Value = 128
Data flag 1 = 256
Data flag 2 = 512
NUMBER OF RECORDS
1
COMMENT


-----------
START OF RECORD
National Number
601902
TIME SERIES NAME
Water Level
INTERVAL
1 hour
DESCRIPTION OF RECORD
DATA
----------
12-Feb-2003,09:00,,1,
12-Feb-2003,10:00,,1,
12-Feb-2003,11:00,,1,
12-Feb-2003,12:00,2.320,,
12-Feb-2003,13:00,2.329,,
12-Feb-2003,14:00,2.320,,
12-Feb-2003,15:00,2.319,,
12-Feb-2003,16:00,2.361,,
12-Feb-2003,17:00,2.403,,
12-Feb-2003,18:00,2.409,,
12-Feb-2003,19:00,2.409,,
12-Feb-2003,20:00,2.409,,
12-Feb-2003,21:00,2.404,,
....
END OF DATA
NUMBER OF VALUES IN RECORD
72
END OF RECORD
END OF FILE
```

Figure A.1 *Example of HYDATA Transfer File format*

The Angola Reformat program creates a HTF file for each of the input files it is given. The HYDATA Data Loader Module (Fry, 2001) is able to read the file and find the appropriate information concerning which station and time series the data belongs to. This information is necessary in order to load the data.

It is therefore essential that the Angola Reformat program is able to write the information to the file. The fields within the record header that are necessary are Station number, Time series name, and interval. The station number can be read from the data file, but the other two fields can change. For this reason the user is given options to either:

- Enter fixed values for the time series name
- Allow the software to look up the time series name in the database

The second of these has a further two options for deciding the time series name if there are more than one water level time series for the station:

- Use the first water level time series for the station
- Alert the user and ask the user to select the time series

The interval is entered by the user, and this will be fixed in the database, changing only if the fixed language strings are changed, using the program within the 'Language conversion' spreadsheet. This will therefore be either '1 hour' or '1 hora'. Users should be aware that if this interval is incorrect, the data will not load correctly.

Using the Angola Reformat software

Install the software following the instructions below:

Run the software by clicking on the icon on the desktop, or by selecting Start|Programs|IH software|Angola Reformat or by double-clicking the file C:\Program Files\Institute of Hydrology\HYDATA 4.2\Angola Reformat
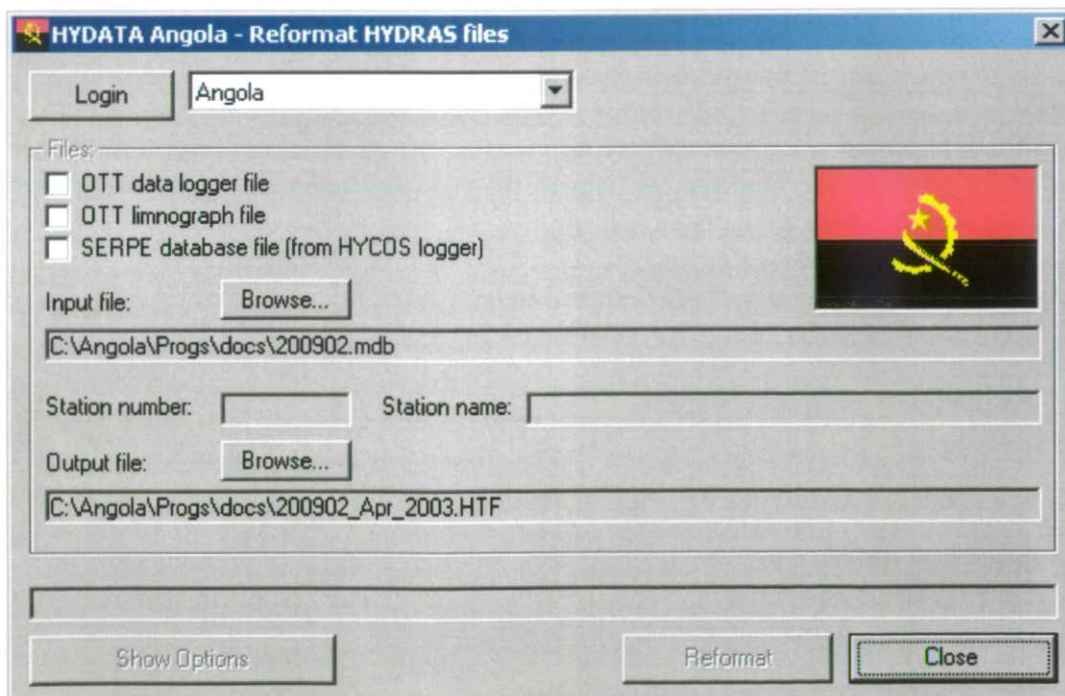

Figure A.2 *Angola Reformat program, main window*

Select the database from the list at the top of the form and click Login to show the Login details form
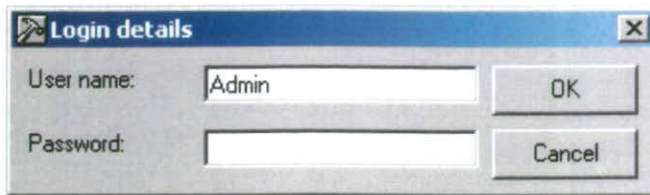
Figure A.3 *Angola reformat program database login form*

Enter the appropriate user name and password and click OK.

Select the type of file to be reformatted, Ott data logger file, Ott limnigraph\Chart file or SERPE database file (from HYCOS logger)

Click the Browse... button next to the Input file label to select the input file.
Select the file using the standard windows control

Click the Browse... button next to the Output file label to select the output file.
The file will be automatically given a name, created from the input file name and the current date. This name can be altered.
Select the file using the standard windows control

Users should not have to edit the options for the software on a regular basis, only if the database structure has changed or if the language of the fixed strings has been changed. If this is the case, click 'Show options' to check or edit the saved default options
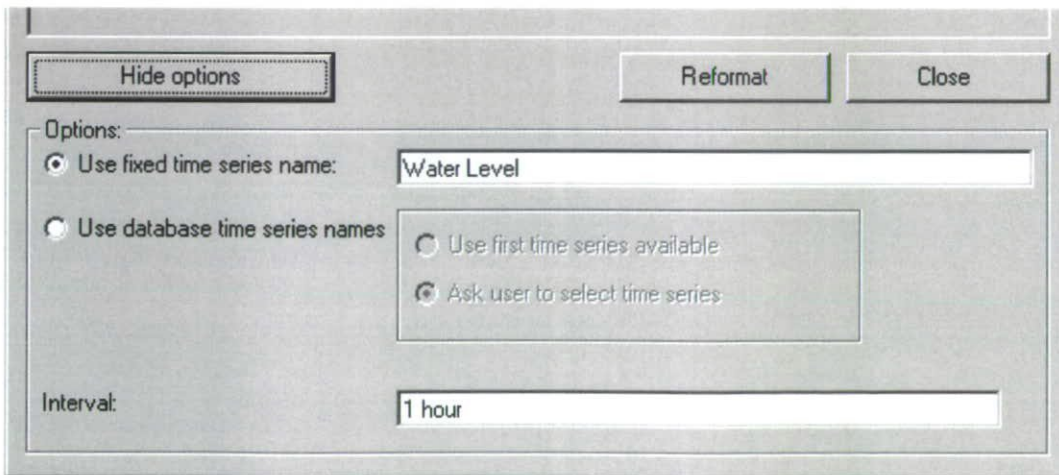

Figure A.4 *Angola reformat program options*

If necessary, enter a new time series name, or select to use the database time series names, and enter a new interval.

Click Reformat to reformat the file.

Click OK when the message appears informing that the reformatting is finished.

Select another input file and repeat the process, or click Close to logoff and close the software.

The appropriate HTF file, specified in the Output file option, should have been created and can be loaded by the HYDATA Data Loader module.

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Charts or limnigraphs

The charts are currently digitised using a CalComp digitiser and the Ott data management software. These files are then exported as comma separated value (CSV) data files, with a single water level value for each digitised point (or 'click' on the chart), as in figure A.5.

```
Data exported from Hydras3
0000601902;09/12/2002;11:57:45;2.855;"m"
0000601902;09/12/2002;12:44:51;2.843;"m"
0000601902;09/12/2002;13:42:56;2.823;"m"
0000601902;09/12/2002;15:17:14;2.820;"m"
0000601902;09/12/2002;17:15:24;2.834;"m"
0000601902;09/12/2002;17:58:53;2.859;"m"
0000601902;09/12/2002;18:01:56;2.859;"m"
0000601902;09/12/2002;18:02:08;2.861;"m"
0000601902;09/12/2002;18:14:41;2.863;"m"
0000601902;09/12/2002;18:46:29;2.871;"m"
0000601902;09/12/2002;18:49:32;2.871;"m"
0000601902;09/12/2002;19:05:00;2.872;"m"
0000601902;09/12/2002;19:29:38;2.874;"m"
0000601902;09/12/2002;20:40:30;2.878;"m"
```

Figure A.5 *Example of HYDRAS3 output of digitised chart data*

The first column of data is the station name (601902) followed by the date, time, water level and a flag.

The Angola Reformat program interpolates between these points and then extracts the hourly values for the period of the file. These are then written to the HTF file with appropriate header information.

Loggers

Logger data is downloaded from the loggers and stored in the Ott HYDRAS software. The data is then exported in a similar format to the chart files, but with fixed regular intervals (1 hour). Data is converted directly into HTF format with the Angola Reformat software.

SADC-HYCOS loggers

SADC-HYCOS stations are equipped with SERPE loggers. These must be collected before the memory is full. The time taken for this depends upon the number of sensors and the interval that data is collected, but HYCOS stations should be able to store over 1-year of data at normal stations and 6 months at enhanced stations.

The SERPE hardware and Visual 98 software must be used to retrieve the data from the memory module. The software should then be used to create an mdb database file of the data. This file can be selected by the Angola Reformat software which will read the file and suggest which station should be used. The software will extract all of the data and convert to HTF.

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Installation of the data management software

Ensure HYDATA 4.2 has been installed before installing the data management software

Installing the Angola Reformat software

Run the appropriate 'setup.exe' file on the CD, from the Angola Reformat folder
Follow the instructions, installing the program to the same folder to which HYDATA
4.2 is installed (usually C:\Program Files\Institute of Hydrology\HYDATA 4.2)
Select a standard installation

The software should now be installed

Installing the HYDATA Data Loader Module

Run the setup.exe program on the CD, from the Modules\HYDATA Data Loader folder
Follow the instructions, installing the program to the same folder to which HYDATA
4.2 is installed (usually C:\Program Files\Institute of Hydrology\HYDATA 4.2)
If messages appear asking whether a more recent file than one being installed should be
kept, click Yes.

The software should now be installed