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THE KINGDOM OF THAILAND

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

GROUNDWATER DATABASE SYSTEM MANUAL

MARCH 1995

KOKUSAI KOGYO CO., LTD.

TOKYO, JAPAN

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INTRODUCTION

The Groundwater Database System is an integrated database system consisting of the following databases: well inventory database, hydrology database, meteorology database, hydrological database, as well as a literature database. The databases and programs are written in FOXPRO 2.5. However, the databases can also be accessed through DBASE III, DBASE IV and other XBASE databases (DBASE III formatted databases). Users therefore can use other types of database programs to edit records or make reports from the databases. The program is menu driven and user friendly so users don't need to be experts in FOXPRO.

HARDWARE REQUIREMENTS

The minimum required hardware to use the program are as follows:

1. 386 processor (486 preferable) with 8 MB main memory
2. 100 MB hard disk space
3. color monitor (preferable)
4. mouse (preferable)

SOFTWARE REQUIREMENTS

The softwares required by the program to run the program are as follows:

1. DOS 5.0 or higher
2. Expanded Memory Manager (preferably QEMM)
3. Cache software (Smartdrv)
3. FOXPRO 2.5
4. SPSS statistical software

The number of files handles should be at least 100. In the CONFIG.SYS, insert the following line:

FILES =100

In the AUTOEXEC.BAT insert the following:

SMARTDRV 640
SET SPSS=C:\SPSS

The first line set asides 640 kilobytes of memory as cache memory to speedup hard disk access. If more memory can be set aside, disk access would be faster.

The second line tells the SPSS program where to find its support files.

INSTALLATION

Although the initial installed files would be only 28 MB, when the program runs some of its utilities, it will require additional space for its index files and for its file manipulation. Together with the FOXPRO and SPSS programs, total required hard disk space would be 100 MB. The installation is contained in 4 diskettes. To install to a hard disk follow these steps:

1. Set the default drive to the drive where the installation diskettes will be used, i.e. C>A: for A drive.

2. Type INSTALL C: if you want to install to drive C. Change C to the drive you want to install to.

3. The installation would automatically create a subdirectory named GWS in the drive you will be installing to.

4. The installation will copy the installation programs and the GWS program in the \GWS subdirectory together with LHA.EXE, the program used to compress the files. The LHA would be used later to decompress the files to their proper subdirectories.

5. All the files with LZH extension will then be copied to the \GWS subdirectory. These files are compressed files of the databases files. LHA will then decompress all these LZH files to their proper subdirectories. DO NOT REMOVE the LZH files, they serve as the backup of the data files.

6. WELL.LZH, the compressed file of the \WINV\WELL.DBF file (originally more than 11 MB) is more than 1.44 MB so it can not be stored in only one diskette. SLICE.COM was used to divide this file into several diskettes. SLICE.COM divided the files into two diskettes so it can be transferred to another computer. Another program, SPLICE.COM would put together these two files into one file. LHA would then decompress the WELL.LZH.

7. The installation is now complete. To run the program type FOX GWS. This will run FOXPRO and automatically run the GWS program.

NOTE: The copying of the LZH files uses the REPLACE command instead of the copy command. This way if there are already installed files in the hard disk similar to the files to be installed, only the newer files would be copied and would not replace the files that would be more updated.

A batch file named, *BACKUP.BAT* is also installed in the hard disk. This batch file can be used to update the compress files (*.LZH) which serves as backup copies of the databases. To copy or move the databases into another computer, these files should replace the files in the installation diskettes to reflect the updates in the databases. Use the SLICE.COM program to divide the WELL.LZH file into smaller

sizes. Use blank formatted diskettes to store to. These diskettes would serve as installation diskettes 3 and 4.

GETTING STARTED

The program can be started in two ways:

A. Loading FOXPRO first, then starting the GWS program.

1. Go to the GWS subdirectory, C> CD \GWS
2. Load the FOXPRO program, C>FOX
3. From the FOXPRO program, activate GWS program, i.e., DO GWS

B. Loading FOXPRO and activating GWS program at the same time

1. Go to the GWS subdirectory, C> CD \GWS
2. Load FOXPRO and GWS programs, i.e., FOX GWS

Note: The directory where the FOXPRO program resides should be included in the PATH.

A batch file can be created to automatically perform these commands. GWS.BAT can contain the following commands:

```
C:
CD \GWS
FOX GWS
```

GWS MENU

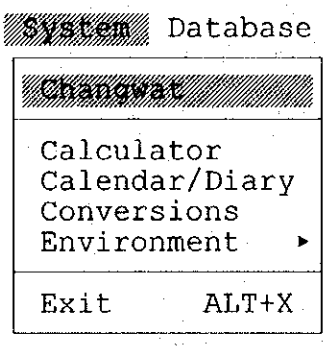
After activating the GWS program by issuing DO GWS in the FOXPRO program, the following GWS main menu will be shown:

System Database Edit Record Window Report Query

The menu can be navigated through the use of the cursor keys. The highlighted option will be activated when the Enter key is pressed, in this case the System menu. The commands can also be activated by pressing the Hot keys associated with the commands, say, Alt-E for the Edit command. The Hot keys are highlighted by a different color.

The commands can also be activated by using a mouse. First, position the mouse pointer in the desired command, then press the left button of the mouse. The commands used by the mouse are the standard commands in the FOXPRO database. Similarly, the standard commands used in FOXPRO were retained in the GWS program to facilitate the learning of the GWS commands. Please refer to the FOXPRO manual for the complete mouse and cursor commands.

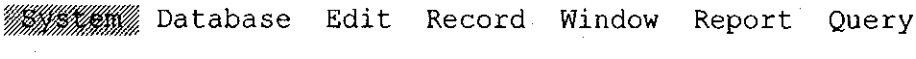
SYSTEM

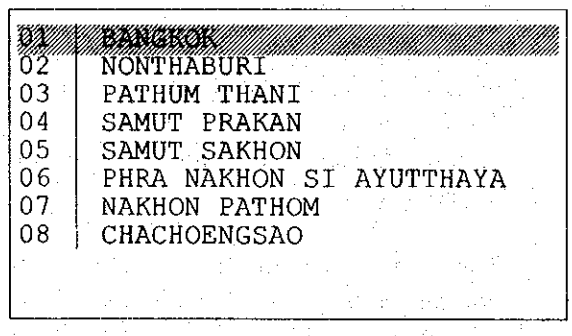


The System menu consists of modules such as selecting the Changwat to work with, the Quit command and some utility programs that may be used to enhance the use of the program. The Calculator can be generally used for calculations. The Calendar/Diary may be used for keeping track of activity schedules and general date tracking activities. The Conversion program is used to convert from one unit to another. The Environment command lets you change the setup of the GWS program such as showing a clock and the number of lines on each screen.

SELECTING CHANGWAT

Selecting the Changwat is applicable only to two databases, well inventory database and groundwater monitoring. Selecting a Changwat merely opens the database and positions the record to the first well in that Changwat. It does not prevent you from getting the wells from other Changwats because the database contains all the wells in all the Changwats.





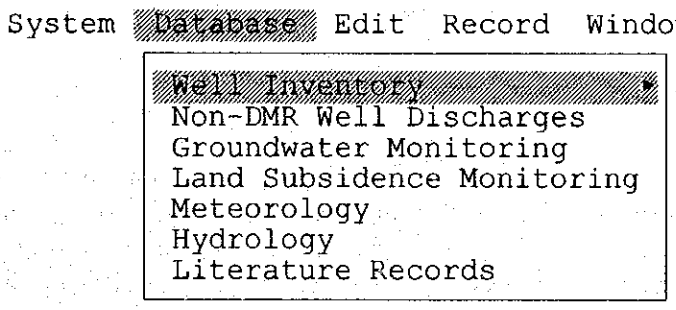
The list of Changwats are listed in the \GWS\DBFS\CHANGWAT.DBF database.

GENERAL NOTE ON UNKNOWN VALUES

For values which are normally more than zero such as measurements of length, distance, diameter, etc. a ZERO value is absurd and only means an unknown measurement.

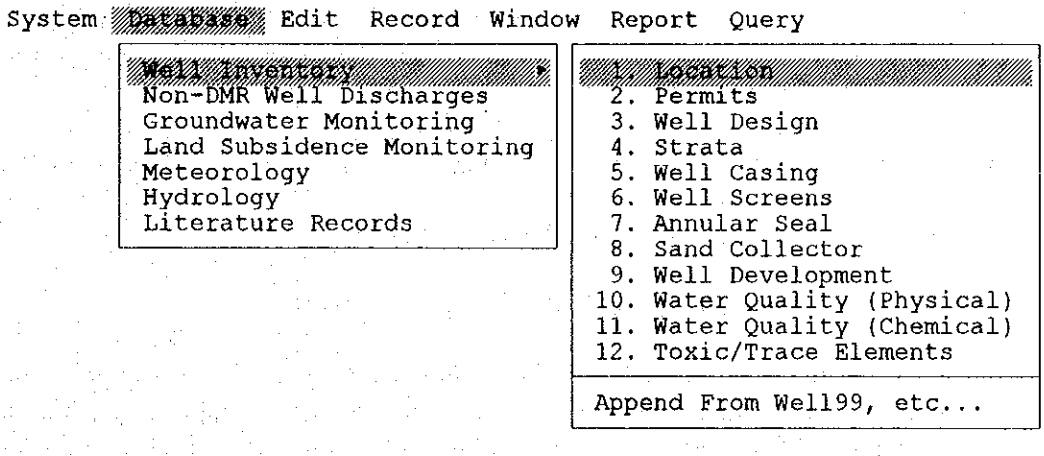
For cases where a ZERO value can be *measured* such as the absence of a chemical element in water, distinction between an unknown value because of non-measurement and an actual zero value should be made. A *NEGATIVE VALUE*, usually the least significant digit, i.e., -0.01 is used to denote an *UNKNOWN* value to distinguish it from an actual zero measurement.

DATABASES



The Database menu lets you choose the database you want to work with. There are seven main databases to choose from. The main databases are further divided into several databases which contain the normalized database.

WELL INVENTORY



Well inventory is divided into several databases and data entry screens. To facilitate data entry, well inventory is divided into twelve screens as shown above.

The last option, Append from Well99, etc can be used to consolidate the databases into the main files if data inputting is done on different computers which are not

networked. For example instead of using only one computer to enter data, the databases can be partitioned based on their location in the Changwat, say Bangkok wells are stored in one computer and the rest in another computer.

To consolidate the files, the following well inventory databases should be copied to the \GWS\WINV\ subdirectory of the main computer that will consolidate the databases and should be named as the shown below:

WELL.DBF	to	WELL99.DBF
WQUAL.DBF	to	WQUAL99.DBF
TQUAL.DBF	to	TQUAL99.DBF
WSCRN.DBF	to	WSCRN99.DBF
WSTR.DBF	to	WSTR99.DBF
WCAS.DBF	to	WCAS99.DBF
WSEAL.DBF	to	WSEAL99.DBF

WELL INVENTORY SUB-MENU

A sub-menu for all twelve screens for the Well Inventory screen is shown on the bottom of each screen. It can be activated by moving the highlighted cursor on the command and pressing the Enter key or using the speedkey associated with the command or simply positioning the mouse cursor on the command and clicking the left button of the mouse. It shows the following sub-menu and the functions of each command:

<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>

Next moves to the next record in the database. The movement is based on the index key of the database, well code, and not on the physical arrangement of the record. That means the record number shown on the screen is simply not increased by one but shows the actual record number according to its position on the database. Speedkey is Control-N or N.

Prev moves to the previous record in the database. Speedkey is Control-R or R.

Top moves to the top record of the database. Speedkey is T.

Bot moves to the bottom of the database. Speedkey is B.

Edit edits the fields in the current screen. Edit mode is also activated when the mouse cursor is positioned on the main window and clicking the left button. Editable fields are shown in a highlighted color while non-editable fields are shown in dimmed colors. The mouse can also be used to position the cursor to the desired field to be selectively edited for faster editing. Speedkey is Control-E or E.

Add adds record to the database. Some screens do not allow the add command to be activated. This means that the addition of records should be done in the location screen. Say in the second screen, we do not want to add well codes in that screen without entering first its location and other administrative information in the location screen. Speedkey is E.

Find allows the user to find a particular record based on the entered criteria. The Find command can also be used not only in the currently edited database but also other opened databases. The resulting browse output can be edited or simply browsed at. Speedkey is Control F.

+Scn changes to the next screen. Instead of quitting the screen and manually opening the next screen this command lets you view all the screens just by pressing the + key. When in the last screen, the first screen is shown.

-Scn changes to the previous screen. When in the first screen, the last screen is shown.

Goto allows the user to jump easily to the desired well code. If the entered value is not the complete well code, it jumps to the nearest occurrence of the well code. Say '0203' is just entered, then it jumps to the first occurrence of well code '0203'. If it does not find the record, the record remains in its present position. Speedkey is G.

Quit exits to the main menu. Speedkey is Q.

1. LOCATION

```
System  Database  Edit  Record  Window  Report  Query  Print
                  GROUNDWATER DATABASE SYSTEM (SCREEN 1)
     Location  BANGKOK, CHATUCHAK, LAT YAO                RECORD # 4/12896

     WELL CODE  010101-1004   Type  [ Private ]  Status  [ Active ]

     Well Name  GARMENT AND THREAD TEXTILE

      Aquifer  [ Nakhon Luang ]    Source of Well Data  [ DMR ]


 Well No., New  3204-0014              Old No.
 Well Address   151 SENA NIKHOM 2, PHAHON YOTHIN, LAT YAO, CHATUCHAK,
                BANGKOK
  OWNER         PHA HOM THAI INDUSTRY FACTORY CO., LTD.
  Address       151 SENA NIKHOM 2, PHAHON YOTHIN, LAD YAO
                CHATUCHAK, BANGKOK
  Ground Elev.      2.00    m MSL
  Map Sheet No  5136 IV          Base Map, X   70     Base Map, Y  129
      Latitude     °  '  "         Longitude     °  '  "
      UTM East   67085             UTM North  152995        Zone  47P

<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>
```

The location screen contains the most basic information on the well. It contains administrative information on the well such as its location, owner and address. The fields in this screen are explained below:

WELL CODE WELL.W_CODE

The Well Code is the basic identifier of the well. The well code identifies where the well is located and what type of well it is. As an example, in well code 010203-1001, it is represented as follows:

01 the first two digits, 01, represents the *Changwat Code* for Bangkok. The complete Changwat codes are listed in the \GWS\DBFS\CHANGWAT.DBF database.

02 second two digits, 02, represents the *Amphoe Code* for Chong Thong. The complete Amphoe codes are listed in the \GWS\DBFS\AMPHOE.DBF database.

03 the third two digits, 03, represents the *Tambon code* for Bang Khun Thian. The complete Tambon codes are listed in the \GWS\DBFS\TAMBON.DBF database.

1 the eight digit represents the *well type*. Code 1 represents a Private well, Code 2 represents a Public well and Code 3 represents an Observation well.

001 the last three digits represents the *well number*. It means 999 wells is the maximum number of wells that a Tambon can accommodate.

When entering or editing a well code, a popup menu appears to guide the user what Changwat Code, Amphoe Code, Tambon Code and Well Code to use. To accept a selection Code, go to the code and press the Enter key. The left and right arrows does not accept the codes.

When adding a new Well Code, the next available well number will be offered. If it is acceptable, merely press the Return key. Otherwise, change the well number.

The well type in the next field is also updated to reflect the current value in the well code.

TYPE WELL.W_TYPE

Well type can not be edited directly through this field. It should be edited through the well code in the previous field. Database \GWS\DBFS\TYPE.DBF list the valid options for this field. The following codes represents the well types:

1 Private
2 Public
3 Observation Well

STATUS WELL.W_STATUS

The current status of the well. Valid status are taken from the \GWS\DBFS\STATUS.DBF database and are listed below.

1 Active
2 Inactive
3 Abandoned
4 Others

WELL NAME WELL.W_NAME

The common name of the well.

AQUIFER WELL.AQUI_NAME

The aquifer where the well is predominantly tapped. The eight aquifers are listed below with their codes and their top and bottom depths in meters. To simplify, the aquifers are assumed not to intersect. The aquifer code is based on the depth of the top most screen or the bottom of the casing if there is no screen data.

AQUIFER	CODE	TOP	BOTTOM
Bangkok	BK	0	60
Phra Pradaeng	PD	60	120
Nakhon Luang	NK	120	180
Nonthaburi	NB	180	280
Sam Khok	SK	280	360
Phaya Thai	PT	360	430
Thon Buri	TB	430	480
Pak Nam	PN	480	600

SOURCE OF DATA WELL.DAT_SOURCE

Agency responsible for the well and the source of information for the well. List of agency codes and their assigned codes are listed below. List of agencies are contained in the \GWS\DBFS\AGENCY.DBF database.

1 DMR
2 PWD
3 MWA
4 PWA
5 DOH
6 ARDO
7 IEAT
8 Mun. Gov't
9 Others

WELL NO, NEW WELL.NEW_NO

A new number assigned to the well by the Agency responsible.

WELL NO, OLD WELL.OLD_NO

The old number assigned to the well by the Agency responsible.

WELL ADDRESS WELL.W_ADDR1, WELL.W_ADDR2

Complete address of the well for easy location of the well. Two fields are assigned to this information.

OWNER WELL.OWNER

Owner of the well.

ADDRESS WELL.OW_ADDR1, WELL.OW_ADDR2

Complete address of the owner.

GROUND ELEV. WELL.ELEVATION

Ground elevation of the well in Meters above Mean Sea Level.

MAP SHEET NO. WELL.MAP_NO

Map sheet no. in 1:50,000 where well is located.

BASE MAP, X WELL.X

Grid X in the map sheet where well is located. Related to the UTM East.

BASE MAP, Y WELL.Y

Grid Y in the map sheet where well is located. Related to the UTM North.

LATITUDE WELL.LAT_DEGR, WELL.LAT_MIN,WELL.LAT_SEC

Latitude location of the well. Three fields are needed to fill the information.

LONGITUDE WELL.LONG_DEGR, WELL_LONG_MIN,WELL.LONG_SEC

Longitude location of the well. Three fields are needed to fill the information.

UTM EAST WELL.UTM_E

Universal Transverse Mercator (UTM) X location of the well in meters.

UTM NORTH WELL.UTM_N

Universal Transverse Mercator (UTM) Y location of the well in meters. Usually reckoned from the equator.

ZONE WELL.GZD

Zone where well is located.

The complete Changwat Codes are listed in the \GWS\DBFS\CHANGWAT.DBF database and shown below:

CHANGWAT

CODE	CHANGWAT
01	BANGKOK
02	NONTHABURI
03	PATHUM THANI
04	SAMUT PRAKAN
05	SAMUT SAKHON
06	PHRA NAKHON SI AYUTTHAYA
07	NAKHON PATHOM
08	CHACHOENGSAO

The complete Amphoe Codes are listed in the \GWS\DBFS\CHANGWAT.DBF database and shown below:

CHANGWAT CODE	AMPHOE CODE	AMPHOE
01	01	CHATUCHAK
01	02	CHOM THONG
01	03	DUSIT
01	04	DON MUANG
01	05	TALING CHAN
01	06	THON BURI
01	07	BANGKOK YAI
01	08	BUNG KUM
01	09	BANGKOK NOI
01	10	PHRA KHANONG
01	11	BANG KAPI
01	12	BANG KHUN THIAN
01	13	BANG KHO LAEM
01	14	BANG SU
01	15	BANG PHLAT
01	16	BANG RAK
01	17	BANG KHEN
01	18	PATHUM WAN

01	19	PRAWT
01	20	SUAN LUANG
01	21	POM PRAP SATTRU PHAI
01	22	PHRA NAKHON
01	23	PHAYA THAI
01	24	PHASI CHAROEN
01	25	MIN BURI
01	26	YAN NAWA
01	27	RATCHATHEWI
01	28	RAT BURANA
01	29	LAT KRABANG
01	30	LAT PHRAO
01	31	SAMPHAMTHAWONG
01	32	SATHON
01	33	NONG CHOK
01	34	NONG KHAEM
01	35	HUAI KHWANG
01	36	DIN DAENG
01	37	KHLONG TOEI
01	38	KHLONG SAN
02	01	MUANG NONTHABURI
02	02	BANG KRUAI
02	03	BANG YAI
02	04	BANG BUA THONG
02	05	PAK KRET
02	06	SAI NOI
03	01	MUANG PATHUM THANI
03	02	SAM KHOK
03	03	LAT LUM KAEO
03	04	THANYABURI
03	05	LAM LUK KA
03	06	KHLONG LUANG
03	07	NONG SUA
04	01	MUANG SAMUT PRAKAN
04	02	BANG BO
04	03	BANG PHLI
04	04	PHRA PRADAENG
04	05	PHRA SAMUT CHEDI
05	01	MUANG SAMUT SAKHON
05	02	KRATHUM BAEN
05	03	BAN PHAEO
06	01	PHRA NAKHON SI AYUTTHAYA
06	02	THA RUA
06	03	NAKHON LUANG
06	04	BANG SAI
06	05	BANG BAN
06	06	BANG PA-IN
06	07	BANG PAHAN

06	08	PHAK HAI
06	09	PHACHI
06	10	LAT BUA LUANG
06	11	WANG NOI
06	12	SENA
06	13	BANG SAI (LEFT)
06	14	UTHAI
06	15	MAHA RAT
06	16	BAN PHRAEK
07	01	MUANG NAKHON PATHOM
07	02	SAM PHRAN
07	03	NAKHON CHAISI
07	04	KAMPHAENG SAEN
07	05	BANG LEN
07	06	DON TUM
08	01	MUANG CHACHOENGSAO
08	02	BANG KHLA
08	03	BANG NAM PRIEO
08	04	PHANOM SARAKHAM
08	05	BANG PAKONG
08	06	SANAM CHAI KHET
08	07	BAN PHO
08	08	PLAENG YAO
08	09	RATCHASAN
08	10	THA TAKIAP

The complete Tambon Codes are listed in the \GWS\DBFS\CHANGWAT.DBF database and shown below:

CHANGWAT CODE	AMPHOE CODE	TAMBON CODE	TAMBON
01	01	01	LAT YAO
01	02	01	BANG KHO
01	02	02	CHOM THONG
01	02	03	BANG KHUN THIAN
01	02	04	BANG MOT
01	03	01	DUSIT
01	03	02	WACHIRA PHAYABAN
01	03	03	SUAN CHITLADA
01	03	04	SI YAEK MAHA NAK
01	03	05	THANON NAKHON CHAISI
01	04	01	TALAT BANGKHEN
01	04	02	THUNG SONG HONG
01	04	03	SIKAN
01	05	01	KHLONG CHAK PHRA
01	05	02	TALING CHAN
01	05	03	CHIMPHLI

01	05	04	BANG RAMAT
01	05	05	BANG PHROM
01	05	06	BANG CHUAK NANG
01	05	07	SALA THAMMASOP
01	05	08	THAWI WATTHANA
01	06	01	WAT KALLAYA
01	06	02	HIRAN RUCHI
01	06	03	BANG YI RUA
01	06	04	BUKKHALO
01	06	05	TALAT PHLU
01	07	01	WAT THA PHRA
01	07	02	WAT ARUN
01	08	01	KHLONG KUM
01	08	02	SAPHAN SUNG
01	08	03	KHANNA YAO
01	09	01	SIRIRAT
01	09	02	BAN CHANG LO
01	09	03	BANG KHUN NON
01	09	04	BANG KHUN SI
01	10	01	BANG CHAK
01	10	02	BANG NA
01	11	01	KHLONG CHAN
01	11	02	WANG THONGLANG
01	11	03	HUA MAK
01	12	01	BANG BON
01	12	02	THA KHAM
01	12	03	SAMAE DAM
01	13	01	BANG KHO LAEM
01	13	02	WAT PHRAYA KRAI
01	13	03	BANG KHLO
01	14	01	BANG SU
01	15	01	BANG YIKHAN
01	15	02	BANG BAMRU
01	15	03	BANG PHLAT
01	15	04	BANG O
01	16	01	MAHA PHUTTHARAM
01	16	02	SI PHRAYA
01	16	03	SILOM
01	16	04	SURIWONG
01	16	05	BANG RAK
01	17	01	KHONG THANON
01	17	02	SAI MAI
01	17	03	ANUSAOWARI
01	17	04	THA RAENG
01	17	05	O NGOEN
01	18	01	RONG MUANG
01	18	02	WANG MAI
01	18	03	LUMPHINI

01	18	04	PATHUM WAN
01	19	01	PRAWET
01	19	02	DOK MAI
01	19	03	NONG BON
01	20	01	SUAN LUANG
01	21	01	WAT SOMMANAT
01	21	02	KHLONG MAHA NAK
01	21	03	BAN BAT
01	21	04	POM PRAP
01	21	05	WAT THEP SIRIN
01	22	01	PHRA BOROM MAHA RATCHAWANG
01	22	02	WANG BURAPHA PHIROM
01	22	03	WAT RATCHABOPHIT
01	22	04	SAMRAN RAT
01	22	05	SAN CHAO PHO SUA
01	22	06	SAO CHINGCHA
01	22	07	WAT BOWORNNIWET
01	22	08	TALAT YOT
01	22	09	CHANA SONGKHRAM
01	22	10	BAN PHANTHOM
01	22	11	BANG KHUM PHROM
01	22	12	WAT SAMPHRAYA
01	23	01	SAMSEN NAI
01	24	01	BANG PHAI
01	24	02	BANG KHAE NUA
01	24	03	BANG WA
01	24	04	BANG KHAE
01	24	05	KHLONG KHWANG
01	24	06	BANG WAEK
01	24	07	BANG DUAN
01	24	08	BANG CHAK
01	24	09	PAK KHLONG PHASI CHAROEN
01	24	10	KHUHA SAWAN
01	25	01	MIN BURI
01	25	02	SAEN SAEP
01	25	03	BANG CHAN
01	25	04	SAI KONG DIN
01	25	05	SAI KONG DIN TAI
01	25	06	SAM WA TAWAN OK
01	25	07	SAM WA TAWAN TOK
01	26	01	CHONG NONSI
01	26	02	BANG PHONGPHANG
01	27	01	THANON PHAYATHAI
01	27	02	THANON PHETCHABURI
01	27	03	THUNG PHRAYA THAI
01	27	04	MAKKASAN
01	28	01	BANG PAKOK
01	28	02	RAT BURANA

01	28	03	BANG MOT
01	28	04	THUNG KHRU
01	29	01	LAT KRASANG
01	29	02	THAP YAO
01	29	03	KHLONG SONG TONNUN
01	29	04	KHLONG SAM PRAWET
01	29	05	LAM PLA THIU
01	29	06	KHUM THONG
01	30	01	LAT PHRAO
01	30	02	CHORAKHE BUA
01	31	01	CHAKKRAWAT
01	31	02	SAMPHANTHAWONG
01	31	03	TALAT NOI
01	32	01	THUNG WAT DON
01	32	02	YAN NAWA
01	32	03	THUNG MAHAMEK
01	33	01	NONG CHOK
01	33	02	KRATHUM RAI
01	33	03	KHLONG SIPSONG
01	33	04	KHU FANG NUA
01	33	05	KHLONG SIP
01	33	06	KHOK FAET
01	33	07	LAM PHAK CHI
01	33	08	LAM TOITING
01	34	01	LAK SONG
01	34	02	NONG KHAEM
01	34	03	NONG KHANG PHLU
01	35	01	HUAI KHWANG
01	35	02	SAMSEN NOK
01	35	03	BANG KAPI
01	36	01	DIN DAENG
01	37	01	KHLONG TOEI
01	37	02	KHLONG TAN
01	37	03	PHRA KHANONG
01	38	01	SOMDET CHAO PHAYA
01	38	02	KHLONG SAN
01	38	03	KHLONG TON SAI
01	38	04	BANG LAMPHU LANG
02	01	01	BANG SIMUANG
02	01	02	BANG KRANG
02	01	03	BANG PHAI
02	01	04	BANG RAK NOI
02	01	05	SAI MA
02	01	06	SUAN YAI
02	01	07	BANG KRASO
02	01	08	TALAT KHWAN
02	01	09	BANG KHEN
02	01	10	THA SAI

02	02	01	WAT CHALO
02	02	02	BANG KRUAI
02	02	03	BANG SI THONG
02	02	04	BANG KHANUN
02	02	05	BANG KHUN KONG
02	02	06	BANG KHUWIANG
02	02	07	MAHA SAWAT
02	02	08	PLAI BANG
02	02	09	SALA KLANG
02	03	01	BANG MAE NANG
02	03	02	BANG MUANG
02	03	03	BAN MAI
02	03	04	BANG LEN
02	03	05	SAOTHONG HIN
02	03	06	BANG YAI
02	04	01	BANG BUA THONG
02	04	02	PHIMON RAT
02	04	03	BANG RAK YAI
02	04	04	LAHAN
02	04	05	BANG RAKPHATTHANA
02	04	06	LAM PHO
02	04	07	BANG KHU RAT
02	04	08	SANO LOI
02	04	09	NONG CHIANG KHOLE
02	05	01	PAK KRET
02	05	02	BANG TALAT
02	05	03	BANG PHUT
02	05	04	BAN MAI
02	05	05	KHLONG KLUA
02	05	06	BANG PHLAP
02	05	07	KHLONG PHRA UDOM
02	05	08	BANG TANAI
02	05	09	KO KRET
02	05	10	OM KRET
02	05	11	THA IT
02	05	12	KHLONG KHOI
02	06	01	KHUN SI
02	06	02	KHLONG KHWANG
02	06	03	THAWI WATTHANA
02	06	04	SAI NOI
02	06	05	SAI YAI
02	06	06	RAT NIYOM
02	06	07	NONG PHRO NGAI
03	01	01	BANG KHU WAT
03	01	02	BANG KHAYAENG
03	01	03	BANG DUA
03	01	04	BANG LUANG
03	01	05	BANG PHUT

03	01	06	BANG KADI
03	01	07	BANG PHUN
03	01	08	BAN KRACHAENG
03	01	09	BAN CHANG
03	01	10	BAN KLANG
03	01	11	BAN MAI
03	01	12	LAK HOK
03	01	13	SUAN PRIK THAI
03	01	14	BANG PROK
03	02	01	BANG TOEI
03	02	02	BANG KRABU
03	02	03	KHLONG KHWAI
03	02	04	THAI KRO
03	02	05	SAM KHOK
03	02	06	KRACHAENG
03	02	07	BANG PHO NUA
03	02	08	BAN NGIU
03	02	09	CHIANG RAK NOI
03	02	10	CHIANG RAK YAI
03	02	11	BAN PATHUM
03	03	01	RAHAENG
03	03	02	KHLONG PHRA UDOM
03	03	03	KHU KHWANG
03	03	04	BO NGOEN
03	03	05	KHU BANG LUANG
03	03	06	LAT LUM KAEO
03	03	07	NA MAI
03	04	01	PRACHATHIPAT
03	04	02	BUNG YITHO
03	04	03	RANGSIT
03	04	04	LAM PHAK KUT
03	04	05	BUNG SANAN
03	04	06	BUNG NAM RAK
03	05	01	LAM LUK KA
03	05	02	BUNG KHAM PHROI
03	05	03	BUNG THONGLANG
03	05	04	LAT SAWAI
03	05	05	KHU KOT
03	05	06	BUNG KHO HAI
03	05	07	LAM SAI
03	05	08	PHUT UDOM
03	06	01	KHLONG NUNG
03	06	02	KHLONG SONG
03	06	03	KHLONG SAM
03	06	04	KHLONG SI
03	06	05	KHLONG HA
03	06	06	KHLONG HOK
03	06	07	KHLONG CHET

03	07	01	NONG SAM WANG
03	07	02	BUNG CHAM O
03	07	03	SALA KHRU
03	07	04	BUNG KA SAM
03	07	05	BUNG BON
03	07	06	BUNG BA
03	07	07	NOPPHARAT
04	01	01	SAMRONG NUA
04	01	02	THEPHARAK
04	01	03	BANG MUANG
04	01	04	BANG MUANG MAI
04	01	05	BANG PRONG
04	01	06	BANG DUAN
04	01	07	PRAEK SA
04	01	08	THAI BAN
04	01	09	BANG PU MAI
04	01	10	BANG PU (KAO)
04	01	11	PAK NAM
04	02	01	BANG BO
04	02	02	KHLONG DAN
04	02	03	BANG PLI NOI
04	02	04	BAN RAKAT
04	02	05	PRENG
04	02	06	KHLONG SUAN
04	02	07	NIYOM YATTRA
04	02	08	BANG PHRIANG
04	03	01	BANG PHLI YAI
04	03	02	BANG KAEO
04	03	03	BANG CHALONG
04	03	04	BANG PLA
04	03	05	BANG SAOTHONG
04	03	06	RACHA THEWA
04	03	07	NONG PRU
04	03	08	SISA CHORKHE NOI
04	03	09	SISA CHORAKHE YAI
04	04	01	BANG YA PHRAEK
04	04	02	BANG KHRU
04	04	03	BANG KRASOP
04	04	04	BANG KO BUA
04	04	05	SONG KHANONG
04	04	06	BANG NAM PHUNG
04	04	07	BANG HUA SUA
04	04	08	BANG YO
04	04	09	BANG CHAK
04	04	10	SAMRONG
04	04	11	SAMRONG KLANG
04	04	12	SAMRONG TAI
04	04	13	BANG KRACHAO

04	04	15	TALAT
04	05	01	PAK KHLONG BANG PLAKOT
04	05	02	LAEM RA PHA
04	05	03	NAI KHLONG BANG PLAKOT
04	05	04	NA KLUA
04	05	05	BAN KHLONG SUAN
05	01	01	THA CHIN
05	01	02	CHAI MONGKHON
05	01	03	BANG YA PHRAEK
05	01	04	KA LONG
05	01	05	NA KHOK
05	01	06	NA DI
05	01	07	BAN KO
05	01	08	BANG KRA CHAO
05	01	09	KHOK KHAM
05	01	10	BANG NAM CHUT
05	01	11	BAN BO
05	01	12	BANG THO RAT
05	01	13	THA SAI
05	01	14	KHOK KRABU
05	01	15	PHANTHAI NORASING
05	01	16	MAHA CHAI
05	01	17	THA CHALOM
05	01	18	KROKKRAK
05	02	01	OM NOI
05	02	02	THA MAI
05	02	03	SUAN LUANG
05	02	04	BANG YANG
05	02	05	KHLONG MADUA
05	02	06	NONG NOK KHAI
05	02	07	DON KAI DI
05	02	08	KHAE RAI
05	02	09	THA SAO
05	02	10	KRATHUM BAEN
05	03	01	BAN PHAEO
05	03	02	RONG KHE
05	03	03	YOK KRABAT
05	03	04	AMPHAENG
05	03	05	LAK SAM
05	03	06	KHLONG TAN
05	03	07	CHET RIU
05	03	08	SUAN SOM
05	03	09	N0NG SONG HONG
05	03	10	NONG BUA
05	03	11	LAK SONG
05	03	12	KASET PHATTHANA
06	01	01	KO RIAN
06	01	02	HANTRA

06	01	03	KHLONG SUAN PHLU
06	01	04	BAN KO
06	01	05	BAN POM
06	01	06	KHLONG TAKHIAN
06	01	07	PAK KRAN
06	01	08	BAN MAI
06	01	09	PHUKHAO THONG
06	01	10	LUM PHLI
06	01	11	WAT TUM
06	01	12	BAN RUN
06	01	13	SUAN PRIK
06	01	14	KHLONG SA BUA
06	01	15	SAMPHAO LOM
06	01	16	PHAI LING
06	01	17	HUA RO
06	01	18	HO RATANA CHAI
06	01	19	PRATU CHAI
06	01	20	KAMANG
06	01	21	THA WASUKRI
06	02	01	THA RUA
06	02	02	CHAMPA
06	02	03	THA LUANG
06	02	04	THA CHAO SANUK
06	02	05	BAN ROM
06	02	06	WANG DAENG
06	02	07	PAK THA
06	02	08	PHO EN
06	02	09	NONG KHANAK
06	02	10	SALA LOI
06	03	01	NAKHON LUANG
06	03	02	SAM THAI
06	03	03	THA CHANG
06	03	04	BO PHONG
06	03	05	BAN CHUNG
06	03	06	PAK CHAN
06	03	07	BANG RAKAM
06	03	08	BANG PRAKHRU
06	03	09	MAE LA
06	03	10	NONG PLING
06	03	11	PHRA NON
06	03	12	KHLONG SAKAE
06	04	01	BANG SAI
06	04	02	MAI TRA
06	04	03	BAN KLUNG
06	04	04	BAN MA
06	04	05	SANAM CHAI
06	04	06	PHAI PHRA
06	04	07	KHOK CHANG

06	04	08	BAN KO
06	04	09	RATCHA KHRAM
06	04	10	CHANG NOI
06	04	11	KHAE TOK
06	04	12	KRACHAENG
06	04	13	BANG PHLI
06	04	14	PHO TAENG
06	04	15	CHIANG RAK NOI
06	04	16	KHAE OK
06	04	17	NA MAI
06	04	18	CHANG LEK
06	04	19	HO MOK
06	04	20	BAN PAENG
06	04	21	CHANG YAI
06	04	22	BANG YITHO
06	04	23	KOKKAEO BURAPHA
06	05	01	BANG BAN
06	05	02	WAT YOM
06	05	03	SAI NOI
06	05	04	SAPHAN THAI
06	05	05	MAHA PHRAM
06	05	06	KOP CHAO
06	05	07	BAN KHLANG
06	05	08	PHRA KHAO
06	05	09	NAMTAO
06	05	10	THANG CHANG
06	05	11	WAT TAKU
06	05	12	BANG LUANG
06	05	13	BANG LUANG DOT
06	05	14	BANG HAK
06	05	15	BAN CHANI
06	05	16	BAN KUM
06	06	01	KHLONG CHIK
06	06	02	CHIANG RAK NOI
06	06	03	TALING CHAN
06	06	04	BAN WA
06	06	05	BAN KROT
06	06	06	BAN PHO
06	06	07	BAN PAENG
06	06	08	TALAT KRIAP
06	06	09	NANG PRADAENG
06	06	10	WAT YOM
06	06	11	BAN PHLAP
06	06	12	KHANON LUANG
06	06	13	KO KOET
06	06	14	BAN LEN
06	06	15	BANG KRASAN
06	06	16	SAM RUAN

06	06	17	BAN SANG
06	06	18	KHUNG LAN
06	07	01	BANG PAHAN
06	07	02	KHWAN MUANG
06	07	03	PHUT LAO
06	07	04	BANG DUA
06	07	05	HAN SANG
06	07	06	THAP NAM
06	07	07	BANG NANG RA
06	07	08	TA NIM
06	07	09	BAN LI
06	07	10	PHO SAM TON
06	07	11	KHAYAI
06	07	12	SAO THONG
06	07	13	BANG PHLOENG
06	07	14	THANG KLANG
06	07	15	BAN MA
06	07	16	TAN EN
06	07	17	BAN KHLO
06	08	01	PHAK HAI
06	08	02	TA LAN
06	08	03	LAT CHIT
06	08	04	BAN YAI
06	08	05	THA DIN DAENG
06	08	06	KUDI
06	08	07	KHOK CHANG
06	08	08	LAT NAM KHEM
06	08	09	BAN KHAE
06	08	10	AMMARIT
06	08	11	NA KHOK
06	08	12	CHAKKARAT
06	08	13	NONG NAM YAI
06	08	14	DON LAN
06	08	15	NA KHU
06	08	16	LAM TAKHIAN
06	09	01	PHACHI
06	09	02	KHOK MUANG
06	09	03	RASOM
06	09	04	NONG NAM SAI
06	09	05	DON YANANG
06	09	06	PHAI LOM
06	09	07	KRA CHIU
06	09	08	PHRA KAEO
06	10	01	LAT PUA LUANG
06	10	02	SAM MUANG
06	10	03	PHRAYA BANLU
06	10	04	SINGHANAT
06	10	05	LAK CHAI

06	10	06	KHU SALOT
06	11	01	LAM TA SAO
06	11	02	BO TA LO
06	11	03	WANG NOI
06	11	04	LAM SAI
06	11	05	SANAP THUP
06	11	06	HAN TAPHAO
06	11	07	PHAYOM
06	11	08	WANG CHULA
06	11	09	KHAO NGAM
06	11	10	CHAMAEP
06	12	01	HUA WIANG
06	12	02	BAN PHO
06	12	03	BANG NOM KHO
06	12	04	BAN KRATHUM
06	12	05	SAM TUM
06	12	06	BAN PHAEN
06	12	07	LAT NGA
06	12	08	CHAO CHET
06	12	09	RANG CHORAKHE
06	12	10	BAN THAEO
06	12	11	SAM KO
06	12	12	CHAO SADET
06	12	13	BAN LUANG
06	12	14	CHAI NA
06	12	15	DON THONG
06	12	16	MAN WICHAI
06	12	17	SENA
06	13	01	BANG SAI
06	13	02	PLAI KLAT
06	13	03	TAO LAO
06	13	04	WANG PHATTHANA
06	13	05	THEP MONGKHON
06	13	06	KAEO FA
06	14	01	UTHAI
06	14	02	KHAN HAM
06	14	03	BAN CHANG
06	14	04	SENA
06	14	05	BAN HIP
06	14	06	PHO SAO HAN
06	14	07	NONG NAM SOM
06	14	08	KHAO MAO
06	14	09	THANU
06	14	10	SAM BANDIT
06	14	11	NONG MAI SUNG
06	15	01	HUA PHAI
06	15	02	BAN MAI
06	15	03	THA TO

06	15	04	BAN KHWANG
06	15	05	BAN NA
06	15	06	PHITPHIAN
06	15	07	RONG CHANG
06	15	08	BANG NA
06	15	09	NAMTAO
06	15	10	CHAO PLUK
06	15	11	MAHARAT
06	15	12	KATHUM
06	16	01	BAN PHRAEK
06	16	02	SAM PHANIANG
06	16	03	KLONG NOI
06	16	04	SONG HONG
06	16	05	BAN MAI
07	01	01	BANG KHAEM
07	01	02	PHRONG MADUA
07	01	03	NONG DIN DAENG
07	01	04	SA KRATHIAM
07	01	05	SUAN PAN
07	01	06	WANG YEN
07	01	07	LAM PHAYA
07	01	08	SANAM CHAN
07	01	09	HUAI CHORAKHE
07	01	10	PHRA PRATHON
07	01	11	THAMMASALA
07	01	12	BO PHLAP
07	01	13	THUNG NOI
07	01	14	SAM KHWAI PHUAK
07	01	15	NAKHON PATHOM
07	01	16	WANG TAKU
07	01	17	THAP LUANG
07	01	18	NONG NGULUAM
07	01	19	NONG PAK LONG
07	01	20	THANON KHAT
07	01	21	BAN YANG
07	01	22	MAP KHAE
07	01	23	TA KONG
07	01	24	DON YAI HOM
07	01	25	PHRA PATHOM CHEDI
07	02	01	KHLONG CHINDA
07	02	02	THA TALAT
07	02	03	RAI KHING
07	02	04	OM YAI
07	02	05	SAM PHRAN
07	02	06	THA KHAM
07	02	07	BANG CHANG
07	02	08	TALAT CHINDA
07	02	09	KHLONG MAI

07	02	10	HOM KRET
07	02	11	BANG KRATHUK
07	02	12	KRATHUM LOM
07	02	13	YAI CHA
07	02	14	BAN MAI
07	02	15	BANG TOEI
07	02	16	SONG KHANONG
07	03	01	NAKHON CHAISI
07	03	02	WAT KHAE
07	03	03	SAM PATHUAN
07	03	04	NGIU RAI
07	03	05	WAT SAMRONG
07	03	06	LAN TAK FA
07	03	07	DON FAEK
07	03	08	HUAI PHLU
07	03	09	BANG KAEO FA
07	03	10	BANG PHRA
07	03	11	WAT LAMUT
07	03	12	SI MAHA PHO
07	03	13	PHANIAT
07	03	14	LAEM BUA
07	03	15	SISA THONG
07	03	16	THA PHAYA
07	03	17	BANG RAKAM
07	03	18	KHOK PHRA CHEDI
07	03	19	BANG KAEO
07	03	20	THA KRACHAP
07	03	21	THA TAMNAK
07	03	22	BANG KRABAO
07	03	23	KHUN KAEO
07	03	24	THAIYAWAT
07	04	01	THUNG KRAPHANG HOM
07	04	02	KRATIP
07	04	03	DON KHOI
07	04	04	THUNG KHWANG
07	04	05	THUNG BUA
07	04	06	THUNG LUK NOK
07	04	07	SA PHATTHANA
07	04	08	SA SIMUM
07	04	09	HUAI KHWANG
07	04	10	HUAI MON THONG
07	04	11	HUAI MUANG
07	04	12	KAMPHAENG SAEN
07	04	13	RANG PHIKUN
07	05	01	BANG LUANG
07	05	02	BANG RAKAM
07	05	03	BANG PLA
07	05	04	BANG PHASI

07	05	05	BANG LEN
07	05	06	KHLONG NOKKRATHUNG
07	05	07	LAM PHAYA
07	05	08	SAI NGAM
07	05	09	HIN MUN
07	05	10	BUA PAK THA
07	05	11	NIN PHET
07	05	12	BANG SAI PA
07	05	13	NARA PHIROM
07	05	14	DON TUM
07	05	15	PHAI HU CHANG
07	06	01	SAM NGAM
07	06	02	HUAI PHRA
07	06	03	DON PHUTSA
07	06	04	LAM HOEI
07	06	05	HUAI DUAN
07	06	06	BAN LUANG
07	06	07	DON RUAK
07	06	08	LAM LUK BUA
08	01	01	NA MUANG
08	01	02	KHLONG CHUK KRACHOE
08	01	03	KHLONG NAKHON NUANG KHET
08	01	04	KHLONG NA
08	01	05	KHLONG PRENG
08	01	06	KHLONG LUANG PHAENG
08	01	07	KHLONG UDOM CHONLACHON
08	01	08	THA KHAI
08	01	09	BANG TOEI
08	01	10	BANG KAEO
08	01	11	BANG KHWAN
08	01	12	BANG TIN PET
08	01	13	BANG KA HAI
08	01	14	BANG PHAI
08	01	15	BANG PHRA
08	01	16	BAN MAI
08	01	17	WANG TAKHIAN
08	01	18	SOTHON
08	01	19	NAM DAENG
08	02	01	KON KAEO
08	02	02	KHLONG KHUAN
08	02	03	BANG KRACHET
08	02	04	THA THONGLANG
08	02	05	BANG TALAT
08	02	06	BANG RONG
08	02	07	BANG LAO
08	02	08	BANG SUAN
08	02	09	PAK NAM
08	02	10	SAO CHANGOK

08	02	11	SAMET NUA
08	02	12	SAMET TAI
08	02	13	HUA SAI
08	03	01	DON CHIMPHLI
08	03	02	SALA DAENG
08	03	03	BUNG NAM RAK
08	03	04	MON THONG
08	03	05	SINGTO THONG
08	03	06	PHRONG AKAT
08	03	07	BANG KHANAK
08	03	08	BANG NAM PRIEO
08	03	09	DON KO KA
08	03	10	YOTHAKA
08	04	01	PHANOM SARAKHAM
08	04	02	THA THAN
08	04	03	BAN SONG
08	04	04	NONG YAO
08	04	05	MUANG KAO
08	04	06	NONG NAE
08	04	07	KO KHANUN
08	04	08	KHAO HIN SON
08	05	01	THA SA-AN
08	05	02	SONG KHLONG
08	05	03	BANG PAKONG
08	05	04	THA KHAM
08	05	05	BANG SAMAK
08	05	06	BANG WUA
08	05	07	BANG KLUA
08	05	08	BANG PHUNG
08	05	09	NONG CHOK
08	05	10	PHIMPHA
08	05	11	HOM SIN
08	06	01	KHU YAI MI
08	06	02	THA KRADAN
08	06	03	THUNG PHRAYA
08	06	04	LAT KRATHING
08	06	05	THA TAKIAP
08	06	06	KHLONG TAKRAO
08	07	01	BAN PHO
08	07	02	KHLONG BAN PHO
08	07	03	BANG SON
08	07	04	THA PHLAP
08	07	05	NONG BUA
08	07	06	NONG TIN NOK
08	07	07	DON SAI
08	07	08	SIP ET SOK
08	07	09	KHLONG KHUT
08	07	10	LAEM PRADU

08	07	11	BANG KRUT
08	07	12	SANAM CHAN
08	07	13	KHLONG PRAWET
08	07	14	THEPPHARAT
08	07	15	KO RAI
08	07	16	LAT KHWANG
08	07	17	SAEN PHU DAT
08	08	01	PLAENG YAO
08	08	02	WANG YEN
08	08	03	HUA SAMRONG
08	08	04	NONG MAI KAEN
08	09	01	BANG KHA
08	09	02	MUANG MAI
08	09	03	DONG NOI
08	10	01	THA TAKIAP
08	10	02	KHLONG TAKRAO

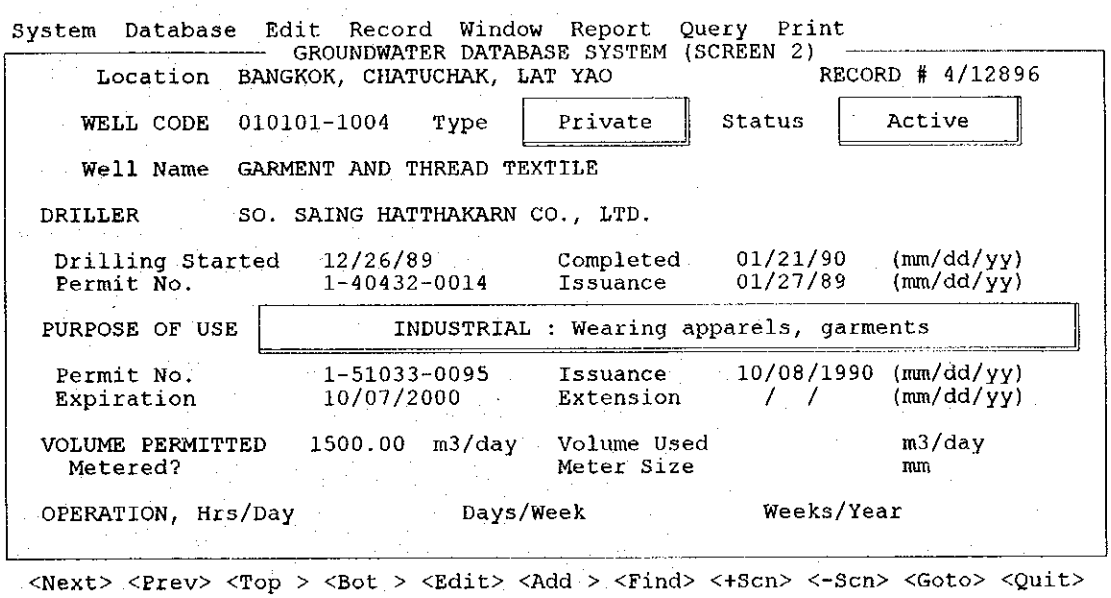
Index Key: W_CODE
Structure for database: **\GWS\WINV\WELL.DBF**

Field	Field Name	Type	Width	Dec
1	W_CODE	Character	11	
2	W_CHANGWAT	Character	2	
3	W_AMPHOE	Character	2	
4	W_TAMBON	Character	2	
5	W_TYPE	Numeric	1	
6	W_NAME	Character	60	
7	W_STATUS	Numeric	1	
8	AQUI_NAME	Numeric	1	
9	DAT_SOURCE	Numeric	1	
10	DRILL_CODE	Character	5	
11	DRILLER	Character	60	
12	NEW_NO	Character	12	
13	OLD_NO	Character	22	
14	W_ADDR1	Character	60	
15	W_ADDR2	Character	60	
16	OWNER	Character	60	
17	OW_ADDR1	Character	60	
18	OW_ADDR2	Character	60	
19	ELEVATION	Numeric	8	2
20	MAP_NO	Character	8	
21	LAT_DEGR	Character	3	
22	LAT_MIN	Character	2	
23	LAT_SEC	Character	2	
24	LONG_DEGR	Character	3	
25	LONG_MIN	Character	2	
26	LONG_SEC	Character	2	
27	UTM_E	Numeric	6	
28	UTM_N	Numeric	6	
29	GZD	Character	3	
30	X	Numeric	3	
31	Y	Numeric	3	

32	START_MM	Character	2	
33	START_DD	Character	2	
34	START_YY	Character	2	
35	COMP_MM	Character	2	
36	COMP_DD	Character	2	
37	COMP_YY	Character	2	
38	DRILL_NO	Character	12	
39	ISSUE_MM	Character	2	
40	ISSUE_DD	Character	2	
41	ISSUE_YY	Character	2	
42	GWUSE_NO	Character	12	
43	GW_USE	Character	2	
44	VOL_PER	Numeric	8	2
45	VOL_ACT	Numeric	8	2
46	PISSUE_MM	Character	2	
47	PISSUE_DD	Character	2	
48	PISSUE_YY	Character	4	
49	EXPIRE_MM	Character	2	
50	EXPIRE_DD	Character	2	
51	EXPIRE_YY	Character	4	
52	EXTEND_MM	Character	2	
53	EXTEND_DD	Character	2	
54	EXTEND_YY	Character	4	
55	METER	Character	1	
56	M_SIZE	Numeric	4	
57	HRS_DAY	Numeric	5	2
58	DAYS_WK	Numeric	5	2
59	WKS_YR	Numeric	5	2
60	D_DEPTH	Numeric	7	2
61	W_DEPTH	Numeric	7	2
62	DIA_TOP	Numeric	4	
63	DIA_BOTTOM	Numeric	4	
64	DIA_RISER	Numeric	4	
65	PTYPE	Numeric	2	
66	PBRAND	Character	3	
67	P_HP	Numeric	7	2
68	P_RC	Numeric	7	2
69	P_TDH	Numeric	6	1
70	P_SET	Numeric	6	2
71	MBRAND	Character	3	
72	M_HP	Numeric	6	2
73	C_TYPE	Numeric	1	
74	C_LENGTH	Numeric	7	2
75	S_LENGTH	Numeric	6	2
76	GR_SIZE	Character	7	
77	GRDEPTH_FR	Numeric	7	2
78	GRDEPTH_TO	Numeric	7	2
79	PIPE_LEN	Numeric	7	2
80	PIPE_DIA	Numeric	4	
81	PDEPTH_FR	Numeric	7	2
82	PDEPTH_TO	Numeric	7	2
83	ER_LOG	Character	1	
84	SP_LOG	Character	1	
85	GR_LOG	Character	1	
86	W_DEV	Numeric	1	

87	WDSTART_MM	Character	2	
88	WDSTART_DD	Character	2	
89	WDSTART_YY	Character	2	
90	WDCOMP_MM	Character	2	
91	WDCOMP_DD	Character	2	
92	WDCOMP_YY	Character	2	
93	WDURATION	Numeric	6	2
94	DISCHARGE	Numeric	7	2
95	PTEST_MM	Character	2	
96	PTEST_DD	Character	2	
97	PTEST_YY	Character	2	
98	PMPTYPE	Numeric	2	
99	PUMPCPCT	Numeric	7	2
100	PUMPSET	Numeric	6	2
101	SWL	Numeric	6	2
102	DRAWDOWN	Numeric	6	2
103	YLD	Numeric	7	2
104	SPCF_CPCTY	Numeric	6	2
105	FLOW	Numeric	1	
106	DURATION	Numeric	6	2
107	PTEST_TYPE	Numeric	1	
108	TRANSMISS	Numeric	8	2
109	ST_COEFF	Numeric	10	6
110	CHECK	Character	1	
** Total **			864	

2. PERMITS



The fields in this screen are explained below:

WELL CODE	WELL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS

WELL NAME WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

DRILLER WELL.DRILLER

Company name of driller. If all the corresponding driller codes are inputted in the field WELL.DRIL_CODE and correspondingly in the \GWS\DBFS\DRILLER.DBF database, this field can be deleted in the WELL database to reduce its size and the program winv02.prg will then have to be edited.

DRILLING STARTED WELL.START_MM, WELL.START_DD, WELL.START_YY

Date drilling started.

DRILLING COMPLETED WELL.COMP_MM, WELL.COMP_DD, WELL.COMP_YY

Date drilling completed.

PERMIT NO. WELL.DRIL_NO

Drilling permit number.

ISSUANCE WELL.ISSUE_MM, WELL.ISSUE_DD, WELL.ISSUE_YY

Date permit was issued.

PURPOSE OF USE WELL.GW_USE

The major use for the well. A two letter code is used to denote the use of the well. The codes used are listed in the \GWS\DBFS\PURPOSE.DBF database and are listed below.

11 DOMESTIC : residences, dorms, courts, subd., condos
21 PUBLIC : Institutional (schools, public admin, hosp., etc.)
31 COMMERCIAL : Office buildings, malls, hotels, clubs, etc.)
41 INDUSTRIAL : Basic factory requirement for drinking and san.
42 INDUSTRIAL : Manufacture of soft drink
43 INDUSTRIAL : Food processing and ice-making
44 INDUSTRIAL : Textile industry, nylons
45 INDUSTRIAL : Wearing apparels, garments
46 INDUSTRIAL : Manufacture of leather products
47 INDUSTRIAL : Manufacture of wood products
48 INDUSTRIAL : Manufacture of paper and paper products
49 INDUSTRIAL : Printing
50 INDUSTRIAL : Chemical industry and chemical products
51 INDUSTRIAL : Rubber industry and rubber products

52 INDUSTRIAL : Plastic products, footwear, insulators, carpets
53 INDUSTRIAL : Manufacture of non-metal products, fibers, etc.
54 INDUSTRIAL : Manufacture of basic metal products, steel bars
55 INDUSTRIAL : Manufacture of metal products
56 INDUSTRIAL : Manufacture of mech., elect., and computer prod
57 INDUSTRIAL : Manufacture , assembly and rep. of vehicles
58 INDUSTRIAL : Manufacture of grain mill products
59 INDUSTRIAL : Agriculture and farm products
60 INDUSTRIAL : Industrial Estates
61 INDUSTRIAL : Tobacco
62 INDUSTRIAL : Power Plant
63 INDUSTRIAL : Others

PERMIT NO. WELL.GWUSE_NO

Permit number for use of well.

DATE ISSUED WELL.PISSUE_MM, WELL.PISSUE_DD, WELL.PISSUE_YY

Date permit was issued.

EXPIRATION WELL.EXPIRE_MM, WELL.EXPIRE_DD, WELL.PISSUE_YY

Date permit will expire.

EXTENSION WELL.EXTEND_MM, WELL.EXTEND_DD, WELL.EXTEND_YY

Date permit is extended.

VOLUME PERMITTED WELL.VOL_PER

Volume permitted in M3/day as stated in the permit.

VOLUME USED WELL.VOL_ACT

Actual volume used during operation in M3/day.

METERED? WELL.METER

Is it metered?

METER SIZE WELL.M_SIZE

If metered, what size in millimeter.

OPERATION, HOURS/DAY WELL.HRS_DAY

Number of hours per day well is operated.

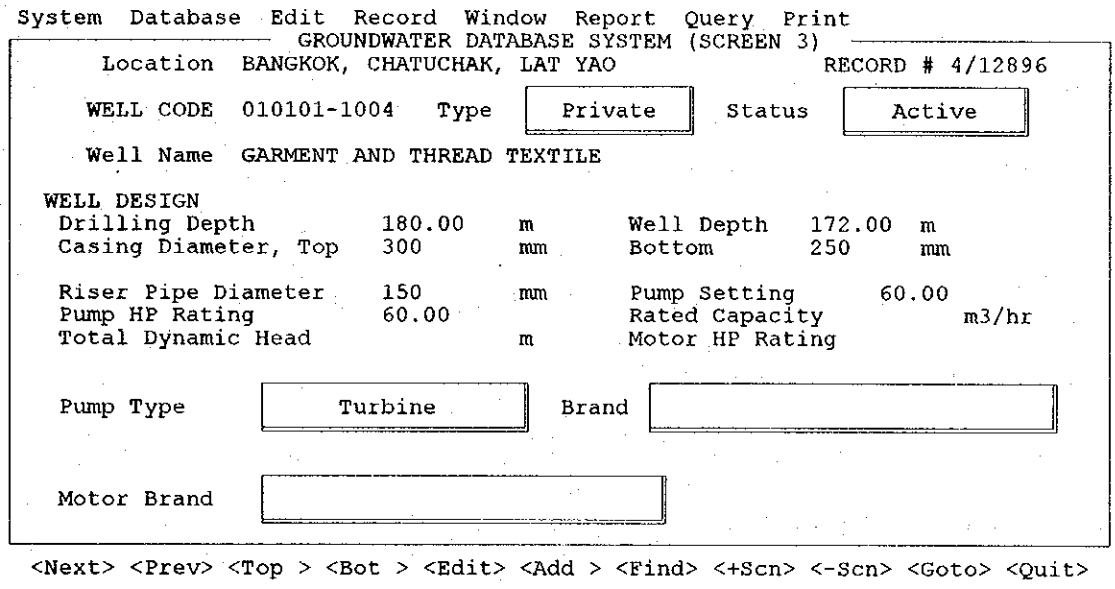
DAYS/WEEK WELL.DAYS_WK

Number of days per week well is operated.

WEEKS/YEAR WELL.WKS_YR

Weeks per year well is operated.

3. WELL DESIGN



The fields in this screen are explained below:

WELL CODE	WELL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

DRILLING DEPTH WELL.D_DEPTH

Drilling depth in meters below ground.

WELL DEPTH WELL.W_DEPTH

Well depth in meters. Usually the depth of the bottom most casing.

CASING DIAMETER, TOP WELL.DIA_TOP

Diameter in millimeter of the top most casing.

BOTTOM WELL.DIA_BOTTOM

Diameter in millimeter of the bottom most casing.

RISER PIPE DIAMETER WELL.DIA_RISER

Riser pipe diameter in millimeter.

PUMP SETTING WELL.PSET

Depth in meters where the pump was set.

PUMP HP RATING WELL.P_HP

Horsepower (HP) rating of the pump installed in the well.

RATED CAPACITY WELL.P_RC

Rated capacity in M3/hr of the installed pump.

TOTAL DYNAMIC HEAD WELL.P_TDH

Rated total dynamic head capacity in meters.

MOTOR HP RATING WELL.M_HP

Horsepower rating of the motor installed for the pump.

PUMP TYPE WELL.P_TYPE

Type of pump installed in the well. The codes used for the different types of pumps are listed in the \GWS\DBFS\PUMPTYPE.DBF database and are listed below.

1 Air Compressor
2 Air Lift Pump
3 Hand Pump
4 Jet Pump
5 Submersible
6 Turbine
7 Rotary
8 Wind Mill
9 Centrifugal Pump

BRAND WELL.P_BRAND

Brand of the pump installed in the well. Instead of inputting directly the brand in the database, a list is opened for selection. The corresponding pump code is looked up in the \GWS\DBFS\PBRANDS.DBF database and is the one stored in the P_BRAND. If the pump brand is not among the selection list, an option to add a brand is offered. The corresponding brand and code is stored in the \GWS\DBFS\PBRANDS.DBF which updates the new list.

MOTOR BRAND WELL.MBRAND

Brand of the motor installed for the pump. The same as above, a list is offered for selection. The motor codes are listed in the \GWS\DBFS\MBRANDS.DBF database. This is automatically updated if a new brand with corresponding code is inputted.

4. STRATA

```
System  Database  Edit  Record  Window  Report  Query  Table  Print
                GROUNDWATER DATABASE SYSTEM (SCREEN 4)
     Location  BANGKOK, CHATUCHAK, LAT YAO              RECORD # 4/12896

    WELL CODE  010101-1004   Type  [ Private ]   Status  [ Active ]

    Well Name  GARMENT AND THREAD TEXTILE

 WELL LOG RECORD
  Electric Logging, Resistivity Log? :
  Spontaneous Potential (SP) Log?    :
  Radiation Logging, Gamma-Ray Log?  :
```

Strata Log

WELL CODE	STR NO	DEPTH FR	DEPTH TO	TYPE	GRAIN	COL
010101-1004	1	0.00	16.00	C		K
010101-1004	2	16.00	21.00	C		B
010101-1004	3	21.00	35.00	S	F	B
010101-1004	4	35.00	39.00	C		G
010101-1004	5	39.00	50.00	S	F	B
010101-1004	6	50.00	56.00	C		LB

<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>

The fields in this screen are explained below:

WELL CODE	WELL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

ELECTRIC LOGGING, RESISTIVITY LOG? WELL.ER_LOG

Was an electric logging or resistivity logging performed on the well? Answered by a Y or N for Yes or No, respectively. Blank means unknown.

SPONTANEOUS POTENTIAL (SP) LOG ? WELL.SP_LOG

Was an spontaneous potential (SP) log performed on the well. Answered by a Y or N for Yes or No, respectively. Blank means unknown.

RADIATION LOGGING, GAMMA RAY LOG? WELL.GR_LOG

Was a radiation logging or gamma ray log performed on the well. Answered by a Y or N for Yes or No, respectively. Blank means unknown.

STRATA LOG DATABASE

The bottom table is a separate database, \GWS\WINV\WSTR.DBF, from the WELL database. It contains the strata information encountered in drilling the well. The information on the corresponding well is shown automatically because the databases are linked. To edit or add data in this database, merely position the mouse cursor in this table and click the left button key. The strata table will become the active window ready for editing. To add a new record, press CONTROL N, the same command used by the standard Browse command of FOXPRO. To edit, position cursor in the field and modify data. Below are the explanations for the different fields:

WELL CODE WSTR.W_CODE

A well code which is the same as in WELL.W_CODE and automatically entered in this field when cursor is moved out of the field.

STR NO WSTR.STR_NO

A serial number starting from 1 denoting the nth position of the strata from the ground.

DEPTH FR WSTR.DEPTH_FR

Starting depth of the strata in meters.

DEPTH TO WSTR.DEPTH_TO

Ending depth of the strata in meters.

TYPE WSTR.TYPE

Type of soil encountered. A series of codes is used to represent the formation, i.e., C+S, for clay plus sand. A popup menu is activated when the cursor is positioned in this field. Choose the type and press the Enter key to encode the type. Press the right arrow to exit the popup list. Several types can be appended to come up with the right combination. A + sign is automatically appended to the selection. If the code is the final selection, press the backspace to erase the + symbol, otherwise the popup list will be shown again. The complete codes are listed in the \GWS\DBFS\LITHO.DBF database and are listed below:

C Clay
S Sand

B	Pebble
TS	Top soil
LS	Limestone
G	Gravel
GR	Granite
I	Silt
ST	Siltstone
QZ	Quartzite
IG	Igneous rock
GY	Gypsum
AN	Andesite
CH	Chert
MB	Marble
O	Cobble
PH	Phyllite
R	Rock
SH	Shale
SP	Soapstone
TR	Trachite
VO	Volcanic Rock
DB	Diabase
AR	Argilite
BA	Basalt
CG	Conglomerate
CL	Caliche
DI	Diorite
GN	Gneiss
GW	Graywacke
L	Lateritic sediments
M	Marl
MD	Mudstone
P	Granule
RH	Rhyolite
SC	Schist
SL	Slate
SS	Sandstone
SY	Slaty shale
X	Rock fragment

GRAIN WSTR.GRAIN

The grain size of the soil. The same as above a popup menu is shown to guide the user. The same procedure as above should be performed. The complete list are listed in the \GWS\DBFS\GRAIN.DBF database and are shown below:

VF	Very Fine
F	Fine
M	Medium

C	Coarse
VC	Very Coarse
SA	Sub-angular
A	Angular
R	Rounded
WR	Well-rounded
SR	Sub-rounded

COLOR WSTRCOLOR

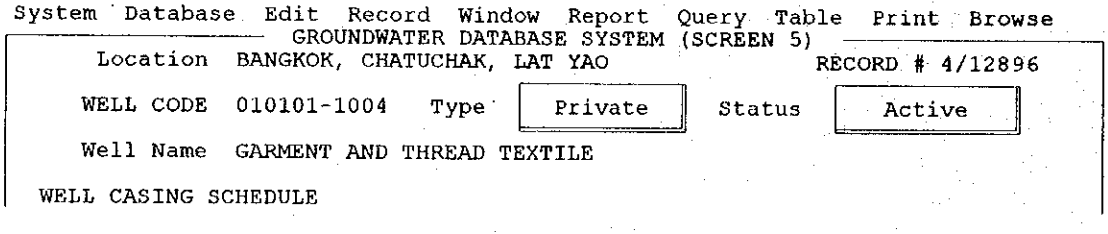
The pedominant color of the soil. The same as above a popup menu is shown to guide the user. The same procedure as above should be performed. The complete list are listed in the \GWS\DBFS\COLOR.DBF database and are shown below:

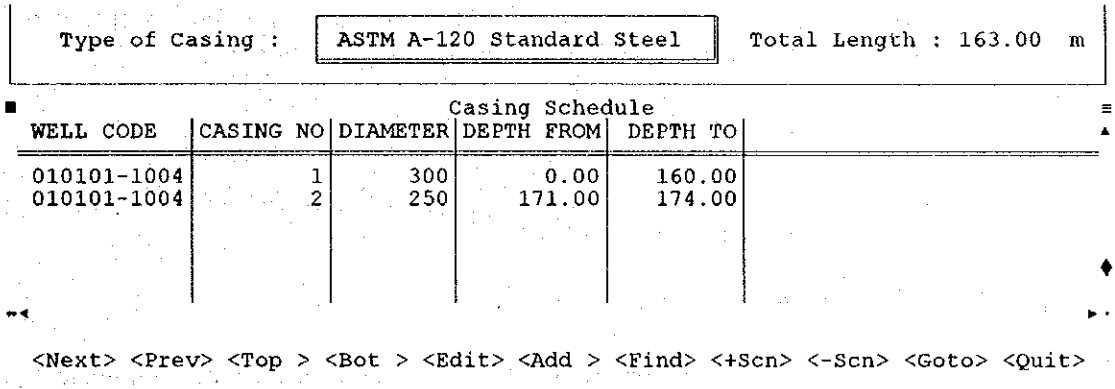
B	Brown
K	Black
N	Green
P	Pink
R	Red
V	Violet
W	White
C	Cream
G	Gray
O	Orange
U	Blue
Y	Yellow
D	Dark
L	Light

Index Key: W_CODE+STR(STR_NO,3)
Structure for database: **\GWS\WINV\WSTR.DBF**

Field	Field Name	Type	Width	Dec
1	W_CODE	Character	11	
2	STR_NO	Numeric	3	
3	DEPTH_FR	Numeric	6	2
4	DEPTH_TO	Numeric	6	2
5	TYPE	Character	22	
6	GRAIN	Character	10	
7	COLOR	Character	10	
** Total **			69	

5. WELL CASING





The fields in this screen are explained below:

WELL CODE	WELL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

TYPE OF CASING WELL.C_TYPE

Type of casing used in the well. The codes for the available casing types are listed in the \GWS\DBFS\CASING.DBF and are shown below.

1 ASTM A-53 Standard Steel
2 ASTM A-120 Standard Steel
3 API 5L Standard Steel
4 API 5A Standard Steel
5 ASTM A-409 Stainless Steel
6 BS (British Standards) 1387
7 Thermoplastic (ABS, PVC, etc)
8 Fiberglass-Reinforced Plastic

TOTAL LENGTH WELL.C_LENGTH

The total length in meters of the casing installed in the well.

CASING SCHEDULE DATABASE

The bottom table is a separate database, \GWS\WINV\WCAS.DBF, from the WELL database. It contains the casing schedule installed in the well. The information on the corresponding well is shown automatically because the databases are linked. To edit or add data in this database, merely position the mouse cursor in this table and click the left button key. The casing schedule table will become the active window, ready for editing. To add a new record, press CONTROL N, the same command used

by the standard Browse command of FOXPRO. To edit, position cursor in the field and modify data. Below are the explanations for the different fields:

WELL CODE WCAS.W_CODE

A well code which is the same as in WELL.W_CODE and automatically entered in this field when cursor is moved out of the field.

CASING NO WCAS.CINT_NO

A serial number starting from 1 denoting the nth position of the casing section starting from the ground.

DIAMETER WCAS.CDIA

Diameter in millimeter of the casing section.

DEPTH FROM WCAS.CDEPTH_FR

Depth of the top of casing section in meters below ground.

DEPTH TO WCAS.CDEPTH_TO

Depth of the bottom of casing section in meters below ground.

```
Index Key: W_CODE+STR(CINT_NO,2)
Structure for database: \GWS\WINV\WCAS.DBF
Field  Field Name  Type        Width    Dec
    1  W_CODE      Character      11
    2  CINT_NO     Numeric         2
    3  C_DIA       Numeric         4
    4  CDEPTH_FR   Numeric         6      2
    5  CDEPTH_TO   Numeric         6      2
** Total **                      30
```

6. WELL SCREENS

```
System  Database  Edit  Record  Window  Report  Query  Table  Print
                GROUNDWATER DATABASE SYSTEM (SCREEN 6)
     Location  BANGKOK, CHATUCHAK, LAT YAO              RECORD # 4/12896

     WELL CODE  010101-1004   Type  [ Private ]   Status  [ Active ]

     Well Name  GARMENT AND THREAD TEXTILE

  WELL SCREEN/SLOTTED PERFORATION SECTIONS
    Total Length of Screens :     9.00
```

	Screen Sections						
WELL CODE	SCREEN NO	TYPE	DIAMETER	SLOT SIZE	GAUZE NO	DEPTH FROM	DEPTH TO
010101-1004	1	2	250		40	162.00	171.00

<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>

The fields in this screen are explained below:

WELL CODE	WELL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

TOTAL LENGTH OF SCREENS WELL.S_LENGTH

Total length of the screen sections or perforations in meters.

SCREEN SECTIONS DATABASE

The bottom table is a separate database, \GWS\WINV\WSCRN.DBF, from the WELL database. It contains the screen sections installed in the well. The information on the corresponding well is shown automatically because the databases are linked. To edit or add data in this database, merely position the mouse cursor in this table and click the left button key. The screen schedule table will become the active window, ready for editing. To add a new record, press CONTROL N, the same command used by the standard Browse command of FOXPRO. To edit, position cursor in the field and modify data. Below are the explanations for the different fields:

WELL CODE WSCRN.W_CODE

A well code which is the same as in WELL.W_CODE and automatically entered in this field when cursor is moved out of the field.

SCREEN NO WSCRN.SINT_NO

A serial number starting from 1 denoting the nth position of the screen section starting from the ground.

TYPE WSCRN.S_TYPE

Type of screen installed in the section. The codes are listed in the \GWS\DBFS\SCRNTYPE.DBF database and are listed below.

1 Slotted Perforation

2 Continuous-Slot
3 Wedge Wire Wound
4 Louvered and Bridge Slot

DIAMETER WSCRN.S_DIA

Diameter in millimeter of the screen section.

SLOT SIZE WSCRN.S_OPEN

Size of the opening or slots in millimeters.

GAUZENO WCSRN.S_NUMBER

Thickness of the screen in gauge no.

DEPTH FROM WSCRN.SDEPTH_FR

Depth of the top of screen section in meters below ground.

DEPTH TO WSCRN.SDEPTH_TO

Depth of the bottom of screen section in meters below ground.

Index Key: W_CODE+STR(SINT_NO,2)
Structure for database: **\GWS\WINV\WSCRN.DBF**

Field	Field Name	Type	Width	Dec
1	W_CODE	Character	11	
2	SINT_NO	Numeric	2	
3	S_TYPE	Numeric	1	
4	S_DIA	Numeric	4	
5	S_NUMBER	Character	2	
6	S_OPEN	Numeric	5	2
7	SDEPTH_FR	Numeric	6	2
8	SDEPTH_TO	Numeric	6	2
** Total **			38	

7. ANNULAR SEAL

System Database Edit Record Window Report Query Table Print

GROUNDWATER DATABASE SYSTEM (SCREEN 7)

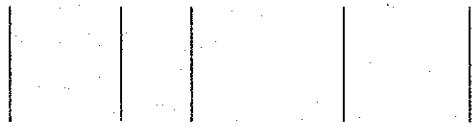
Location BANGKOK, CHATUCHAK, LAT YAO RECORD # 4/12896

WELL CODE 010101-1004 Type Private Status Active

Well Name GARMENT AND THREAD TEXTILE

ANNULAR SEAL SECTIONS
Gravel Pack, Size of Gravel : 4 Depth From : 155.00 To : 180.00 m

WELL CODE	SEAL NO	TYPE	Annular Seal DEPTH FROM	DEPTH TO
010101-1004	1	5	0.00	155.00



<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>

The fields in this screen are explained below:

WELL CODE	WELL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

ANNULAR SEAL DATABASE

The bottom table is a separate database, \GWS\WINV\WSEAL.DBF, from the WELL database. It contains the annular seal installed in the well. The information on the corresponding well is shown automatically because the databases are linked. To edit or add data in this database, merely position the mouse cursor in this table and click the left button key. The annular seal table will become the active window, ready for editing. To add a new record, press CONTROL N, the same command used by the standard Browse command of FOXPRO. To edit, position cursor in the field and modify data. Below are the explanations for the different fields:

WELL CODE WSEAL.W_CODE

A well code which is the same as in WELL.W_CODE and automatically entered in this field when cursor is moved out of the field.

SCREEN NO WSEAL.SLINT_NO

A serial number starting from 1 denoting the nth position of the annular seal section starting from the ground.

TYPE WSEAL.SL_TYPE

Type of annular seal installed in the section. The codes are listed in the \GWS\DBFS\SEALYPE.DBF database and are listed below.

1 BACK FILL
2 CEMENT
3 CEMENT & SAND
4 CEMENT WITH CLAY
5 CLAY

6 SANDY CLAY
7 SAND
8 GRAVEL

DEPTH FROM WSEAL.SLDEPTH_FR

Depth of the top of annular seal section in meters below ground.

DEPTH TO WSEAL.SLDEPTH_TO

Depth of the bottom of annular seal section in meters below ground.

```
Index Key: W_CODE+STR(SLINT_NO,2)
Structure for database: \GWS\WINV\WSEAL.DBF
Field  Field Name  Type        Width    Dec
    1  W_CODE      Character      11
    2  SLINT_NO    Numeric         2
    3  SLTYPE      Numeric         1
    4  SLDEPTH_FR  Numeric         6      2
    5  SLDEPTH_TO  Numeric         6      2
** Total **                        27
```

8. SAND COLLECTOR

```
System  Database  Edit  Record  Window  Report  Query  Print
                    GROUNDWATER DATABASE SYSTEM (SCREEN 8)
     Location  BANGKOK, CHATUCHAK, LAT YAO                RECORD # 4/12896

    WELL CODE  010101-1004   Type  [ Private ]   Status  [ Active ]

    Well Name  GARMENT AND THREAD TEXTILE

                         SAND COLLECTOR PIPE
```

Pipe Length (m)	Pipe Diameter (mm)	Depth (m) From	Depth (m) To

```
<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>
```

This screen contains the information on the sand collector pipe. The fields in this screen are explained below:

WELL CODE WELL.W_CODE
TYPE WELL.W_TYPE
STATUS WELL.W_STATUS
WELL NAME WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

PIPE LENGTH WELL.PIPE_LEN

Total length in meters of the collector pipe.

PIPE DIAMETER WELL.PIPE_DIA

Diameter in millimeters of the collector pipe.

DEPTH FROM WELL.PDEPTH_FR

Depth in meters below ground of the top of the collector pipe.

DEPTH TO WELL.PDEPTH_TO

Depth in meters below ground of the bottom of the collector pipe.

9. WELL DEVELOPMENT

```
System  Database  Edit  Record  Window  Report  Query  Print
                GROUNDWATER DATABASE SYSTEM (SCREEN 9)
     Location  BANGKOK, CHATUCHAK, LAT YAO              RECORD # 4/12896

    WELL CODE  010101-1004   Type  [ Private ]   Status  [ Active ]

    Well Name  GARMENT AND THREAD TEXTILE

 WELL DEVELOPMENT AND PUMPING TEST     Method  [ Air Developing by Surging ]

  Date Started        01/22/90          Date Completed   01/23/90  (mm/dd/yy)
  Duration            48.00             Well Discharge   130.00     m3/hr

 PUMPING TEST                          Pump Type  [ Turbine ]
  Date                01/24/90
  Pump Capacity                 m3/hr  Pump Setting            60.00  m
  Static Water Level    37.50   m      Drawdown                 8.23  m
  Yield                130.00   m3/hr  Specific Capacity       15.80  m3/hr/m

  Flow Measurement   [ Flowmeter ]     Type of Test  [ Constant-Rate ]

  Duration               6.00  hours
  Transmissivity               m2/day Storage Coefficient

<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>
```

This screen contains the information on the well development and pumping test conducted on the well. The fields in this screen are explained below:

WELL CODE WELL.W_CODE
TYPE WELL.W_TYPE
STATUS WELL.W_STATUS
WELL NAME WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

METHOD WELL.W_DEV

Method used in the well development. The codes are taken from the \GWS\DBFS\DEVELOP.DBF database and are listed below.

1 Overpumping
2 Backwashing
3 Mechanical Surging
4 Air Developing by Surging and Pumping
5 Others

DATE STARTED WELL.WDSTART_MM, WDSTART_DD, WDSTART_YY

Date well development was started.

DATE COMPLETED WELL.WDCOMP_MM, WDCOMP_DD, WDCOMP_YY

Date well development was completed.

DURATION WELL.WDURATION

How many hours was well development done?

WELL DISCHARGE WELL.DISCHARGE

What was the well discharge then?

PUMP TYPE WELL.PMPTYPE

What type of pump was used in the pumping test? The codes are listed in the \GWS\DBFS\PUMPTYPE.DBF database and are listed below.

1 Air Compressor
2 Air Lift Pump
3 Hand Pump
4 Jet Pump
5 Submersible
6 Turbine
7 Rotary
8 Wind Mill
9 Centrifugal Pump

DATE WELL.PTEST_MM, PTEST_DD, PTEST_YY

Date when pumping test was conducted.

PUMP CAPACITY WELL.PUMPCPCT

What was the pump capacity in m3/hr?

PUMP SETTING WELL.PUMPSET

At what depth in meters below ground was the pump set?

STATIC WATER LEVEL WELL.SWL

What was the static water level in meters before the start of the pumping test?

DRAWDOWN WELL.DRAWDOWN

What was the drawdown in meters after the end of pumping test?

YIELD WELL.YLD

How much did the well yield in m3/hr?

SPECIFIC CAPACITY WELL.SPCF_CPCTY

What was the computed specific capacity in m3/hr/m?

FLOW MEASUREMENT WELL.FLOW

What method of flow measurement was used? The codes are listed in the \GWS\DBFS\FLOW.DBF database and are listed below.

1 Flowmeter
2 Orifice
3 Weir
4 Flume
5 Container
6 Others

TYPE OF TEST WELL.PTEST_TYPE

Type of pumping test conducted. The codes used are listed in the \GWS\DBFS\PUMPTEST.DBF database and are listed below.

1 Step-Drawdown
2 Constant-Rate
3 Others

DURATION WELL.DURATION

Duration of the pumping test in hours.

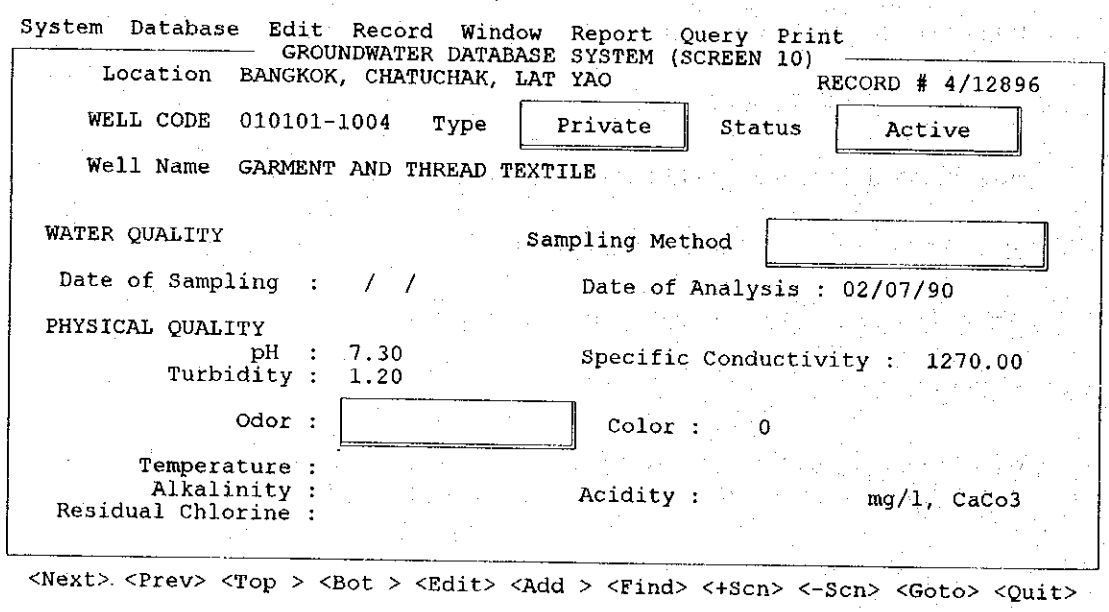
TRANSMISSIVITY WELL.TRANSMISS

What was the computed well transsmissivity in m2/day?

STORAGE COEFFICIENT WELL.ST_COEFF

What was the computed storage coefficient?

10. WATER QUALITY (PHYSICAL)



This screen contains the information on the physical characteristics of the water taken from the well. The fields in this screen are explained below:

WELL CODE	WQUAL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

SAMPLING METHOD WQUAL.METHOD

The sampling method used in getting the water from the well. The codes used are listed in the \GWS\DBFS\CHMETHOD.DBF database and are shown below:

1 Bailer
2 Air-lift samplers
3 Submersible pump
4 Suction-lift pump
5 Gas-operated pump
6 Hand pump

DATE OF SAMPLING WQUAL.SAMPLE_MM, SAMPLE_DD, SAMPLE_YY

Date of sampling in the format MM/DD/YY for month, day, year.

DATE OF ANALYSIS WQUAL.ANAL_MM, ANAL_DD, ANAL_YY

Date of analysis in the format MM/DD/YY for month, day, year.

PH WQUAL.PH

Acidity or basicity of the water in terms of PH. Range is 0 to 14. PH of acid water is 0 to 7. PH of basic water is 7 to 14. A PH of 7 is neutral.

SPECIFIC CONDUCTIVITY WQUAL.SPCOND

Specific conductivity of the water in mhos. This reflects the resistance of the water to conduct electricity.

TURBIDITY WQUAL.TURBIDITY

Turbidity or state of clearness of the water.

ODOR WQUAL.ODOR

Odor of the water. The codes used are listed in the \GWS\DBFS\ODOR.DBF database and are shown below:

1 Odorless
2 Slightly Smelly
3 Strong Smell

COLOR WQUAL.COLOR

Color of the water.

TEMPERATURE WQUAL.TEMP

Normal temperature of water.

ALKALINITY WQUAL.ALKALINITY

Alkalinity in mg/liter as CaCo3.

ACIDITY WQUAL.ACIDITY

Acidity in mg/liter.

RESIDUAL CHLORINE WQUAL.RCHLORINE

Residual chlorine.

Index Key: W_CODE
Structure for database: **\GWS\WINV\WQUAL.DBF**

Field	Field Name	Type	Width	Dec	Index
1	W_CODE	Character	11		
2	METHOD	Numeric	1		
3	SAMPLE_MM	Character	2		
4	SAMPLE_DD	Character	2		
5	SAMPLE_YY	Character	2		
6	ANAL_MM	Character	2		
7	ANAL_DD	Character	2		
8	ANAL_YY	Character	2		
9	PH	Numeric	5	2	
10	SPCOND	Numeric	8	2	
11	TURBIDITY	Numeric	5	2	
12	COLOR	Numeric	5		
13	ODOR	Numeric	1		
14	TEMP	Numeric	4	1	
15	ALKALINITY	Numeric	7	2	
16	ACIDITY	Numeric	7	2	
17	RCHLORINE	Numeric	7	2	
18	CALCIUM	Numeric	7	2	
19	MAGNESIUM	Numeric	7	2	
20	SODIUM	Numeric	7	2	
21	POTASSIUM	Numeric	7	2	
22	DIS_IRON	Numeric	7	2	
23	TOT_IRON	Numeric	7	2	
24	MANGANESE	Numeric	7	2	
25	COPPER	Numeric	7	2	
26	ZINC	Numeric	7	2	
27	CHLORIDE	Numeric	7	2	
28	SULPHATE	Numeric	7	2	
29	CARBONATE	Numeric	7	2	
30	HCO_3	Numeric	7	2	
31	CO_2	Numeric	7	2	
32	NITRITE	Numeric	7	2	
33	NITRATE	Numeric	7	2	
34	FLOURIDE	Numeric	7	2	
35	TSOLIDS	Numeric	7	2	
36	THARDNESS	Numeric	7	2	
37	NON_HARD	Numeric	7	2	
** Total **			214		

11. WATER QUALITY (CHEMICAL)

```
System  Database  Edit  Record  Window  Report  Query  Print
                GROUNDWATER DATABASE SYSTEM (SCREEN 11)
     Location  BANGKOK, CHATUCHAK, LAT YAO              RECORD # 4/12896

     WELL CODE  010101-1004   Type  [ Private ]   Status  [ Active ]

     Well Name  GARMENT AND THREAD TEXTILE


 CHEMICAL QUALITY (mg/l)  :
  Calcium, Ca             :   97.00     Magnesium, Mg          :   32.00
  Sodium, Na              :  117.00     Potassium, K           :    5.90
  Dissolved Iron, Fe      :             Total Iron, Fe         :    0.21
  Manganese, Mn           :    0.01     Copper, Cu             :    0.00
  Zinc, Zn                :    0.05     Chloride, Cl           :  266.00
  Sulphate, SO4           :   16.00     Carbonate, CO3         :    0.00
  Bicarbonate, HC03       :  265.00     Carbon Dioxide, CO2    :   21.00
  Nitrite, NO2            :    0.02     Nitrate, NO3           :    2.60
  Flouride, F             :    0.10     Total Solids           :  850.00
  Total Hardness as CaCo3 :  372.00     Non Carbonate Hardness :  155.00

<Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>
```

The fields in this screen are explained below:

WELL CODE	WQUAL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

The following more commonly measured chemical elements in mg/liter shows their corresponding fields in the \GWS\WINV\WQUAL.DBF database.

CALCIUM, Ca	WQUAL.CALCIUM
MAGNESIUM, Mg	WQUAL.MAGNESIUM
SODIUM, Na	WQUAL.SODIUM
POTASSIUM, K	WQUAL.POTASSIUM
DISSOLVED IRON, Fe	WQUAL.DIS_IRON
TOTAL IRON, Fe	WQUAL.TOR_IRON
MANGANESE, Mn	WQUAL.MANGANESE
COPPER, Cu	WQUAL.COPPER
ZINC, Zn	WQUAL.ZINC
CHLORINE, Cl	WQUAL.CHLORIDE
SULPHATE, SO4	WQUAL.SULPHATE
CARBONATE, CO3	WQUAL.CARBONATE
BICARBONATE, HC03	WQUAL.HCO_3
CARBON DIOXIDE, CO2	WQUAL.CO_2
NITRITE, NO2	WQUAL.NITRITE

NITRATE, NO3	WQUAL.NITRATE
FLOURIDE, F	WQUAL.FLOURIDE
TOTAL SOLIDS	WQUAL.TSOLIDS
TOTAL HARDNESS as CaCo3	WQUAL.THARDNESS
NON CARBONATE HARDNESS	WQUAL.NON_HARD

12. WATER QUALITY (TOXIC)

```
System  Database  Edit  Record  Window  Report  Query  Print
                GROUNDWATER DATABASE SYSTEM (SCREEN 12)
     Location  BANGKOK, CHATUCHAK, LAT YAO              RECORD # 4/12896

     WELL CODE  010101-1004   Type  [ Private ]   Status  [ Active ]

     Well Name  GARMENT AND THREAD TEXTILE

   Sampling Method  [                    ]

   Date of Sampling          /  /        Date of Analysis      /  /

  TOXIC ELEMENTS (mg/l)
   Arsenic, As          :               Cyanide, CN       :
   Lead, Pb             :               Mercury, Hg       :
   Cadmium, Cd          :               Selenium, Se      :
   Chromium, Cr         :

  TRACE ELEMENTS (mg/l)
   Barium, Ba           :               Silver, Ag        :
   Phenols              :               Bromide, Br       :
   Iodide, I            :

 <Next> <Prev> <Top > <Bot > <Edit> <Add > <Find> <+Scn> <-Scn> <Goto> <Quit>
```

The fields in this screen are explained below:

WELL CODE	TQUAL.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME

The above fields cannot be edited in this screen. They can only be edited in the first screen, the location screen. They are only shown here as a guide.

The following less measured chemical elements in mg/liter shows their corresponding fields in the \GWS\WINV\TQUAL.DBF database. They were separated from the main chemical database to minimize the main chemical database size because there are no measurements on them most of the time.

SAMPLING METHOD TQUAL.METHOD

The sampling method used in getting the water from the well. The codes used are listed in the \GWS\DBFS\CHMETHOD.DBF database and are shown below:

1 Bailer
2 Air-lift samplers

3 Submersible pump
4 Suction-lift pump
5 Gas-operated pump
6 Hand pump

DATE OF SAMPLING	TQUAL.SAMPLE_MM, SAMPLE_DD, SAMPLE_YY
DATE OF ANALYSIS	TQUAL.ANAL_MM, ANAL_DD, ANAL_YY
ARSENIC, As	TQUAL.ARSENIC
CYANIDE, CN	TQUAL.CYANIDE
LEAD, Pb	TQUAL.LEAD
MERCURY, Hg	TQUAL.MERCURY
CADMIUM, Cd	TQUAL.CADMIUM
SELENIUM, Se	TQUAL.SELENIUM
CHROMIUM, Cr	TQUAL.CHROMIUM
BARIUM, Ba	TQUAL.BARIUM
SILVER, Ag	TQUAL.SILVER
PHENOLS, Ba	TQUAL.PHENOLS
BROMIDE, Br	TQUAL.BROMIDE
IODIDE, I	TQUAL.IODIDE

Index Key: W_CODE
Structure for database: **\GWS\WINV\TQUAL.DBF**

Field	Field Name	Type	Width	Dec
1	W_CODE	Character	11	
2	METHOD	Numeric	1	
3	SAMPLE_MM	Character	2	
4	SAMPLE_DD	Character	2	
5	SAMPLE_YY	Character	2	
6	ANAL_MM	Character	2	
7	ANAL_DD	Character	2	
8	ANAL_YY	Character	2	
9	ARSENIC	Numeric	7	2
10	CYANIDE	Numeric	7	2
11	LEAD	Numeric	7	2
12	MERCURY	Numeric	7	2
13	CADMIUM	Numeric	7	2
14	SELENIUM	Numeric	7	2
15	CHROMIUM	Numeric	7	2
16	BARIUM	Numeric	7	2
17	SILVER	Numeric	7	2
18	PHENOLS	Numeric	7	2
19	BROMIDE	Numeric	7	2
20	IODIDE	Numeric	7	2
** Total **			109	

WELL INVENTORY DATABASES

Select area: 1,
Database in Use: \GWS\WINV\WELL.DBF Alias: WELL
Master index file: \GWS\WINV\WELL.IDX Key: W_CODE
Related into: GWQUAL

```
      Relation:  W_CODE
  Related into:  GWL
      Relation:  W_CODE
  Related into:  HGEO
      Relation:  W_CODE
  Related into:  DISC
      Relation:  W_CODE
  Related into:  NDMR
      Relation:  W_CODE
  Related into:  SEAL
      Relation:  W_CODE
  Related into:  WCASING
      Relation:  W_CODE
  Related into:  STR
      Relation:  W_CODE
  Related into:  SCREEN
      Relation:  W_CODE
  Related into:  CHEM
      Relation:  W_CODE
  Related into:  TCHEM
      Relation:  W_CODE

Select area:  2,
  Database in Use: \GWS\WINV\TQUAL.DBF    Alias: TCHEM
  Master index file:   \GWS\WINV\TQUAL.IDX  Key: W_CODE

Select area:  3,
  Database in Use: \GWS\WINV\WQUAL.DBF    Alias: CHEM
  Master index file:   \GWS\WINV\WQUAL.IDX  Key: W_CODE

Select area:  4,
  Database in Use: \GWS\WINV\WSCRN.DBF    Alias: SCREEN
  Master index file:   \GWS\WINV\WSCRN.IDX
  Key: W_CODE+STR(SINT_NO,2)

Select area:  5,
  Database in Use: \GWS\WINV\WSTR.DBF    Alias: STR
  Master index file:   \GWS\WINV\WSTR.IDX
  Key: W_CODE+STR(STR_NO,3)

Select area:  6,
  Database in Use: \GWS\WINV\WCAS.DBF    Alias: WCASING
  Master index file:   \GWS\WINV\WCAS.IDX
  Key: W_CODE+STR(CINT_NO,2)

Select area:  7,
  Database in Use: \GWS\WINV\WSEAL.DBF    Alias: SEAL
  Master index file:   \GWS\WINV\WSEAL.IDX
```

Key: W_CODE+STR(SLINT_NO,2)

Select area: 8,
Database in Use: \GWS\NDMR\NDMR.DBF Alias: NDMR
Master index file: \GWS\NDMR\NDMR.IDX Key: W_CODE

Select area: 9,
Database in Use: \GWS\NDMR\DISC.DBF Alias: DISC
Master index file: \GWS\NDMR\DISC.IDX
Key: W_CODE+STR(YEAR,4)

Select area: 10,
Database in Use: \GWS\WHGEO\HGEO.DBF Alias: HGEO
Master index file: \GWS\WHGEO\HGEO.IDX Key: W_CODE

Select area: 11,
Database in Use: \GWS\WHGEO\GWL.DBF Alias: GWL
Master index file: \GWS\WHGEO\GWL.IDX Key: W_CODE

Select area: 12,
Database in Use: \GWS\WHGEO\GWQUAL.DBF Alias: GWQUAL
Master index file: \GWS\WHGEO\GWQUAL.IDX Key: W_CODE

Select area: 13,
Database in Use: \GWS\DBFS\DRILLERS.DBF Alias: DRILLERS
Master index file: \GWS\DBFS\DRILLERS.IDX Key: DRILL_CODE

Select area: 14,
Database in Use: \GWS\DBFS\PBRANDS.DBF Alias: PBRANDS
Master index file: \GWS\DBFS\PBRANDS.IDX Key: P_CODE

Select area: 15,
Database in Use: \GWS\DBFS\MBRANDS.DBF Alias: MBRANDS
Master index file: \GWS\DBFS\MBRANDS.IDX Key: M_CODE

Select area: 16,
Database in Use: \GWS\DBFS\TYPE.DBF Alias: TYPE

Select area: 17,
Database in Use: \GWS\DBFS\STATUS.DBF Alias: STATUS

Select area: 18,
Database in Use: \GWS\DBFS\PURPOSE.DBF Alias: PURPOSE

Select area: 19,
Database in Use: \GWS\DBFS\CASING.DBF Alias: CASING

Select area: 20,

Database in Use: \GWS\DBFS\DEVELOP.DBF Alias: DEVELOP

Select area: 21,
Database in Use: \GWS\DBFS\CHMETHOD.DBF Alias: CHMETHOD

Select area: 22,
Database in Use: \GWS\DBFS\AQUIFER.DBF Alias: AQUIFER

Select area: 23,
Database in Use: \GWS\DBFS\SOURCE.DBF Alias: SOURCE

Select area: 24,
Database in Use: \GWS\DBFS\FLOW.DBF Alias: FLOW

Select area: 25,
Database in Use: \GWS\DBFS\PUMPTEST.DBF Alias: PUMPTEST

Select area: 26,
Database in Use: \GWS\DBFS\SCRNTYPE.DBF Alias: SCRNTYPE

Select area: 27,
Database in Use: \GWS\DBFS\SEALTYPE.DBF Alias: SEALTYPE

Select area: 28,
Database in Use: \GWS\DBFS\PUMPTYPE.DBF Alias: PUMPTYPE

Select area: 29,
Database in Use: \GWS\DBFS\ODOR.DBF Alias: ODOR

Select area: 30,
Database in Use: \GWS\DBFS\LITHO.DBF Alias: LITHO

Select area: 31,
Database in Use: \GWS\DBFS\GRAIN.DBF Alias: GRAIN

Select area: 32,
Database in Use: \GWS\DBFS\COLOR.DBF Alias: COLOR

Select area: 33,
Database in Use: \GWS\WHGEO\WIONS.DBF Alias: WIONS

Select area: 34,
Database in Use: \GWS\DBFS\HAGENCY.DBF Alias: HAGENCY

Select area: 35,
Database in Use: \GWS\DBFS\VLIMIT.DBF Alias: VLIMIT

Select area: 36,

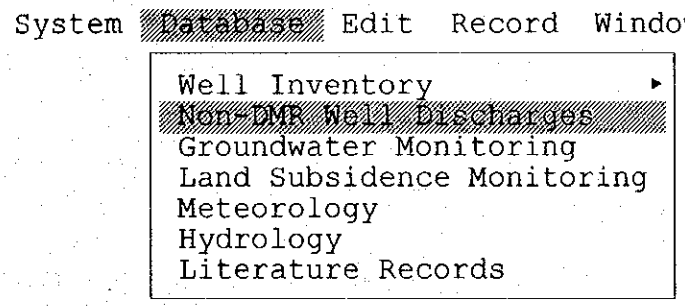
Database in Use: \GWS\DBFS\REPORTS.DBF Alias: REPORTS

Select area: 37,
Database in Use: \GWS\DBFS\CHANGWAT.DBF Alias: CHANGWAT
Master index file: \GWS\DBFS\CHANGWAT.IDX Key: CHANG_CODE

Select area: 38,
Database in Use: \GWS\DBFS\AMPHOE.DBF Alias: AMPHOE
Master index file: \GWS\DBFS\AMPHOE.IDX
Key: CHANG_CODE+AMPHO_CODE

Select area: 39,
Database in Use: \GWS\DBFS\TAMBON.DBF Alias: TAMBON
Master index file: \GWS\DBFS\TAMBON.IDX
Key: CHANG_CODE+AMPHO_CODE+TAMBO_CODE

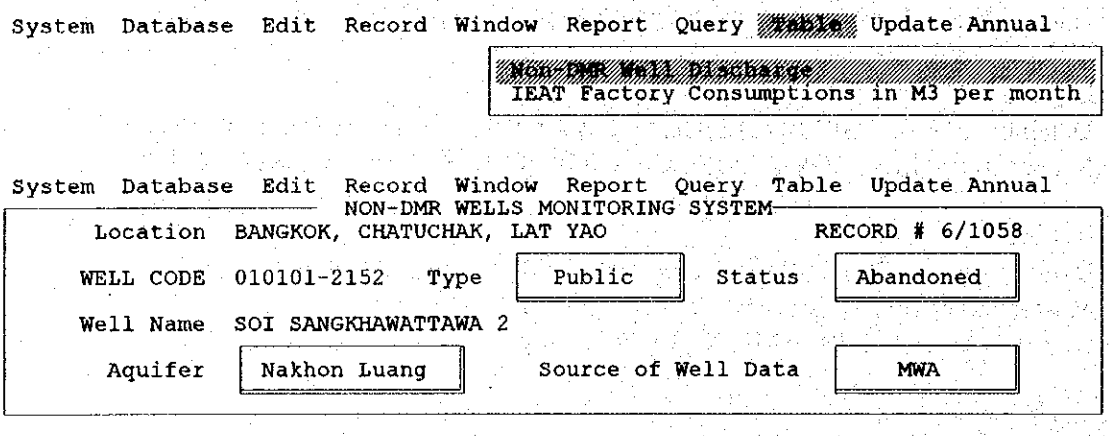
NON-DMR WELLS



The well discharge rates for the non-DMR monitored wells are listed in this database. A well is considered a non-DMR well if the source of well data (DAT_SOURCE field) in the WELL database is not equal to 1 (code for DMR wells). For the complete codes used for the source of well data, please refer to the well location screen (screen 1).

The \GWS\NDMR\NDMR.DBF database contains the list of all non-DMR well codes. This is linked with the WELL database to get the complete information on the well. Two databases are maintained to contain the non-DMR well discharges, \GWS\NDMR\DISC.DBF contains the complete monthly well discharges of all non-DMR wells while \GWS\NDMR\IEAT.DBF contains the monthly consumption in m3 of IEAT factories. The IEAT factories' monthly consumptions is the basis in getting the monthly discharge rates of wells in IEAT factories. The monthly consumption is merely divided into the number of wells supplying each water system network. The average monthly discharge rates of IEAT wells are then copied to the DISC.DBF. The well code of each well belonging to each network should therefore be ascertained.

The two tables can be shown by selecting the Table option as shown below: The default table is the Non-DMR well discharges.



The fields in this screen are explained below:

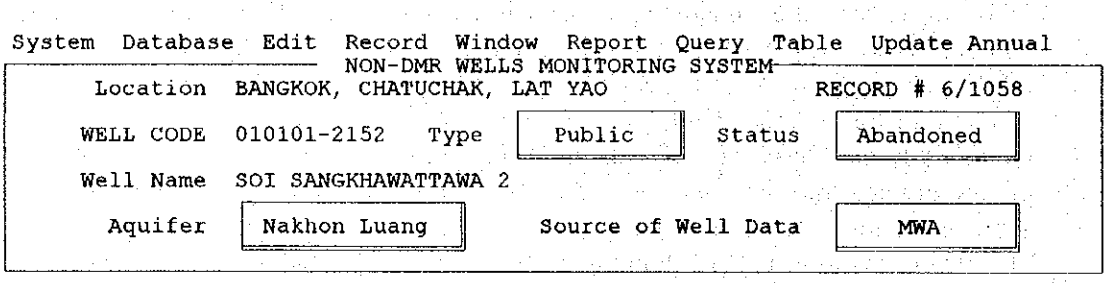
WELL CODE	NDMR.W_CODE
TYPE	WELL.W_TYPE
STATUS	WELL.W_STATUS
WELL NAME	WELL.W_NAME
AQUIFER	WELL.AQUI_NAME
SOURCE OF DATA	WELL.DAT_SOURCE

The above fields are fully explained in the well location screen. The well code for non-DMR wells can only be entered if the well code is already entered in the WELL database. The other fields are edited using the WELL database.

Index Key: W_CODE
Structure for database: **\GWS\NDMR\NDMR.DBF**

Field	Field Name	Type	Width	Dec	Index
1	W_CODE	Character	11		
** Total **			12		

MONTHLY NON-DMR WELL DISCHARGES DATABASE



Monthly Non-DMR Well Discharges in CUMD

Well	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
010101-2152	1982	0	0	0	0	0	0	178560	170376	1353
010101-2152	1983	178560	153888	171120	169200	162936	151200	0	131688	1200
010101-2152	1984	0	0	0	0	0	0	0	0	
010101-2152	1985	165912	150216	169632	164160	170376	163440	168144	168144	1749

010101-2152	1986	0	191520	200136	169920	167400	211680	168980	212284	1833
010101-2152	1987	199124	168245	192696	206640	223200	208453	233616	233616	2232
010101-2152	1988	223944	195576	210552	206640	202368	200880	207576	208320	1900
010101-2152	1989	208320	238560	258168	246960	251472	200160	183768	0	

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

The bottom table is a separate database, \GWS\NDMR\DISC.DBF. It contains the discharge rates in m3 per day of non-DMR wells. The user should enter the monthly discharge rates for each well code. The ANNUAL, M_AVERAGE, D_AVERAGE, MONTHS fields need not be entered because they are automatically computed once the december value is edited. The option UPDATE ANNUAL in the above menu can be used to compute the annual discharge rates for all the wells if you think the figures are not up to date.

ANNUAL	the annual discharge rates in CUMD.
M_AVERAGE	the computed monthly average in CUMD
D_AVERAGE	the computed daily average in CUMD
MONTHS	the number of months the well was operated based on the available data on monthly discharges.

Index Key: W_CODE+STR(YEAR,4)
Structure for database: **\GWS\NDMR\DISC.DBF**

Field	Field Name	Type	Width	Dec	Index
1	W_CODE	Character	11		
2	YEAR	Numeric	4		
3	JAN	Numeric	6		
4	FEB	Numeric	6		
5	MAR	Numeric	6		
6	APR	Numeric	6		
7	MAY	Numeric	6		
8	JUN	Numeric	6		
9	JUL	Numeric	6		
10	AUG	Numeric	6		
11	SEP	Numeric	6		
12	OCT	Numeric	6		
13	NOV	Numeric	6		
14	DEC	Numeric	6		
15	ANNUAL	Numeric	7		
16	M_AVERAGE	Numeric	6		
17	D_AVERAGE	Numeric	5		
18	MONTHS	Numeric	2		
** Total **			108		

IEAT FACTORY CONSUMPTIONS DATABASE

System Database Edit Record Window Report Query Table Update Annual

NON-DMR WELLS MONITORING SYSTEM

Location BANGKOK, CHATUCHAK, LAT YAO RECORD # 6/1058

WELL CODE 010101-2152 Type Public Status Abandoned

Well Name SOI SANGKHAWATTAWA 2

Aquifer	Nakhon Luang	Source of Well Data	MWA

IEAT Factory Consumptions in M3 per month

Facno	Factype	Gw_use	Year	Jan	Feb	Mar
IEAT-1001	food snacks	43	1992	721	1137	1755
IEAT-1002	electrical appliances	56	1992	35	37	46
IEAT-1003	clay	53	1992	4664	5582	5251
IEAT-1004	wood products	47	1992	975	1080	823
IEAT-1005	electrolytic capacitor	56	1992	3212	2057	1696
IEAT-1007	foods/ice cream	43	1992	1852	2310	2169
IEAT-1008	plastic parts	52	1992	196	192	182
IEAT-1009	detergents	50	1992	860	860	860

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

FACNO IEAT factory number.

FACTYPE Factory type.

GW_USE Groundwater use.

Enter the monthly consumption of the factory in m3. Compute manually the annual consumption and monthly average consumption. Sum up all the monthly consumption of factories in each network. Divide the sum by the total number of wells in each network. Take note of the average monthly discharge for each well in each network. Enter the monthly discharge of each well in the DISC.DBF.

Index Key: FACNO
Structure for database: **\GWS\NDMR\IEAT.DBF**

Field	Field Name	Type	Width	Dec	Index
1	FACNO	Character	12		
2	FACTYPE	Character	30		
3	GW_USE	Character	2		
4	YEAR	Numeric	4		
5	JAN	Numeric	6		
6	FEB	Numeric	6		
7	MAR	Numeric	6		
8	APR	Numeric	6		
9	MAY	Numeric	6		
10	JUN	Numeric	6		
11	JUL	Numeric	6		
12	AUG	Numeric	6		
13	SEP	Numeric	6		
14	OCT	Numeric	6		
15	NOV	Numeric	6		
16	DEC	Numeric	6		
17	TOTAL	Numeric	6		
18	AVERAGE	Numeric	6		
** Total **			133		

NON-DMR WELL DATABASES

Select area: 1,
  Database in Use: \GWS\WINV\WELL.DBF Alias: WELL
  Master index file: \GWS\WINV\WELL.IDX Key: W_CODE

Select area: 2,
  Database in Use: \GWS\NDMR\NDMR.DBF Alias: NDMR
  Master index file: \GWS\NDMR\NDMR.IDX Key: W_CODE
    Related into: DISC
      Relation: W_CODE
    Related into: WELL
      Relation: W_CODE

Select area: 3,
  Database in Use: \GWS\NDMR\DISC.DBF Alias: DISC
  Master index file: \GWS\NDMR\DISC.IDX
  Key: W_CODE+STR(YEAR,4)

Select area: 4,
  Database in Use: \GWS\NDMR\IEAT.DBF Alias: IEAT
  Master index file: \GWS\NDMR\IEAT.IDX Key: FACNO

Select area: 5,
  Database in Use: \GWS\DBFS\AQUIFER.DBF Alias: AQUIFER

Select area: 6,
  Database in Use: \GWS\DBFS\SOURCE.DBF Alias: SOURCE

Select area: 7,
  Database in Use: \GWS\DBFS\REPORTS.DBF Alias: REPORTS

Select area: 8,
  Database in Use: \GWS\DBFS\CHANGWAT.DBF Alias: CHANGWAT
  Master index file: \GWS\DBFS\CHANGWAT.IDX Key: CHANG_CODE

Select area: 9,
  Database in Use: \GWS\DBFS\AMPHOE.DBF Alias: AMPHOE
  Master index file: \GWS\DBFS\AMPHOE.IDX
  Key: CHANG_CODE+AMPHO_CODE

Select area: 10,
  Database in Use: \GWS\DBFS\TAMBON.DBF Alias: TAMBON
  Master index file: \GWS\DBFS\TAMBON.IDX
  Key: CHANG_CODE+AMPHO_CODE+TAMBO_CODE

GROUNDWATER MONITORING

The groundwater monitoring database consists of the ground water level database (\GWS\WHGEO\GWL.DBF) and the ground water quality monitoring database (\GWS\WHGEO\GWQUAL.DBF). The information on these ground water monitoring wells are stored in the \GWS\WHGEO\HGEO.DBF database. The two monitored parameters, water level and water quality are activated by using the option Table as shown below.

```
System  Database  Edit  Record  Window  Report  Query  Table
                                          ┌──────────────────────┐
                                          │ Ground Water Level in m │
                                          │ Ground Water Quality    │
                                          └──────────────────────┘
```

The ground water monitoring screen is shown below:

```
System  Database  Edit  Record  Window  Report  Query  Table
                  GROUNDWATER MONITORING DATABASE SYSTEM
    Location   BANGKOK, CHATUCHAK, LAT YAO                RECORD # 1/258

 WELL CODE  : 010101-3121   Type  [ Automatic ]   Status  [ Active ]

 Well Name    : PHRA KHANONG FLOOD CONTROL STATION
 Well Address: PHRA KHANONG FLOOD CONTROL STATION, SOI KASEM SUWAN (77),
 Agency Responsible :
 Area Code    : C4              Station No. :  55
 Well No.     :                 Ground Elev.:    0.00  m MSL
 Map Sheet No: 5136 III         Base Map, X :    72    Base Map, Y:  115
   Latitude   :     °     "     UTM East    :  67280  Zone :        47P
   Longitude  :     °     "     UTM North   : 151580
 Remarks      :
 Benchmark Elevation :    0.00 m above ground
```

Well Code	Date	Ground Water Level in m WL below Bench	WL MSL	Static
010101-3121	01/01/90	23.00	-23.00	Y

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

They are explained below: The fields listed in WELL.DBF can only be edited in the WELL inventory screen.

WELL CODE HGEO.W_CODE

The well code in the HGEO.DBF should already have been entered in the WELL.DBF database so that the other information on the well can also be accessed.

TYPE HGEO.OBS_TYPE

Type of observation. It can either be automatic or manual.

STATUS WELL.W_STATUS

Status of the well. It can be active, inactive, abandoned or others. This information can be edited only in the well inventory screen.

WELL NAME WELL.W_NAME

Common name for the well. Can only be edited in the well inventory screen.

WELL ADDRESS WELL. W_ADDR1

Address of the well.

AGENCY RESPONSIBLE HGEO.AGENCY

The responsible agency for the well.

AREA CODE HGEO.ACODE

The area code used by the agency responsible.

STATION NO. HGEO.STA_NO

The station number used by the agency responsible.

WELL NO WELL.NEW_NO

Well number used by the agency responsible.

GROUND ELEV. WELL.ELEVATION

Ground elevation in meters above mean sea level.

MAP SHEET NO WELL.MAP_NO

The 1:50,000 scale map sheet no. where the well is located.

BASE MAP, X WELL.X

Grid X in the map sheet where well is located. Related to the UTM East.

BASE MAP, Y WELL.Y

Grid Y in the map sheet where well is located. Related to the UTM North.

LATITUDE WELL.LAT_DEGR, WELL.LAT_MIN,WELL.LAT_SEC

Latitude location of the well.

LONGITUDE WELL.LONG_DEGR, WELL_LONG_MIN,WELL.LONG_SEC

Longitude location of the well.

UTM EAST WELL.UTM_E

Universal Transverse Mercator (UTM) X location of the well in meters.

UTM NORTH WELL.UTM_N

Universal Transverse Mercator (UTM) Y location of the well in meters. Usually reckoned from the equator.

ZONE WELL.GZD

Zone where well is located.

REMARKS HGEO.REMARKS

Free form remarks for the well.

BENCHMARK ELEVATION HGEO.BENCH_ELEV

The elevation of the benchmark station in meters above mean sea level.

Index Key: W_CODE
Structure for database: **\GWS\WHGEO\HGEO.DBF**

Field	Field Name	Type	Width	Dec
1	W_CODE	Character	11	
2	OBS_TYPE	Numeric	1	
3	BENCH_ELEV	Numeric	7	2
4	ACODE	Character	12	
5	STA_NO	Character	12	
6	AGENCY	Character	30	
7	REMARKS	Character	30	
** Total **			104	

GROUND WATER LEVEL DATABASE

WELL CODE GWL.W_CODE

Linked with the WELL database. The well code in the WELL database is automatically entered in this field when being edited.

DATE GWL.DATE

Date in MM/DD/YY format.

WL BELOW BENCH GWL.GW_LEVEL

Water level below the benchmark in meters.

WL MSL GWL.GW_MSL

Water level in meters below mean sea level.

STATIC GWL.STATIC

Is the measurement static? Answered by Y or N for yes or no, respectively.

```
Index Key: W_CODE
Structure for database: \GWS\WHGEO\GWL.DBF
Field  Field Name  Type        Width    Dec
    1  W_CODE      Character      11
    2  DATE        Date            8
    3  GW_LEVEL    Numeric         7      2
    4  GW_MSL      Numeric         7      2
    5  STATIC      Character       1
** Total **                        35
```

GROUND WATER QUALITY DATABASE

```
System  Database  Edit  Record  Window  Report  Query  Table  Browse
                    GROUNDWATER MONITORING DATABASE SYSTEM
    Location   BANGKOK, CHATUCHAK, LAT YAO                RECORD # 1/258

  WELL CODE  : 010101-3121   Type [          ]   Status [  Active  ]

  Well Name    : PHRA KHANONG FLOOD CONTROL STATION
  Well Address: PHRA KHANONG FLOOD CONTROL STATION, SOI KASEM SUWAN (77),
  Agency Responsible :
  Area Code    : C4              Station No. :  55
  Well No.     :                 Ground Elev.:    0.00  m MSL
  Map Sheet No: 5136 III         Base Map, X :    72    Base Map, Y:  115
    Latitude  :    °     "       UTM East    :  67280  Zone :        47P
    Longitude :    °     "       UTM North   :  151580
  Remarks      :
  Benchmark Elevation :    0.00 m above ground
                      Ground Water Quality Monitoring
  Well Code | Parameter | Concentrat |  Date  |

    <Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >
```

WELL CODE GWQUAL.W_CODE

Linked with the WELL database. The well code in the WELL database is automatically entered in this field when being edited.

PARAMETER GWQUAL.PARAMETER

Code of measured parameter. The codes are listed in the \GWS\WHGEO\WIONS.DBF The codes are listed below:

1	pH
2	Specific Conductivity
3	Turbidity
4	Color
5	Odor
6	Temperature
7	Alkalinity
8	Acidity
9	Residual Chlorine
10	Calcium
11	Magnesium
12	Sodium
13	Potassium
14	Dissolved Iron
15	Total Iron
16	Manganese
17	Copper
18	Zinc
19	Chloride
20	Sulphate
21	Carbonate
22	Bicarbonate
23	Carbon Dioxide
24	Nitrite
25	Nitrate
26	Flouride
27	Total Solids
28	Total Hardness
29	Noncarbonate Hardness
30	Arsenic
31	Cyanide
32	Lead
33	Mercury
34	Cadmium
35	Selenium
36	Chromium
37	Barium
38	Silver
39	Phenols
40	Bromide
41	Iodide

CONCENTRATION GWQUAL.CONCENT

Concentration of the parameter measured.

DATE GWQUAL.DATE

Date in MM/DD/YY format.

Index Key: W_CODE
Structure for database: **\GWS\WHGEO\GWQUAL.DBF**

Field	Field Name	Type	Width	Dec
1	W_CODE	Character	11	
2	PARAMETER	Numeric	2	
3	CONCENT	Numeric	10	3
4	DATE	Date	8	
** Total **			32	

GROUNDWATER MONITORING DATABASES

Select area: 1,
Database in Use: D:\GWS\WINV\WELL.DBF Alias: WELL
Master index file: D:\GWS\WINV\WELL.IDX Key: W_CODE

Select area: 2,
Database in Use: D:\GWS\WHGEO\HGEO.DBF Alias: HGEO
Master index file: D:\GWS\WHGEO\HGEO.IDX Key: W_CODE
Related into: GWQUAL
Relation: W_CODE
Related into: GWL
Relation: W_CODE
Related into: WELL
Relation: W_CODE

Select area: 3,
Database in Use: D:\GWS\WHGEO\GWL.DBF Alias: GWL
Master index file: D:\GWS\WHGEO\GWL.IDX Key: W_CODE

Select area: 4,
Database in Use: D:\GWS\WHGEO\GWQUAL.DBF Alias: GWQUAL
Master index file: D:\GWS\WHGEO\GWQUAL.IDX Key: W_CODE

Select area: 5,
Database in Use: D:\GWS\WHGEO\WIONS.DBF Alias: WIONS

Select area: 6,
Database in Use: D:\GWS\DBFS\REPORTS.DBF Alias: REPORTS

Select area: 7,

Database in Use: D:\GWS\DBFS\HAGENCY.DBF Alias: HAGENCY

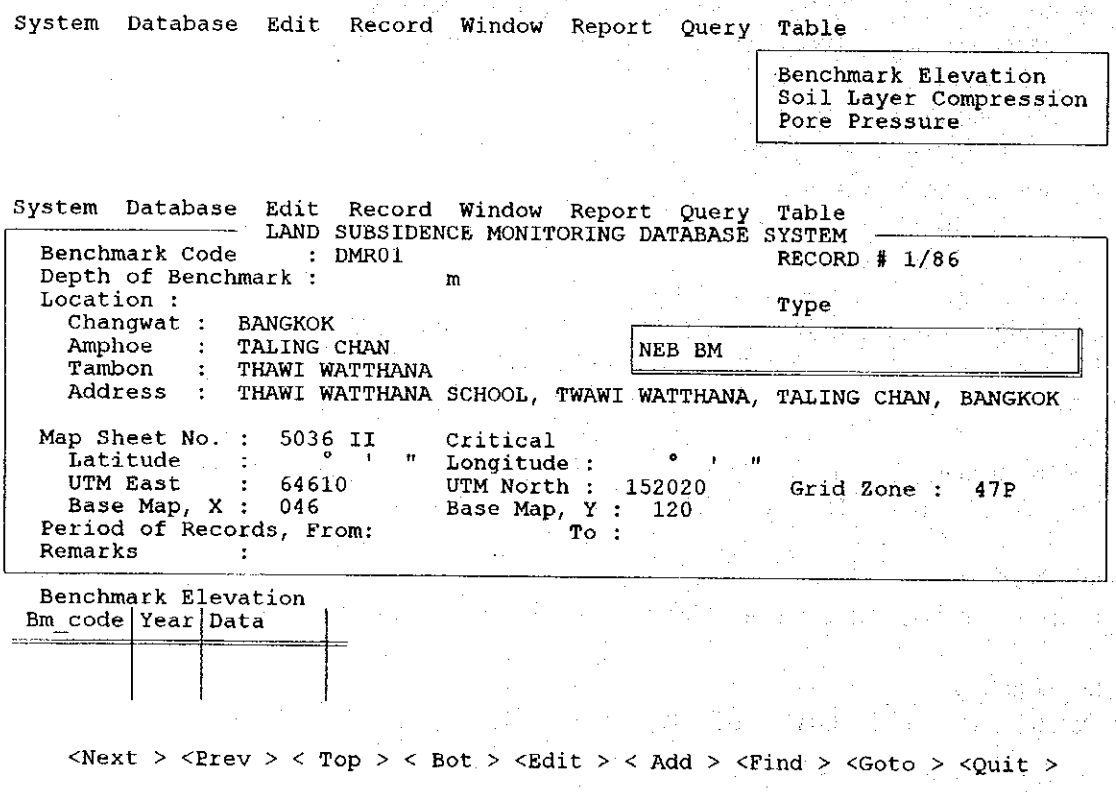
Select area: 8,
Database in Use: D:\GWS\DBFS\CHANGWAT.DBF Alias: CHANGWAT
Master index file: D:\GWS\DBFS\CHANGWAT.IDX Key: CHANG_CODE

Select area: 9,
Database in Use: D:\GWS\DBFS\AMPHOE.DBF Alias: AMPHOE
Master index file: D:\GWS\DBFS\AMPHOE.IDX
Key: CHANG_CODE+AMPHO_CODE

Select area: 10,
Database in Use: D:\GWS\DBFS\TAMBON.DBF Alias: TAMBON
Master index file: D:\GWS\DBFS\TAMBON.IDX
Key: CHANG_CODE+AMPHO_CODE+TAMBO_CODE

LAND SUBSIDENCE MONITORING DATABASE

The land subsidence monitoring database is composed of the soil layer compression database (\GWS\WLAND\COMPRESS.DBF) and the pore pressure database (\GWS\WLAND\POREPRES.DBF). The benchmark information are stored in \GWS\WLAND\BENCHMRK.DBF while the benchmark elevation are stored in the \GWS\WLAND\BMELEV.DBF database. The databases can be edited by using the option Table as shown below.



The above information with their corresponding fields in the \GWS\WLAND\ BENCHMRK.DBF are listed below:

BENCHMARK CODE	BENCHMRK.BM_CODE
TYPE	BENCHMRK.BM_TYPE
DEPTH OF BENCHMARK	BENCHMRK.DEPTH
LOCATION, CHANGWAT	BENCHMRK.SLOC_CC
LOCATION, AMPHOE	BENCHMRK.SLOC_AA
LOCATION, TAMBON	BENCHMRK.SLOC_TT
ADDRESS	BENCHMRK.SLOC_DTL
MAP SHEET NO.	BENCHMRK.MAP_NO
CRITICAL	BENCHMRK.CR_ZONE
LATITUDE	BENCHMRK.LAT_DEG, LAT_MIN, LAT_SEC
LONGITUDE	BENCHMRK.LONG_DEGR, LONG_MIN, LONG_SEC
UTM EAST	BENCHMRK.UTM_E
UTM NORTH	BENCHMRK.UTM_N
GRID ZONE	BENCHMRK.GZD
BASE MAP, X	BENCHMRK.X
BASE MAP, Y	BENCHMRK.Y
PERIOD OF RECORDS, FROM	BENCHMRK.FR_REC
TO	BENCHMRK.TO_REC
REMARKS	BENCHMRK.REMARKS

Index Key: BM_CODE
Structure for database: **\GWS\WLAND\BENCHMRK.DBF**

Field	Field Name	Type	Width	Dec	Index
1	BM_CODE	Character	6		
2	BM_TYPE	Numeric	2		
3	SLOC_CC	Character	2		
4	SLOC_AA	Character	2		
5	SLOC_TT	Character	2		
6	SLOC_DTL	Character	120		
7	DEPTH	Numeric	6	2	
8	CR_ZONE	Character	6		
9	MAP_NO	Character	8		
10	LAT_DEGR	Character	3		
11	LAT_MIN	Character	2		
12	LAT_SEC	Character	2		
13	LONG_DEGR	Character	3		
14	LONG_MIN	Character	2		
15	LONG_SEC	Character	2		
16	UTM_E	Character	5		
17	UTM_N	Character	6		
18	GZD	Character	3		
19	X	Character	3		
20	Y	Character	3		
21	FR_REC	Character	4		
22	TO_REC	Character	4		
23	REMARKS	Character	45		
24	ELEVATION	Numeric	8	2	
25	BM_NO	Character	7		
26	STA_NO	Character	3		

27	B_AGENCY	Character	3
28	A_CODE	Character	2
29	A_STAT	Character	1
** Total **			266

Index Key: BM_CODE
Structure for database: **\GWS\WLAND\BMELEV.DBF**

Field	Field Name	Type	Width	Dec	Index
1	BM_CODE	Character	6		
2	YEAR	Numeric	4		
3	DATA	Numeric	8	2	
** Total **			19		

SOIL LAYER COMPRESSION DATABASE

System Database Edit Record Window Report Query Table

LAND SUBSIDENCE MONITORING DATABASE SYSTEM

Benchmark Code : DMR01 RECORD # 1/86
Depth of Benchmark : m
Location : Type
Changwat : BANGKOK
Amphoe : TALING CHAN NEB BM
Tambon : THAWI WATTHANA
Address : THAWI WATTHANA SCHOOL, TWAWI WATTHANA, TALING CHAN, BANGKOK

Map Sheet No. : 5036 II Critical
Latitude : ° ' " Longitude : ° ' "
UTM East : 64610 UTM North : 152020 Grid Zone : 47P
Base Map, X : 046 Base Map, Y : 120
Period of Records, From: To :
Remarks :

Soil Layer Compression in Millimeter

Bm_code	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	O

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: BM_CODE
Structure for database: **\GWS\WLAND\COMPRESS.DBF**

Field	Field Name	Type	Width	Dec	Index
1	BM_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	6	2	
4	FEB	Numeric	6	2	
5	MAR	Numeric	6	2	
6	APR	Numeric	6	2	
7	MAY	Numeric	6	2	
8	JUN	Numeric	6	2	
9	JUL	Numeric	6	2	
10	AUG	Numeric	6	2	
11	SEP	Numeric	6	2	
12	OCT	Numeric	6	2	
13	NOV	Numeric	6	2	
14	DEC	Numeric	6	2	
15	ANNUAL	Numeric	7	2	
** Total **			90		

PORE PRESSURE DATABASE

```
System  Database  Edit  Record  Window  Report  Query  Table
                LAND SUBSIDENCE MONITORING DATABASE SYSTEM
  Benchmark Code      : DMR01                          RECORD # 1/86
  Depth of Benchmark :          m
  Location :                                           Type
    Changwat :  BANGKOK
    Amphoe   :  TALING CHAN                    NEB BM
    Tambon   :  THAWI WATTHANA
    Address  :  THAWI WATTHANA SCHOOL, TWAWI WATTHANA, TALING CHAN, BANGKOK

  Map Sheet No. :  5036 II      Critical
    Latitude    :      °  '  "  Longitude :      °  '  "
    UTM East    :  64610        UTM North :  152020      Grid Zone :  47P
    Base Map, X :  046          Base Map, Y :  120
  Period of Records, From:                To :
  Remarks       :
```

Pore Pressure in tons/m2

Bm_code	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: BM_CODE
Structure for database: **\GWS\WLAND\POREPRES.DBF**

Field	Field Name	Type	Width	Dec	Index
1	BM_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	7	2	
4	FEB	Numeric	7	2	
5	MAR	Numeric	7	2	
6	APR	Numeric	7	2	
7	MAY	Numeric	7	2	
8	JUN	Numeric	7	2	
9	JUL	Numeric	7	2	
10	AUG	Numeric	7	2	
11	SEP	Numeric	7	2	
12	OCT	Numeric	7	2	
13	NOV	Numeric	7	2	
14	DEC	Numeric	7	2	
15	ANNUAL	Numeric	9	2	
** Total **			104		

LAND SUBSIDENCE MONITORING DATABASES

Select area: 1,
Database in Use: D:\GWS\WLAND\BENCHMRK.DBF Alias: BENCH
Master index file: D:\GWS\WLITR\BENCHMRK.IDX Key: BM_CODE
Related into: SUBSIDE
Relation: BM_CODE
Related into: POREPRES
Relation: BM_CODE
Related into: COMPRESS
Relation: BM_CODE

Related into: BMELEV
Relation: BM_CODE

Select area: 2,
Database in Use: D:\GWS\WLAND\BMELEV.DBF Alias: BMELEV
Master index file: D:\GWS\WLITR\BMELEV.IDX Key: BM_CODE

Select area: 3,
Database in Use: D:\GWS\WLAND\COMPRESS.DBF Alias: COMPRESS
Master index file: D:\GWS\WLITR\COMPRESS.IDX Key: BM_CODE

Select area: 4,
Database in Use: D:\GWS\WLAND\POREPRES.DBF Alias: POREPRES
Master index file: D:\GWS\WLITR\POREPRES.IDX Key: BM_CODE

Select area: 5,
Database in Use: D:\GWS\WLAND\SUBSIDE.DBF Alias: SUBSIDE
Master index file: D:\GWS\WLITR\SUBSIDE.IDX Key: BM_CODE

Select area: 6,
Database in Use: D:\GWS\DBFS\BMTYPE.DBF Alias: BMTYPE

Select area: 7,
Database in Use: D:\GWS\DBFS\REPORTS.DBF Alias: REPORTS

Select area: 8,
Database in Use: D:\GWS\DBFS\CHANGWAT.DBF Alias: CHANGWAT
Master index file: D:\GWS\DBFS\CHANGWAT.IDX Key: CHANG_CODE

Select area: 9,
Database in Use: D:\GWS\DBFS\AMPHOE.DBF Alias: AMPHOE
Master index file: D:\GWS\DBFS\AMPHOE.IDX
Key: CHANG_CODE+AMPHO_CODE

Select area: 10,
Database in Use: D:\GWS\DBFS\TAMBON.DBF Alias: TAMBON
Master index file: D:\GWS\DBFS\TAMBON.IDX
Key: CHANG_CODE+AMPHO_CODE+TAMBO_CODE

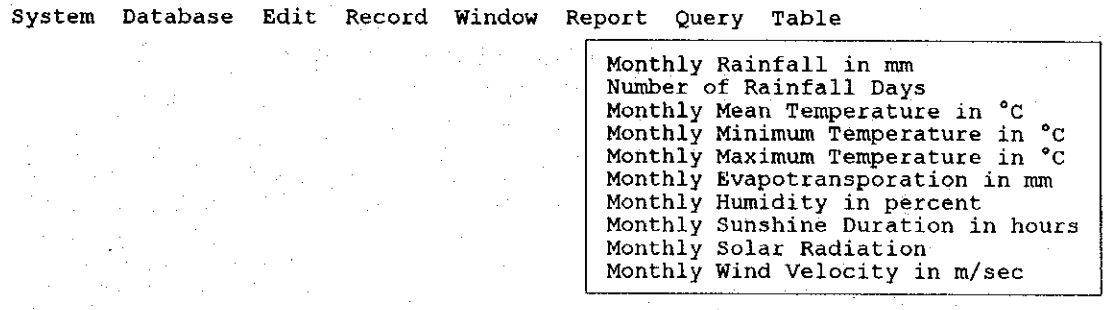
METEOROLOGY

The meteorology database is composed of ten monitored parameters. The data comes from the metereology agency and are merely transferred to the database. The data on the metereology station are listed in the \GWS\WMET\MSTATION.DBF. The following is the list of the monitored parameters and their corresponding database files.

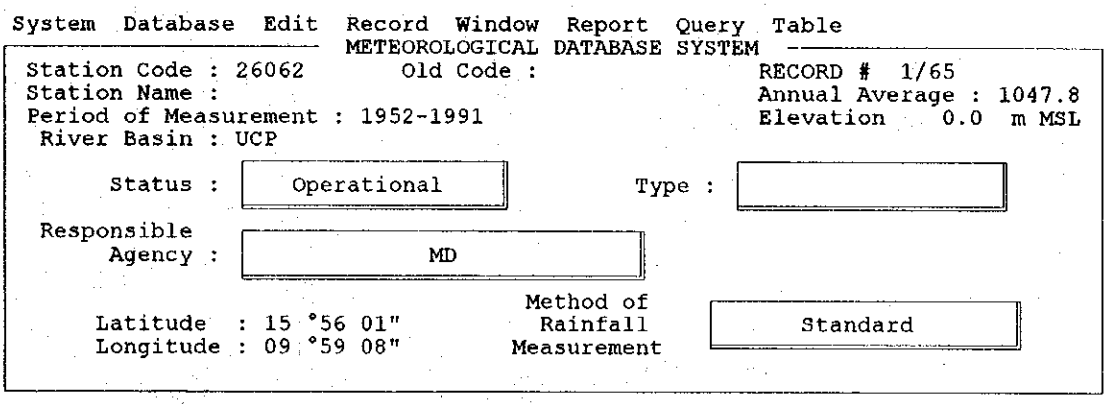
Monthly rainfall \GWS\WMET\RAIN_M.DBF

Number of rainfall days	\GWS\WMET\RAIN_DAY.DBF
Monthly mean temperature	\GWS\WMET\TMEAN_M.DBF
Monthly minimum temperature	\GWS\WMET\TMIN_M.DBF
Monthly maximum temperature	\GWS\WMET\TMAX_M.DBF
Monthly evapotransporation	\GWS\WMET\EVAP_M.DBF
Monthly humidity	\GWS\WMET\HUMID_M.DBF
Monthly sunshine duration	\GWS\WMET\SUN_M.DBF
Monthly solar radiation	\GWS\WMET\SOLAR_M.DBF
Monthly wind velocity	\GWS\WMET\WIND_M.DBF

These monitored databases can be activated by using the option Table as shown below:



METEOROLOGICAL STATION DATABASE



STATION CODE	MSTATION.MCODE
OLD CODE	MSTATION.OLD_CODE
STATION NAME	MSTATION.M_NAME
ANNUAL AVERAGE	MSTATION.ANNUAL
PERIOD OF MEASUREMENT	MSTATION.PERIOD
ELEVATION	MSTATION.M_ELEV
RIVER BASIN	MSTATION.R_BASIN
STATUS	MSTATION.M_STATUS, operational or abandoned
TYPE	MSTATION.M_TYPE, hydromet or synoptic

RESPONSIBLE AGENCY MSTATION.M_AGENCY

The agencies are coded and are taken from the \GWS\DBFS\MAGENCY database. This should be EDITED because they are temporary only since they were not given during the time of programming.

LATITUDE MSTATION.MLAT_DEGR, MLAT_MIN, MLAT_SEC
LONGITUDE MSTATION.MLONG_DEGR, MLAT_MIN, MLAT_SEC

METHOD OF RAINFALL
MESUREMENT MSTATION.METHOD, standard or recording

Index Key: M_CODE
Structure for database: **\GWS\WMET\MSTATION.DBF**

Field	Field Name	Type	Width	Dec
1	M_CODE	Character	6	
2	OLD_CODE	Character	6	
3	M_NAME	Character	38	
4	M_AGENCY	Character	10	
5	R_BASIN	Character	20	
6	M_ELEV	Numeric	6	1
7	MLAT_DEGR	Character	3	
8	MLAT_MIN	Character	2	
9	MLAT_SEC	Character	2	
10	MLONG_DEGR	Character	3	
11	MLONG_MIN	Character	2	
12	MLONG_SEC	Character	2	
13	PERIOD	Character	25	
14	M_STATUS	Character	11	
15	M_TYPE	Character	10	
16	ANNUAL	Numeric	6	1
17	METHOD	Character	10	
** Total **			163	

MONTHLY RAINFALL DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 26062 Old Code : RECORD # 1/65
Station Name : Annual Average : 1047.8
Period of Measurement : 1952-1991 Elevation 0.0 m MSL
River Basin : UCP

Status : Operational Type :

Responsible Agency : MD

Latitude : 15 °56 01"
Longitude : 09 °59 08"

Method of Rainfall Measurement : Standard

Monthly Rainfall in mm

Statio	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	O
26062	1952	7.6	134.6	0.0	-0.1	-0.1	-0.1	17.0	24.9	111.7	1
26062	1953	14.7	0.0	5.3	105.5	181.7	194.0	144.5	122.9	251.0	1

Index Key: M_CODE
Structure for database: **\GWS\WMET\RAIN_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	6	1	
4	FEB	Numeric	6	1	
5	MAR	Numeric	6	1	
6	APR	Numeric	6	1	
7	MAY	Numeric	6	1	
8	JUN	Numeric	6	1	
9	JUL	Numeric	6	1	
10	AUG	Numeric	6	1	
11	SEP	Numeric	6	1	
12	OCT	Numeric	6	1	
13	NOV	Numeric	6	1	
14	DEC	Numeric	6	1	
15	ANNUAL	Numeric	8	1	
** Total **			91		

NUMBER OF RAINFALL DAYS DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 379003 Old Code : 36052 RECORD # 12/65
Station Name : Chon Daen, Phetchabun Annual Average : 1249.0
Period of Measurement : 1955-1991 Elevation 0.0 m MSL
River Basin : UCP

Status : Operational Type :

Responsible Agency : MD

Latitude : 16 °11 15"
Longitude : 100°51 48"

Method of Rainfall Measurement : Standard

Number of Rainfall days

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
379003	1981	0	-1	3	5	10	14	19	8	10	5	3	0	-1
379003	1982	0	1	2	5	9	10	7	15	15	12	5	1	82

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Index Key: M_CODE
Structure for database: **\GWS\WMET\RAIN_DAY.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	2		
4	FEB	Numeric	2		
5	MAR	Numeric	2		
6	APR	Numeric	2		
7	MAY	Numeric	2		
8	JUN	Numeric	2		

9	JUL	Numeric	2
10	AUG	Numeric	2
11	SEP	Numeric	2
12	OCT	Numeric	2
13	NOV	Numeric	2
14	DEC	Numeric	2
15	ANNUAL	Numeric	3
** Total **			38

MONTHLY MEAN TEMPERATURE DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 425201 Old Code : RECORD # 43/65
Station Name : Suphan Buri Annual Average : 0.0
Period of Measurement : 1962-1991 Elevation 7.0 m MSL
River Basin :

Status : Operational Type : Synoptic

Responsible Agency : MD

Latitude : 14 °29 00"
Longitude : 100°08 00"

Method of Rainfall Measurement

Monthly Mean Temperature in °C

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
425201	1952	26.6	29.5	30.0	31.6	31.6	30.4	29.5	28.7	28.5	27.7	27.5	24.6	
425201	1953	26.5	28.0	30.7	32.4	30.4	29.6	29.2	28.4	28.7	28.8	26.8	25.8	

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\TMEAN_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	4	1	
4	FEB	Numeric	4	1	
5	MAR	Numeric	4	1	
6	APR	Numeric	4	1	
7	MAY	Numeric	4	1	
8	JUN	Numeric	4	1	
9	JUL	Numeric	4	1	
10	AUG	Numeric	4	1	
11	SEP	Numeric	4	1	
12	OCT	Numeric	4	1	
13	NOV	Numeric	4	1	
14	DEC	Numeric	4	1	
15	ANNUAL	Numeric	4	1	
** Total **			63		

MONTHLY MINIMUM TEMPERATURE DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 26062 Old Code : RECORD # 1/65
Station Name : Annual Average : 1047.8
Period of Measurement : 1952-1991 Elevation 0.0 m MSL
River Basin : UCP

Status : Operational Type :

Responsible Agency : MD

Latitude : 15 °56 01"
Longitude : 09 °59 08"

Method of Rainfall Measurement : Standard

Monthly Minimum Temperature in °C

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\TMIN_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	5	1	
4	FEB	Numeric	5	1	
5	MAR	Numeric	5	1	
6	APR	Numeric	5	1	
7	MAY	Numeric	5	1	
8	JUN	Numeric	5	1	
9	JUL	Numeric	5	1	
10	AUG	Numeric	5	1	
11	SEP	Numeric	5	1	
12	OCT	Numeric	5	1	
13	NOV	Numeric	5	1	
14	DEC	Numeric	5	1	
15	ANNUAL	Numeric	5	1	
** Total **			76		

MONTHLY MAXIMUM TEMPERATURE DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 430201 Old Code : RECORD # 49/65
Station Name : Prachin Buri Annual Average : 0.0
Period of Measurement : 1955-1991 Elevation 5.0 m MSL
River Basin :

Status : Operational Type : Synoptic

Responsible Agency : MD

Latitude : 13 °03 00"
Longitude : 101°22 00"

Method of Rainfall Measurement :

Monthly Maximum Temperature in °C

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
430201	1952	31.5	33.9	32.4	35.0	34.8	32.0	31.2	30.2	30.9	30.5	31.
430201	1953	27.2	26.8	28.4	29.4	27.4	26.9	27.2	26.8	27.2	27.8	27.

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\TMAX_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	5	1	
4	FEB	Numeric	5	1	
5	MAR	Numeric	5	1	
6	APR	Numeric	5	1	
7	MAY	Numeric	5	1	
8	JUN	Numeric	5	1	
9	JUL	Numeric	5	1	
10	AUG	Numeric	5	1	
11	SEP	Numeric	5	1	
12	OCT	Numeric	5	1	
13	NOV	Numeric	5	1	
14	DEC	Numeric	5	1	
15	ANNUAL	Numeric	5	1	
** Total **			76		

MONTHLY EVAPOTRANSPORATION DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 430201 Old Code : RECORD # 49/65
Station Name : Prachin Buri Annual Average : 0.0
Period of Measurement : 1955-1991 Elevation 5.0 m MSL
River Basin :

Status : Operational Type : Synoptic

Responsible Agency : MD

Latitude : 13 °03 00"
Longitude : 101°22 00"

Method of Rainfall Measurement

Monthly Evapotransporation in mm

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	O
430201	1981	-.1	-.1	-.1	-.1	-.1	-.1	-.1	-.1	-.1	
430201	1982	145.8	132.5	162.7	163.3	171.4	124.1	134.3	106.5	111.6	

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\EVAP_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		

2	YEAR	Numeric	4	
3	JAN	Numeric	6	1
4	FEB	Numeric	6	1
5	MAR	Numeric	6	1
6	APR	Numeric	6	1
7	MAY	Numeric	6	1
8	JUN	Numeric	6	1
9	JUL	Numeric	6	1
10	AUG	Numeric	6	1
11	SEP	Numeric	6	1
12	OCT	Numeric	6	1
13	NOV	Numeric	6	1
14	DEC	Numeric	6	1
15	ANNUAL	Numeric	6	1
** Total **			89	

MONTHLY HUMIDITY DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 430201 Old Code : RECORD # 49/65
Station Name : Prachin Buri Annual Average : 0.0
Period of Measurement : 1955-1991 Elevation 5.0 m MSL
River Basin :

Status : Operational Type : Synoptic

Responsible Agency : MD

Latitude : 13 °03 00"
Longitude : 101°22 00"

Method of Rainfall Measurement :

Monthly Humidity in percent

Statio	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
430201	1952	69	66	80	78	82	83	85	86	84	86	77	66	79
430201	1953	67	74	75	78	85	87	86	88	86	84	76	66	79

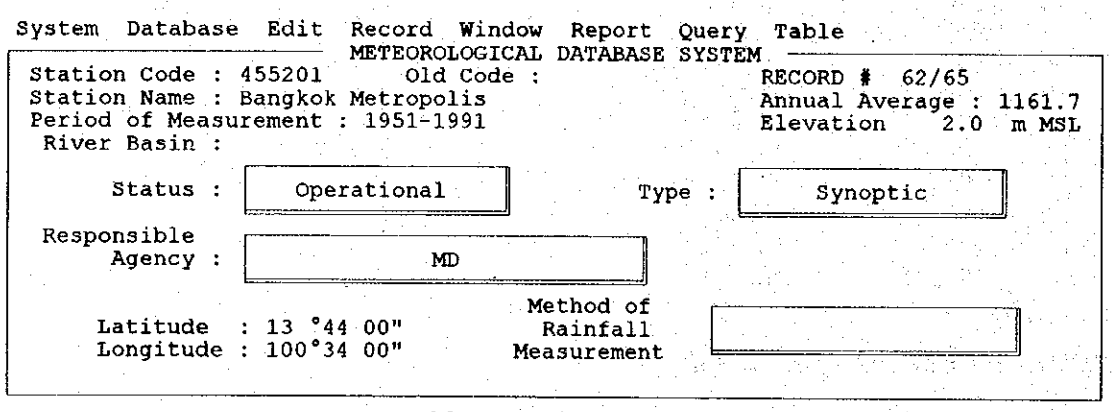
<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\HUMID_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	2		
4	FEB	Numeric	2		
5	MAR	Numeric	2		
6	APR	Numeric	2		
7	MAY	Numeric	2		
8	JUN	Numeric	2		
9	JUL	Numeric	2		
10	AUG	Numeric	2		
11	SEP	Numeric	2		
12	OCT	Numeric	2		
13	NOV	Numeric	2		
14	DEC	Numeric	2		

15	ANNUAL	Numeric	2
** Total **			37

MONTHLY SUNSHINE DATABASE



Monthly Sunshine in hours

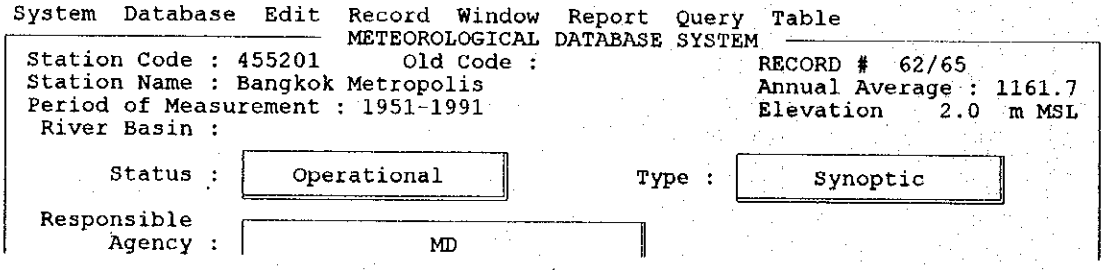
Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
455201	1956	286.5	267.0	281.1	192.4	194.3	190.9	157.3	151.0	148.0	227.4	244.
455201	1957	284.3	251.9	261.9	238.5	281.1	158.1	139.7	166.6	127.1	175.1	264.

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\SUN_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	5	1	
4	FEB	Numeric	5	1	
5	MAR	Numeric	5	1	
6	APR	Numeric	5	1	
7	MAY	Numeric	5	1	
8	JUN	Numeric	5	1	
9	JUL	Numeric	5	1	
10	AUG	Numeric	5	1	
11	SEP	Numeric	5	1	
12	OCT	Numeric	5	1	
13	NOV	Numeric	5	1	
14	DEC	Numeric	5	1	
15	ANNUAL	Numeric	7	1	
** Total **			78		

MONTHLY SOLAR RADIATION DATABASE



Latitude : 13 °44 00"
Longitude : 100°34 00"

Method of Rainfall Measurement

Monthly Solar Radiation

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	O
455201	1964	-0.1	472.5	480.5	543.5	463.5	467.7	-0.1	464.5	376.2	
455201	1965	498.2	444.7	553.2	603.7	503.8	413.5	500.9	466.0	393.6	

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: M_CODE
Structure for database: **\GWS\WMET\SOLAR_M.DBF**
Number of data records: 28
Date of last update : 03/29/94

Field	Field Name	Type	Width	Dec	Index
1	M_CODE	Character	6		
2	YEAR	Numeric	4		
3	JAN	Numeric	6	1	
4	FEB	Numeric	6	1	
5	MAR	Numeric	6	1	
6	APR	Numeric	6	1	
7	MAY	Numeric	6	1	
8	JUN	Numeric	6	1	
9	JUL	Numeric	6	1	
10	AUG	Numeric	6	1	
11	SEP	Numeric	6	1	
12	OCT	Numeric	6	1	
13	NOV	Numeric	6	1	
14	DEC	Numeric	6	1	
15	ANNUAL	Numeric	7	1	
** Total **			90		

MONTHLY WIND VELOCITY DATABASE

System Database Edit Record Window Report Query Table

METEOROLOGICAL DATABASE SYSTEM

Station Code : 455201 Old Code : RECORD # 62/65
Station Name : Bangkok Metropolis Annual Average : 1161.7
Period of Measurement : 1951-1991 Elevation 2.0 m MSL
River Basin :

Status : Operational Type : Synoptic

Responsible Agency : MD

Latitude : 13 °44 00"
Longitude : 100°34 00"

Method of Rainfall Measurement

Monthly Wind Velocity in m/sec

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
455201	1952	2.8	6.2	6.2	4.9	3.8	4.5	5.3	4.6	4.1	5.1	3.2	4.0	
455201	1953	2.9	3.1	5.1	4.6	4.3	5.0	4.3	4.2	3.1	2.7	3.8	3.0	
455201	1954	3.0	3.7	4.7	3.0	3.3	3.8	3.9	3.7	3.6	2.8	2.6	3.0	

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```
Index Key: M_CODE
Structure for database: \GWS\WMET\WIND_M.DBF
Number of data records:     382
Date of last update    : 03/31/94
Field  Field Name  Type        Width     Dec     Index
    1  M_CODE      Character       6
    2  YEAR        Numeric         4
    3  JAN         Numeric         4       1
    4  FEB         Numeric         4       1
    5  MAR         Numeric         4       1
    6  APR         Numeric         4       1
    7  MAY         Numeric         4       1
    8  JUN         Numeric         4       1
    9  JUL         Numeric         4       1
   10  AUG         Numeric         4       1
   11  SEP         Numeric         4       1
   12  OCT         Numeric         4       1
   13  NOV         Numeric         4       1
   14  DEC         Numeric         4       1
   15  ANNUAL      Numeric         4       1
** Total **                       63
```

METEOROLOGY DATABASES

Select area: 1,
Database in Use: D:\GWS\WMET\MSTATION.DBF Alias: MSTATION
Master index file: D:\GWS\WMET\MSTATION.IDX Key: M_CODE
Related into: WIND_M
Relation: M_CODE
Related into: SOLAR_M
Relation: M_CODE
Related into: SUN_M
Relation: M_CODE
Related into: HUMID_M
Relation: M_CODE
Related into: EVAP_M
Relation: M_CODE
Related into: TMAX_M
Relation: M_CODE
Related into: TMIN_M
Relation: M_CODE
Related into: TMEAN_M
Relation: M_CODE
Related into: RAIN_DAY
Relation: M_CODE
Related into: RAIN_M
Relation: M_CODE

Select area: 2,
Database in Use: D:\GWS\WMET\RAIN_M.DBF Alias: RAIN_M

Master index file: D:\GWS\WMET\RAIN_M.IDX Key: M_CODE

Select area: 3,
Database in Use: D:\GWS\WMET\RAIN_DAY.DBF Alias: RAIN_DAY
Master index file: D:\GWS\WMET\RAIN_DAY.IDX Key: M_CODE

Select area: 4,
Database in Use: D:\GWS\WMET\TMEAN_M.DBF Alias: TMEAN_M
Master index file: D:\GWS\WMET\TMEAN_M.IDX Key: M_CODE

Select area: 5,
Database in Use: D:\GWS\WMET\TMIN_M.DBF Alias: TMIN_M
Master index file: D:\GWS\WMET\TMIN_M.IDX Key: M_CODE

Select area: 6,
Database in Use: D:\GWS\WMET\TMAX_M.DBF Alias: TMAX_M
Master index file: D:\GWS\WMET\TMAX_M.IDX Key: M_CODE

Select area: 7,
Database in Use: D:\GWS\WMET\EVAP_M.DBF Alias: EVAP_M
Master index file: D:\GWS\WMET\EVAP_M.IDX Key: M_CODE

Select area: 8,
Database in Use: D:\GWS\WMET\HUMID_M.DBF Alias: HUMID_M
Master index file: D:\GWS\WMET\HUMID_M.IDX Key: M_CODE

Select area: 9,
Database in Use: D:\GWS\WMET\SUN_M.DBF Alias: SUN_M
Master index file: D:\GWS\WMET\SUN_M.IDX Key: M_CODE

Select area: 10,
Database in Use: D:\GWS\WMET\SOLAR_M.DBF Alias: SOLAR_M
Master index file: D:\GWS\WMET\SOLAR_M.IDX Key: M_CODE

Select area: 11,
Database in Use: D:\GWS\WMET\WIND_M.DBF Alias: WIND_M
Master index file: D:\GWS\WMET\WIND_M.IDX Key: M_CODE

Select area: 12,
Database in Use: D:\GWS\DBFS\MAGENCY.DBF Alias: MAGENCY

Select area: 13,
Database in Use: D:\GWS\DBFS\REPORTS.DBF Alias: REPORTS

Select area: 14,
Database in Use: D:\GWS\DBFS\CHANGWAT.DBF Alias: CHANGWAT
Master index file: D:\GWS\DBFS\CHANGWAT.IDX Key: CHANG_CODE

Select area: 15,
Database in Use: D:\GWS\DBFS\AMPHOE.DBF Alias: AMPHOE
Master index file: D:\GWS\DBFS\AMPHOE.IDX
Key: CHANG_CODE+AMPHO_CODE

Select area: 16,
Database in Use: D:\GWS\DBFS\TAMBON.DBF Alias: TAMBON
Master index file: D:\GWS\DBFS\TAMBON.IDX
Key: CHANG_CODE+AMPHO_CODE+TAMBO_CODE

HYDROLOGY

The hydrology database monitors the discharge rates and gage heights of several river systems through the various gaging stations all over the country. The data on the gaging stations are stored in the \GWS\WHLOG\HSTATION.DBF.

```
System  Database  Edit  Record  Window  Report  Query  Table
                                                  Monthly River Discharges
                                                  Daily   River Discharges
                                                  Monthly Gage Height
                                                  Daily   Gage Height
```

HYDROLOGICAL GAGING STATION DATABASE

```
System  Database  Edit  Record  Window  Report  Query  Table
          HYDROLOGICAL GAGING STATION MONITORING DATABASE SYSTEM
 Station Code : C.1                                  RECORD #  1/147
  River       : Chao Phraya                    Drainage Area :   118816 sq km
  Stream      :                                   Elevation :     0.00 m
  Location    : Wat Phikun Ngam (Ban Tha Hat)     Basin :
  Changwat    : Chai Nat                   Amphoe : Wat Sing

       Status :  Abandoned        Observation :  Simultaneous

  Responsible                                     Latitude  :  15°16'17"
       Agency :  DMR                              Longitude : 100°03'44"
                                                  Map Sheet No. 5039 IV
  Years of Record : 1905-1959
  Rating Period   : 1905-1913, 1948-1954
  Disharge Data   : 1950-1955
```

<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: H_CODE
Structure for database: **\GWS\WHLOG\HSTATION.DBF**

Field	Field Name	Type	Width	Dec	Description
1	H_CODE	Character	8		Station Code
2	H_RIVER	Character	25		River name
3	H_STREAM	Character	25		Stream name
4	H_LOCATION	Character	35		Location
5	AMPHOE	Character	22		Amphoe name

6	CHANGWAT	Character	24		Changwat name
7	HLAT_DEGR	Character	3		Latitude, degree
8	HLAT_MIN	Character	2		Latitude, minutes
9	HLAT_SEC	Character	2		Latitude, seconds
10	HLONG_DEGR	Character	3		Longitude, degree
11	HLONG_MIN	Character	2		Longitude, minutes
12	HLONG_SEC	Character	2		Longitude, seconds
13	H_MAPNO	Character	8		map no
14	YR_RECORD	Character	50		years with record
15	YR_RATING	Character	50		rating period
16	YR_DATA	Character	50		years with data
17	TEMP1	Character	10		
18	TEMP2	Character	10		
19	H_AGENCY	Numeric	1		Agency
20	H_STAT	Numeric	1		Status
21	H_OBS	Numeric	1		Observation,
22	H_BASIN	Character	19		Basin Name
23	H_DRAIN	Numeric	8		Drainage Area
24	H_ELEV	Numeric	8	2	Elevation
** Total **			370		

MONTHLY RIVER DISCHARGE DATABASE

System Database Edit Record Window Report Query Table

HYDROLOGICAL GAGING STATION MONITORING DATABASE SYSTEM

Station Code : C.1 RECORD # 1/147
River : Chao Phraya Drainage Area : 118816 sq km
Stream : Elevation : 0.00 m
Location : Wat Phikun Ngam (Ban Tha Hat) Basin :
Changwat : Chai Nat Amphoe : Wat Sing

Status : Abandoned Observation : Simultaneous

Responsible Agency : DMR

Latitude : 15°16'17"
Longitude : 100°03'44"
Map Sheet No. 5039 IV

Years of Record : 1905-1959
Rating Period : 1905-1913, 1948-1954
Disharge Data : 1950-1955

Monthly River Discharges

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug

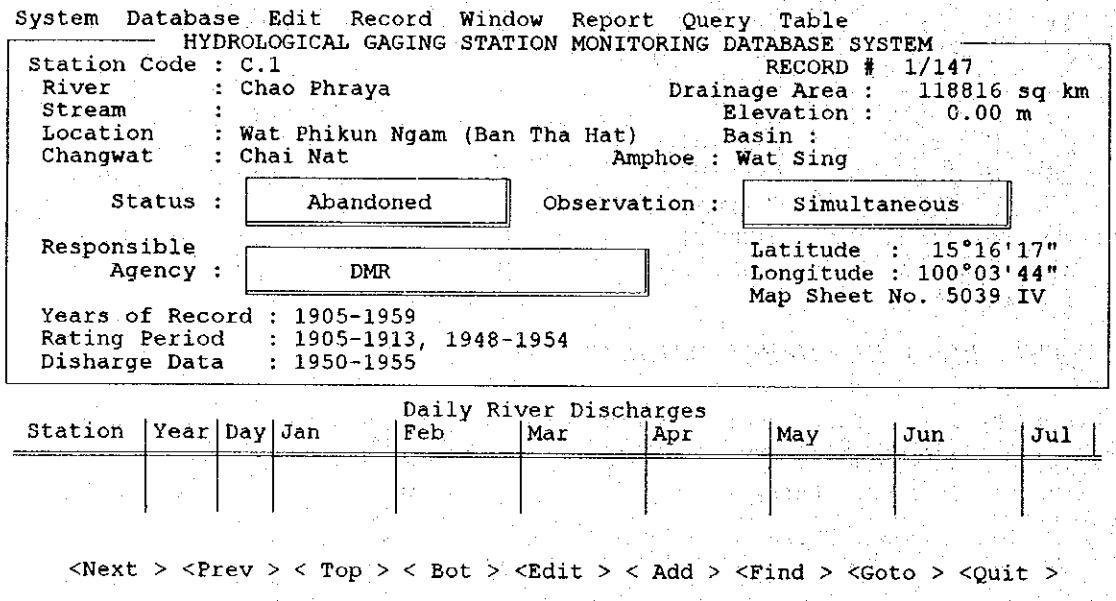
<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: H_CODE
Structure for database: **\GWS\WHLOG\RDIS_M.DBF**

Field	Field Name	Type	Width	Dec	Index
1	H_CODE	Character	8		
2	YEAR	Numeric	4		
3	JAN	Numeric	8	3	
4	FEB	Numeric	8	3	
5	MAR	Numeric	8	3	
6	APR	Numeric	8	3	
7	MAY	Numeric	8	3	
8	JUN	Numeric	8	3	
9	JUL	Numeric	8	3	

10	AUG	Numeric	8	3
11	SEP	Numeric	8	3
12	OCT	Numeric	8	3
13	NOV	Numeric	8	3
14	DEC	Numeric	8	3
15	ANNUAL	Numeric	10	3
** Total **			119	

DAILY RIVER DISCHARGE DATABASE



Index Key: H_CODE
Structure for database: **\GWS\WHLOG\RDIS_D.DBF**

Field	Field Name	Type	Width	Dec	Index
1	H_CODE	Character	8		
2	YEAR	Numeric	4		
3	DAY	Numeric	2		
4	JAN	Numeric	8	3	
5	FEB	Numeric	8	3	
6	MAR	Numeric	8	3	
7	APR	Numeric	8	3	
8	MAY	Numeric	8	3	
9	JUN	Numeric	8	3	
10	JUL	Numeric	8	3	
11	AUG	Numeric	8	3	
12	SEP	Numeric	8	3	
13	OCT	Numeric	8	3	
14	NOV	Numeric	8	3	
15	DEC	Numeric	8	3	
16	ANNUAL	Numeric	10	3	
** Total **			121		

MONTHLY GAGE HEIGHT DATABASE

System Database Edit Record Window Report Query Table

HYDROLOGICAL GAGING STATION MONITORING DATABASE SYSTEM

Station Code : C.1 RECORD # 1/147
River : Chao Phraya Drainage Area : 118816 sq km
Stream : Elevation : 0.00 m
Location : Wat Phikun Ngam (Ban Tha Hat) Basin :
Changwat : Chai Nat Amphoe : Wat Sing

Status : Abandoned Observation : Simultaneous

Responsible Agency : DMR

Latitude : 15°16'17"
Longitude : 100°03'44"
Map Sheet No. 5039 IV

Years of Record : 1905-1959
Rating Period : 1905-1913, 1948-1954
Disharge Data : 1950-1955

Monthly Gage Heights in meters

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug

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Index Key: H_CODE
Structure for database: **\GWS\WHLOG\MGAGE.DBF**

Field	Field Name	Type	Width	Dec	Index
1	H_CODE	Character	8		
2	YEAR	Numeric	4		
3	JAN	Numeric	7	3	
4	FEB	Numeric	7	3	
5	MAR	Numeric	7	3	
6	APR	Numeric	7	3	
7	MAY	Numeric	7	3	
8	JUN	Numeric	7	3	
9	JUL	Numeric	7	3	
10	AUG	Numeric	7	3	
11	SEP	Numeric	7	3	
12	OCT	Numeric	7	3	
13	NOV	Numeric	7	3	
14	DEC	Numeric	7	3	
15	ANNUAL	Numeric	7	3	
** Total **			104		

DAILY GAGE HEIGHT DATABASE

System Database Edit Record Window Report Query Table Browse

HYDROLOGICAL GAGING STATION MONITORING DATABASE SYSTEM

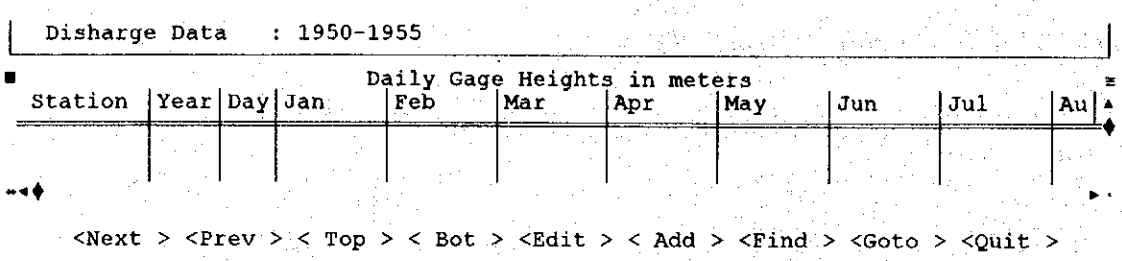
Station Code : C.1 RECORD # 1/147
River : Chao Phraya Drainage Area : 118816 sq km
Stream : Elevation : 0.00 m
Location : Wat Phikun Ngam (Ban Tha Hat) Basin :
Changwat : Chai Nat Amphoe : Wat Sing

Status : Abandoned Observation : Simultaneous

Responsible Agency : DMR

Latitude : 15°16'17"
Longitude : 100°03'44"
Map Sheet No. 5039 IV

Years of Record : 1905-1959
Rating Period : 1905-1913, 1948-1954



Index Key: H_CODE
Structure for database: **\GWS\WHLOG\GAGE_D.DBF**

Field	Field Name	Type	Width	Dec	Index
1	H_CODE	Character	8		
2	YEAR	Numeric	4		
3	DAY	Numeric	2		
4	JAN	Numeric	7	3	
5	FEB	Numeric	7	3	
6	MAR	Numeric	7	3	
7	APR	Numeric	7	3	
8	MAY	Numeric	7	3	
9	JUN	Numeric	7	3	
10	JUL	Numeric	7	3	
11	AUG	Numeric	7	3	
12	SEP	Numeric	7	3	
13	OCT	Numeric	7	3	
14	NOV	Numeric	7	3	
15	DEC	Numeric	7	3	
** Total **			99		

HYDROLOGICAL GAGING STATION DATABASES

Select area: 1,
  Database in Use: D:\GWS\WHLOG\HSTATION.DBF Alias: HSTATION
  Master index file: D:\GWS\WHLOG\HSTATION.IDX Key: H_CODE
    Related into: DGAGE
      Relation: H_CODE
    Related into: MGAGE
      Relation: H_CODE
    Related into: DDIS
      Relation: H_CODE
    Related into: MDIS
      Relation: H_CODE

Select area: 2,
  Database in Use: D:\GWS\WHLOG\RDIS_M.DBF Alias: MDIS
  Master index file: D:\GWS\WHLOG\RDIS_M.IDX Key: H_CODE

Select area: 3,
  Database in Use: D:\GWS\WHLOG\RDIS_D.DBF Alias: DDIS
  Master index file: D:\GWS\WHLOG\RDIS_D.IDX Key: H_CODE

Select area: 4,

Database in Use: D:\GWS\WHLOG\MGAGE.DBF Alias: MGAGE
Master index file: D:\GWS\WHLOG\GAGE_M.IDX Key: H_CODE

Select area: 5,
Database in Use: D:\GWS\WHLOG\GAGE_D.DBF Alias: DGAGE
Master index file: D:\GWS\WHLOG\GAGE_D.IDX Key: H_CODE

Select area: 6,
Database in Use: D:\GWS\DBFS\HAGENCY.DBF Alias: HAGENCY

Select area: 7,
Database in Use: D:\GWS\DBFS\REPORTS.DBF Alias: REPORTS

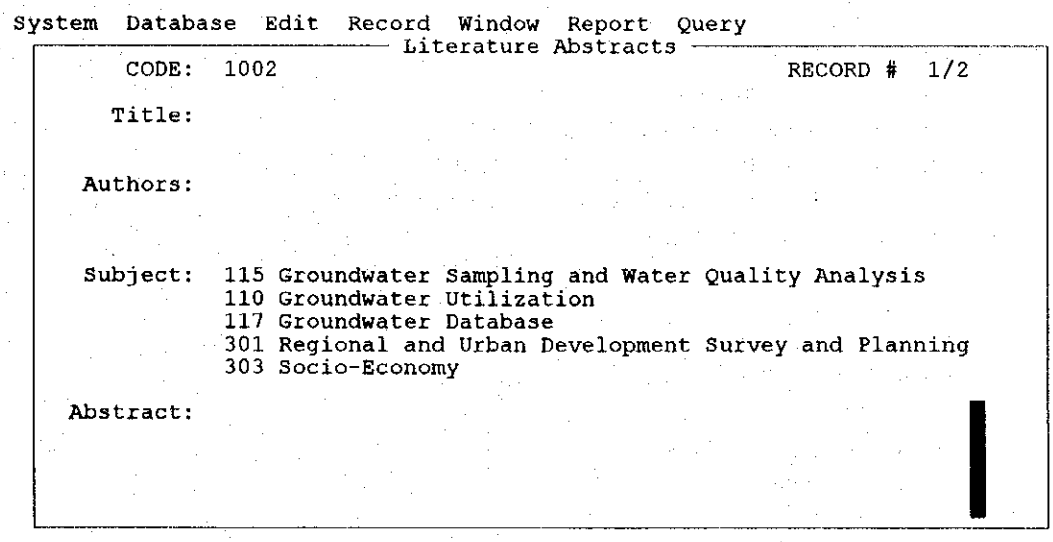
Select area: 8,
Database in Use: D:\GWS\DBFS\CHANGWAT.DBF Alias: CHANGWAT
Master index file: D:\GWS\DBFS\CHANGWAT.IDX Key: CHANG_CODE

Select area: 9,
Database in Use: D:\GWS\DBFS\AMPHOE.DBF Alias: AMPHOE
Master index file: D:\GWS\DBFS\AMPHOE.IDX
Key: CHANG_CODE+AMPHO_CODE

Select area: 10,
Database in Use: D:\GWS\DBFS\TAMBON.DBF Alias: TAMBON
Master index file: D:\GWS\DBFS\TAMBON.IDX
Key: CHANG_CODE+AMPHO_CODE+TAMBO_CODE

LITERATURE RECORDS

The literature database can be used to catalog the available literatures on the subject of groundwater or any other topic that matters. The books are coded with the authors and the corresponding subject matter for easier retrieval.



<Next > <Prev > < Top > < Bot > <Edit > < Add > <Find > <Goto > <Quit >

Index Key: LIT_CODE
Structure for database: **\GWS\WLITR\LITR.DBF**

Field	Field Name	Type	Width	Dec	Description
1	LIT_CODE	Character	6		CODE
2	LIT_NAME1	Character	50		Title
3	LIT_NAME2	Character	50		Title, con't
4	AUTHOR1	Character	30		Author 1
5	AUTHOR2	Character	30		Author 2
6	AUTHOR3	Character	30		Author 3
7	SUBJ1	Character	3		Subject code 1
8	SUBJ2	Character	3		Subject code 2
9	SUBJ3	Character	3		Subject code 3
10	SUBJ4	Character	3		Subject code 4
11	SUBJ5	Character	3		Subject code 5
12	ABSTRACT	Memo	10		Free form remarks
** Total **			222		

Index Key: S_CODE
Structure for database: **\GWS\WLITR\SUBJ.DBF**

Field	Field Name	Type	Width	Dec	Description
1	S_CODE	Character	3		Subject code
2	SUBJECT	Character	50		Descript of above
** Total **			54		

The list of subject codes and their corresponding subjects are listed below. These can however be modified to suit the user's need.

101 Hydrogeology
102 Geology
103 Groundwater Development and Management
104 Artificial Groundwater Recharge
105 Groundwater Modelling and Simulations
106 Geochemistry
107 Well Inventory Survey
108 Salt Water Intrusion and Modelling
109 Groundwater Laws
110 Groundwater Utilization
111 Groundwater Management Organizations
112 Optimal Groundwater Pumpage Planning
113 Test Well Drilling, Core Boring and Pumping Test
114 Geophysical Prospecting
115 Groundwater Sampling and Water Quality Analysis
116 Geomorphology
117 Groundwater Database
118 Groundwater Monitoring
119 Groundwater Potential
120 Water Balance Analysis
201 Land Subsidence
202 Topographic Survey

203 Geotechnical Engineering and Soil Mechanics
204 Land Subsidence Modelling
301 Regional and Urban Development Survey and Planning
302 Water Supply System Evaluation and Design
303 Socio-Economy
304 Water Demand Projections
305 Population Projections
401 Meteorology and Hydrology
402 Hydrological Observations
403 Hydrological Data Processing and Analysis
501 Social and Environmental Impact Assessment

LITERATURE DATABASES

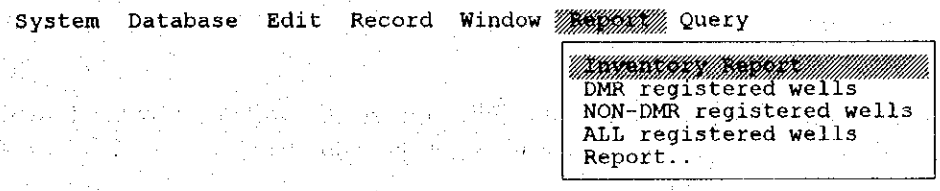
```
Select area:  1,
   Database in Use: D:\GWS\WLITR\LITR.DBF    Alias: LITR
   Master index file:   D:\GWS\WLITR\LITR.IDX  Key: LIT_CODE
          Memo file:    D:\GWS\WLITR\LITR.DBT

Select area:  2,
   Database in Use: D:\GWS\WLITR\SUBJ.DBF    Alias: SUBJ
   Master index file:   D:\GWS\WLITR\SUBJ.IDX  Key: S_CODE

Currently Selected Database:
Select area:  3,
   Database in Use: D:\GWS\DBFS\REPORTS.DBF    Alias: REPORTS
```

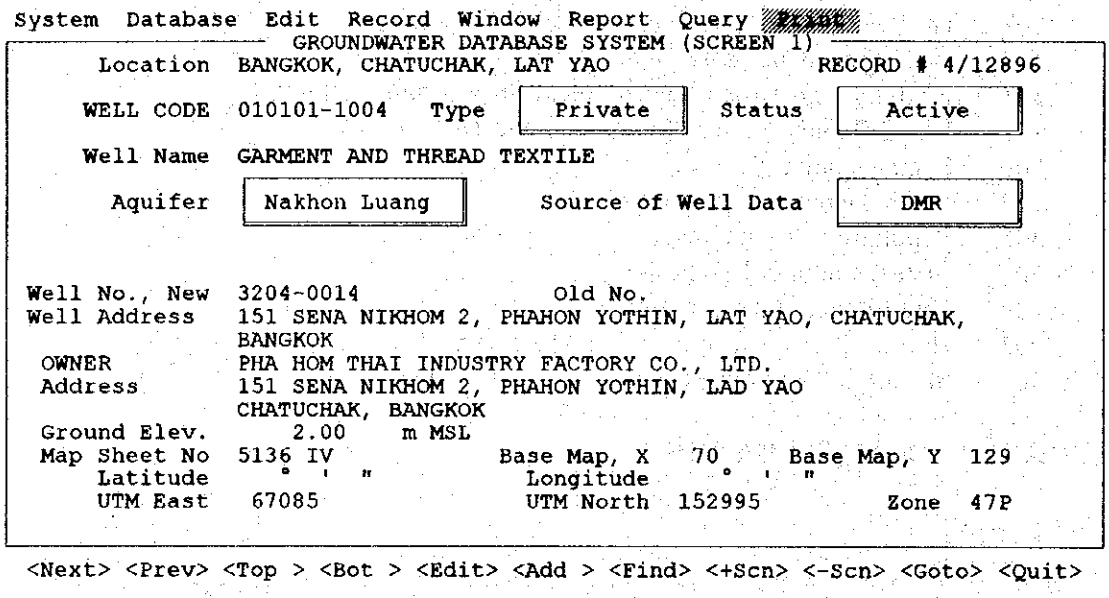
REPORTS

The generated reports are shown by activating the Report option in the main menu. The first four reports pertains to the well database while the Report... option gives the generalized report on the different databases. They are explained in the next sections.

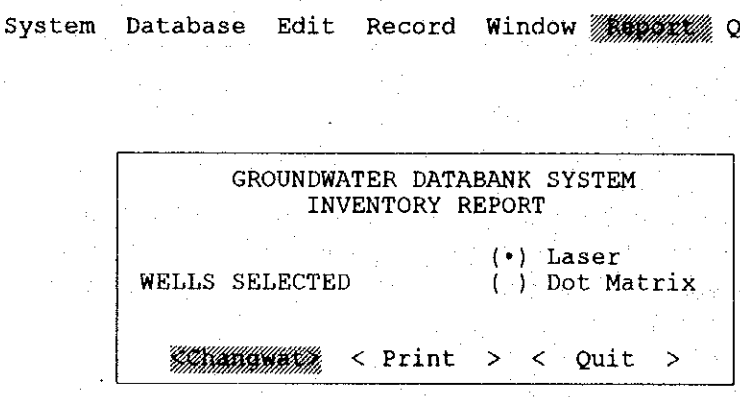


INVENTORY REPORT

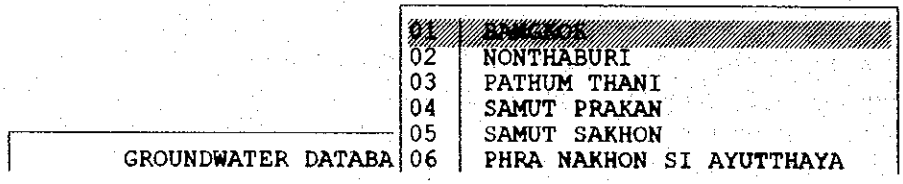
The Inventory Report option prints the available data of each well on an A4 size report ready format. A minimum of three pages is printed for each well even if there is only a minimum information on the well. Additional pages are printed when more information are available for the well. Two methods of printing the Inventory Report can be used. The first is printing the Inventory Report in the Well Inventory database using the Print option in its menu as shown below: All the twelve screens has this option. The well that is currently shown in the screen will be printed.

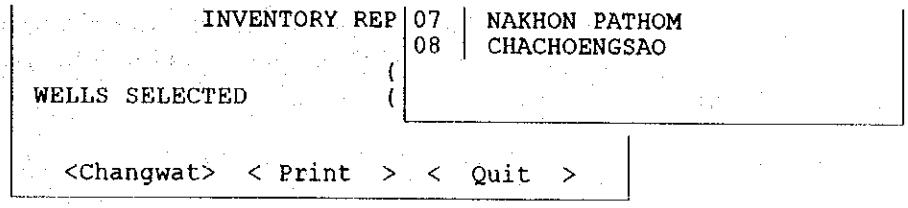


The second method is printing it in the Report option in the main menu and selecting the Inventory Report. Several options are available. The report can be printed using Laser printers or Dot Matrix printers. The user can select and print several wells in one go instead of selecting and printing them one at a time. The wells can be selected by selecting the Changwat option as shown below:



After activating the Changwat option, the following screen will be shown: It will show a list of the Changwats with which to select the wells from.

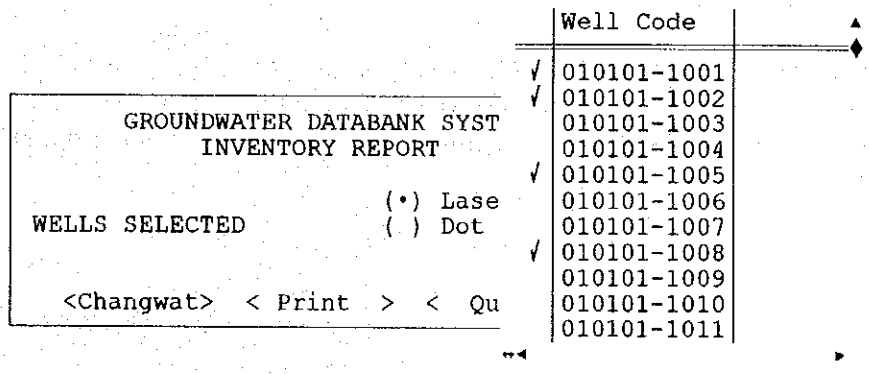




After selecting the Changwat, the selection list will be positioned to the first well in the selected Changwat. The Space key toggles the wells to be selected\unselected. The selected well has a check mark on the left side of the well. The F2 key can first be used to unselect all the wells because the previous selections made are saved together with the database. The WELL.CHECK field gives the selection status of the well. A blank value is unselected, any other value is selected. The F1 key can also be used to select all the wells for printing, although printing might take all day.

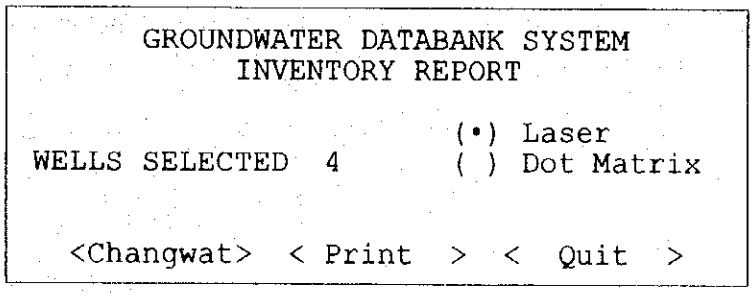
System Database Edit Record Window Report Query

Space = Toggle check
F1 = Select All
F2 = Unselect All
ESC = Done



After the wells are selected, the number of wells selected will be shown. The Print option can then be used to print the wells. The selected wells are printed using the selected printer in the radio button, either a Laser or a Dot Matrix printer.

System Database Edit Record Window Report Query



The current well being printed will be shown on the screen. The Escape key can be used to abort printing the report. Turning off the printer can also be used to abort printing the report.

```
System  Database  Edit  Record  Window  Report  Query

                                    Printing Well No 010101-1001
                                    Press Esc to Abort Printing.
```

```
        GROUNDWATER DATABANK SYSTEM
             INVENTORY REPORT

                              (•) Laser
WELLS SELECTED  4             ( ) Dot Matrix

  <Changwat>  < Print  >  < Quit  >
```

STATISTICAL REPORTS

Using an interface that calls the SPSS statistical software, several statistical reports can be generated. Statistical reports are categorized into DMR registered wells, NON-DMR registered wells and ALL registered wells using the Reports option as shown below:

```
System  Database  Edit  Record  Window  Report  Query
                                          Inventory Report
                                          DMR registered wells
                                          NON-DMR registered wells
                                          ALL registered wells
                                          Report..
```

After choosing the any of the three choices of registered wells in the Report option, the following query will be shown: The first line asks for the statistical report year. Only wells that falls within the report year would be included in the statistical reports, by considering the well's year of issue, year of expiration and the year of extension, if any. The second line asks for the factor to be used as a multiplication factor for the volume permitted as given in the well's water permit. However, if there is a value for the actual volume used, this will be used instead.

```
System  Database  Edit  Record  Window  Report  Query
```

```
Enter report year                 :  1992
Enter factor for volume permitted :  1.000
```

After entering the values above, the program will create an ASCII file that will be used by the SPSS statistical software to prepare its reports. The following ASCII files will be created for the following options:

WELLS_T1.TXT	DMR registered wells
WELLS_T2.TXT	NON-DMR registered wells
WELLS_T3.TXT	ALL registered wells

```
System  Database  Edit  Record  Window  Report  Query
```

```
Creating SPSS file for statistical reports...
```

DMR REGISTERED WELLS

The following statistical reports can be generated when the DMR registered wells is selected and the corresponding WELLS_T1.TXT file is created.

```
System  Database  Edit  Record  Window  Report  Query
```

```
1.  Distribution of DMR-Registered Wells
    > by changwat and aquifer
2.  Distribution of DMR-Registered Wells in the Study Area
    > by changwat and aquifer
    > by changwat, aquifer and type of user
    > by issuance, expiration and extension of well rights
3.  Estimated Daily Groundwater Pumpage in the Study Area
    > by changwat and type of user
    > by aquifer and type of user
    > by changwat, aquifer and type of user
    > by amphoe

0.  Exit

Enter report to generate :  0
```

NOTE: The reports would be printed directly to the printer so the printer should be always ready and online.

For option 1, the DMT1.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the DTAB1.TAB file. Annex 1-1 shows the report generated.

For option 2, the DMT2.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the DTAB2.TAB file. Annexes 1-2.1, 1-2.2, and 1-2.3 show the generated reports.

For option 3, the DMT3.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the DTAB3.TAB file. Annexes 1-3.1,1-3.2,1-3.3 and 1-3.4 show the generated reports.

NON-DMR REGISTERED WELLS

The following statistical reports can be generated when the NON-DMR registered wells is selected and the corresponding WELLS_T2.TXT file is created.

```
System  Database  Edit  Record  Window  Report  Query
```

```
1.  Distribution of NON-DMR-Registered Wells
    > by changwat, aquifer and agency
2.  Distribution of NON-DMR-Registered Wells in the Study Area
    > by changwat, aquifer and agency
    > by changwat, aquifer, type of user and agency
3.  Estimated Daily Groundwater Pumpage in the Study Area
    > by changwat and agency
    > by aquifer and agency
    > by changwat, aquifer and agency

0.  Exit


Enter report to generate :  0
```

NOTE: The reports would be printed directly to the printer so the printer should be always ready and online.

For option 1, the NDMT1.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the NTAB1.TAB file. Annex 2-1 show the generated report.

For option 2, the NDMT2.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the NTAB2.TAB file. Annexes 2-2.1, and 2-2.2 show the generated reports.

For option 3, the NDMT3.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the NTAB3.TAB file. Annexes 2-3.1, 2-3.2, and 2-3.3 show the generated reports.

ALL REGISTERED WELLS

The following statistical reports can be generated when the ALL registered wells is selected and the corresponding WELLS_T3.TXT file is created.

```
System  Database  Edit  Record  Window  Report  Query
```

```
1.  Distribution of All Registered Wells
    > by changwat, aquifer and agency
2.  Distribution of All Registered Wells in the Study Area
    > by changwat, aquifer and agency
    > by changwat, aquifer, type of user and agency
3.  Estimated Daily Groundwater Pumpage in the Study Area
    > by changwat and agency
    > by aquifer and agency
    > by changwat, agency and aquifer
    > by amphoe (centers of groundwater pumpage)
    > by x and y

0.  Exit

Enter report to generate :  0
```

NOTE: The reports would be printed directly to the printer so the printer should be always ready and online.

For option 1, the ADMT1.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the ATAB1.TAB file. Annex 3.1 show the generated report.

For option 2, the ADMT2.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the ATAB2.TAB file. Annexes 3-2.1, and 3-2.2 show the generated reports.

For option 3, the ADMT3.SPS file would be used by the SPSS software to create the statistical report. The report would be written in the ATAB3.TAB file. Annexes 3-3.1, 3-3.2, 3-3.3 and 3-3.4 show the generated reports.

SPSS

After choosing the report to be generated as explained above, the SPSS would be called from within FOXPRO. If there is no problem with the data, the following screen would be shown. It would indicate the number of wells that will be considered