

**Data Repositories and Computational Infrastructure for  
Environmental and Climate Studies in the Eastern Mediterranean  
2<sup>nd</sup> DARECLIMED Workshop  
Cyprus Hilton Hotel, Nicosia  
15-16 December, 2011**

# **The Cyprus Water Development Department: Water data collection, data bases, access and utilization of data by third parties**



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- **Data collection – monitoring programmes**
- **Main data base “Cymos”**
- **Other data bases**
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- **Procedures for accessing and utilizing data**



# The Water Development Department (1)

- **History:**

- 1896: Established as a Section of the Public Works Department, with responsibility for domestic water supply and irrigation.
- 1939: Independent Government department called “*Water Supply and Irrigation Department*” (W.S.I.D.)
- 1954: Name changed to “*Water Development Department*” (W.D.D.)
- 1960: Independency of the Republic of Cyprus: The department came under the Ministry of Agriculture, Natural Resources and Environment.
- 15. Nov. 2010: The “*Integrated Water Management Law 79(I)/2010*” is put into force. It assigns the integrated management of water to the Water Development Department.



# The Water Development Department (2)

- **Mission:**

- Implementation of the water policy of the Ministry of Agriculture, Natural Resources and Environment
- Main objectives:
  - Development, protection and management of water resources
  - Assurance of sustainable use of the resource

- **Structure:**

- Several divisions: Hydrometry, Hydrology&Hydrogeology, Planning, Design, Sewage & Reuse, Construction, Water Supply Systems, Irrigation Systems, Mechanical-Electrical Services
- District Offices: Nicosia, Limassol, Paphos, Larnaca & Ammochostos



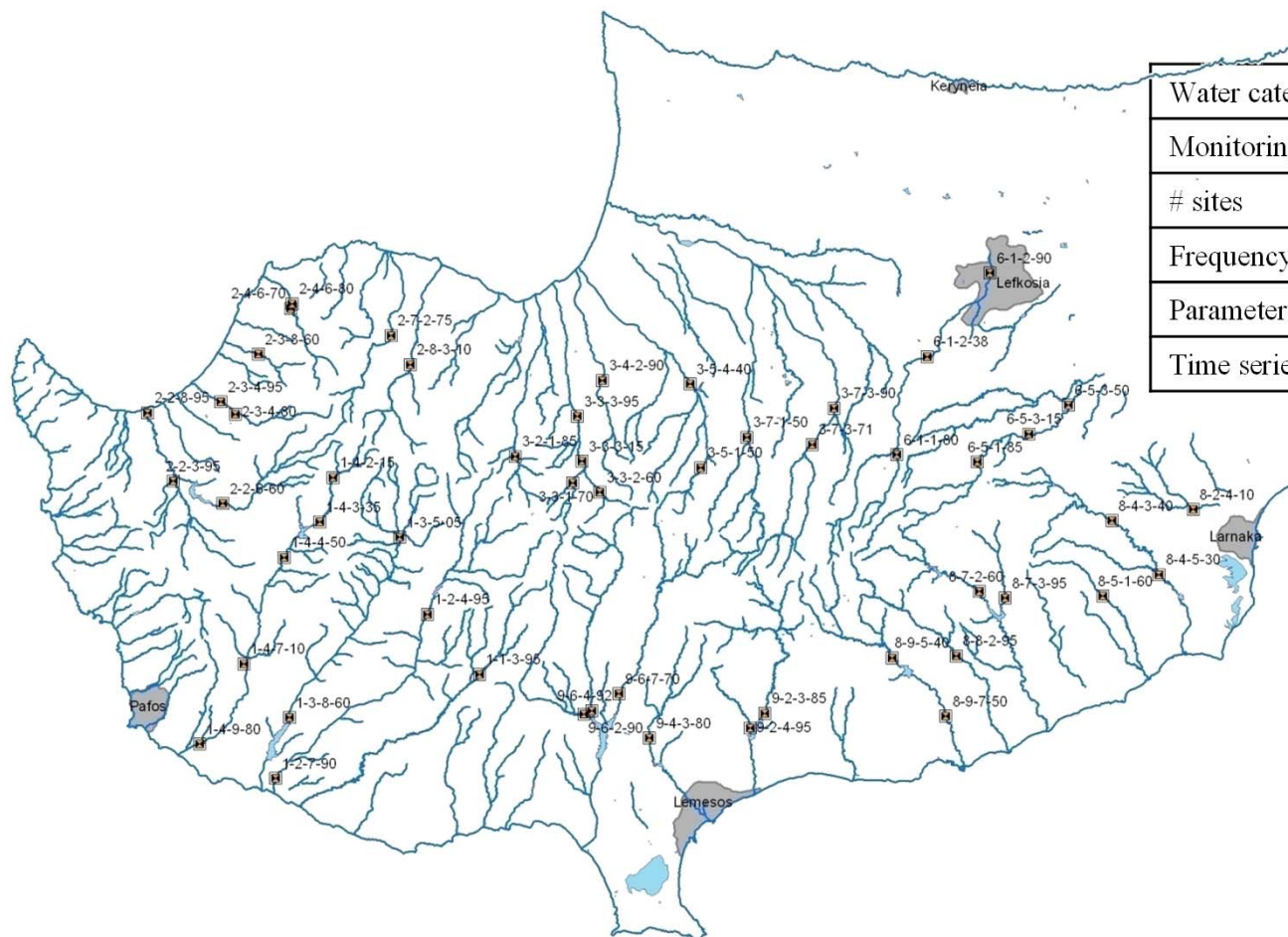
# The Water Development Department (3)

- The mission of the Department with respect to water data collection (Law 79(I)/2010):
  - To conduct activities related to the investigation, monitoring and research of the Republic's water resources [Art.3(2)δ]
  - To conduct water monitoring and control programmes [Art.3(2)ζ]
  - To collect, evaluate and maintain data and information on the available water resources and on their quality [Art.6(1)ια]
  - To construct, maintain and operate hydrometric works [Art.6(1)ιγ]
  - To keep registers and data bases [Art.6(1)ιδ]



# Data collection – monitoring programmes

## Water Quantity (1)



Water category	Rivers
Monitoring programme	Streamflow
# sites	52
Frequency	continuous/mean daily flows
Parameters	streamflow
Time series	Since Oct. 1965



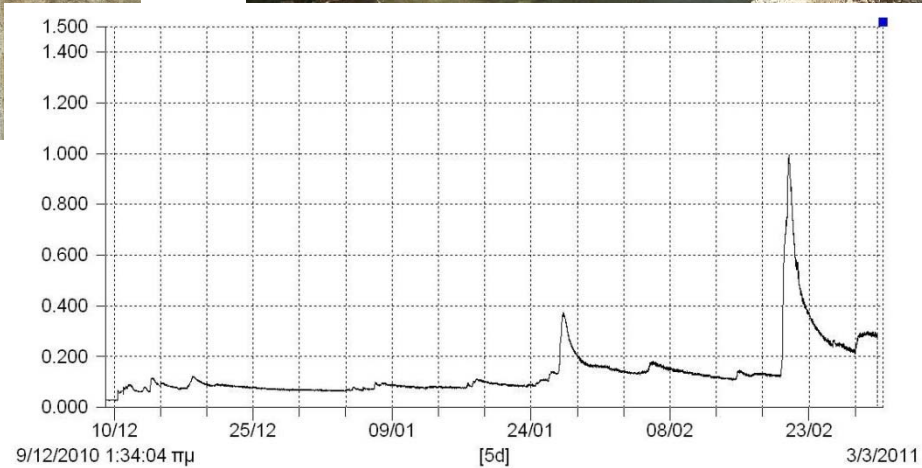
# Data collection – monitoring programmes

## Water Quantity (2)



# Data collection – monitoring programmes

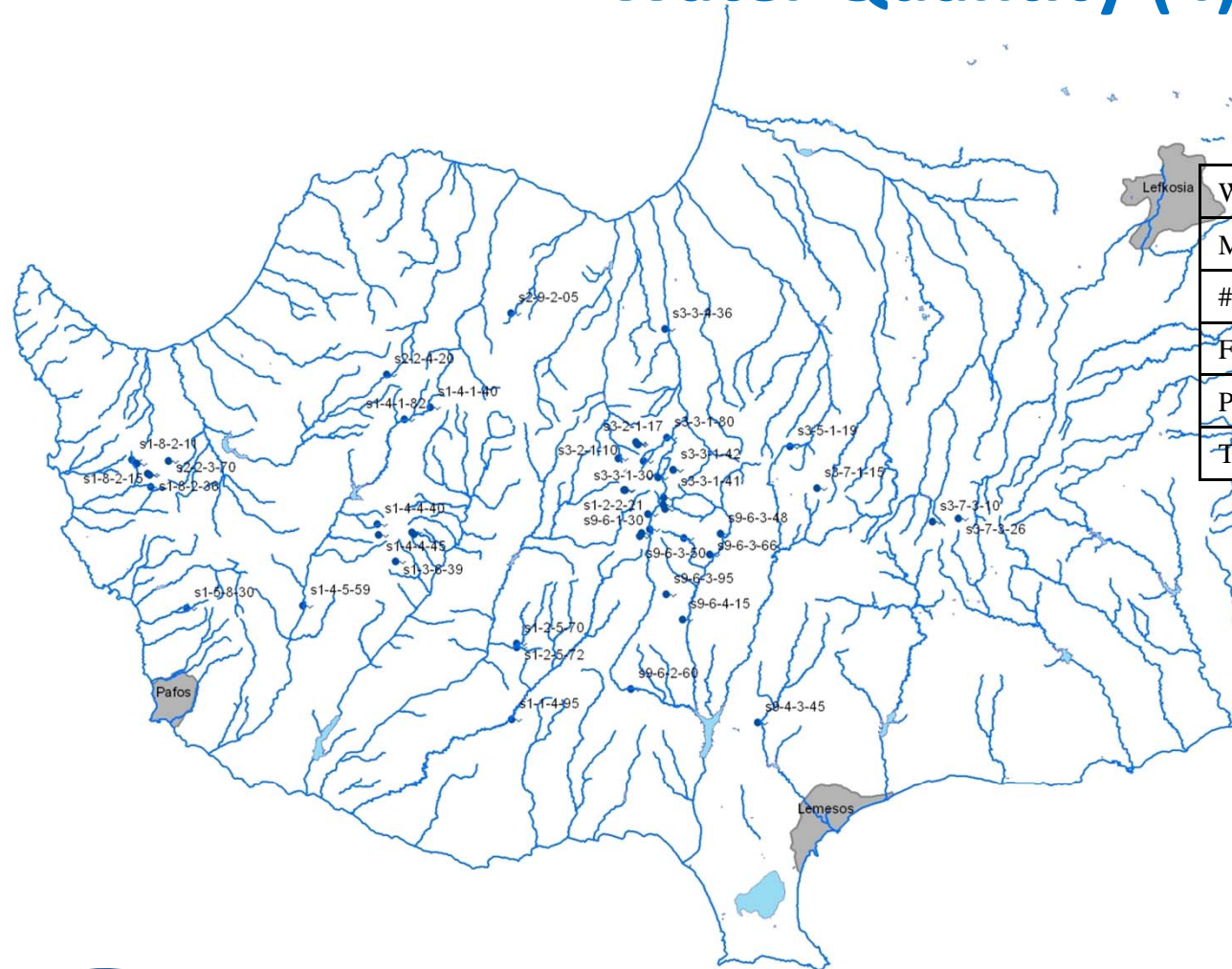
## Water Quantity (3)





# Data collection – monitoring programmes

## Water Quantity (4)



Water category	Groundwater
Monitoring programme	Springflow
# sites	50
Frequency	1/month
Parameters	Springflow, temperature
Time series	Many since 1950s



# Data collection – monitoring programmes

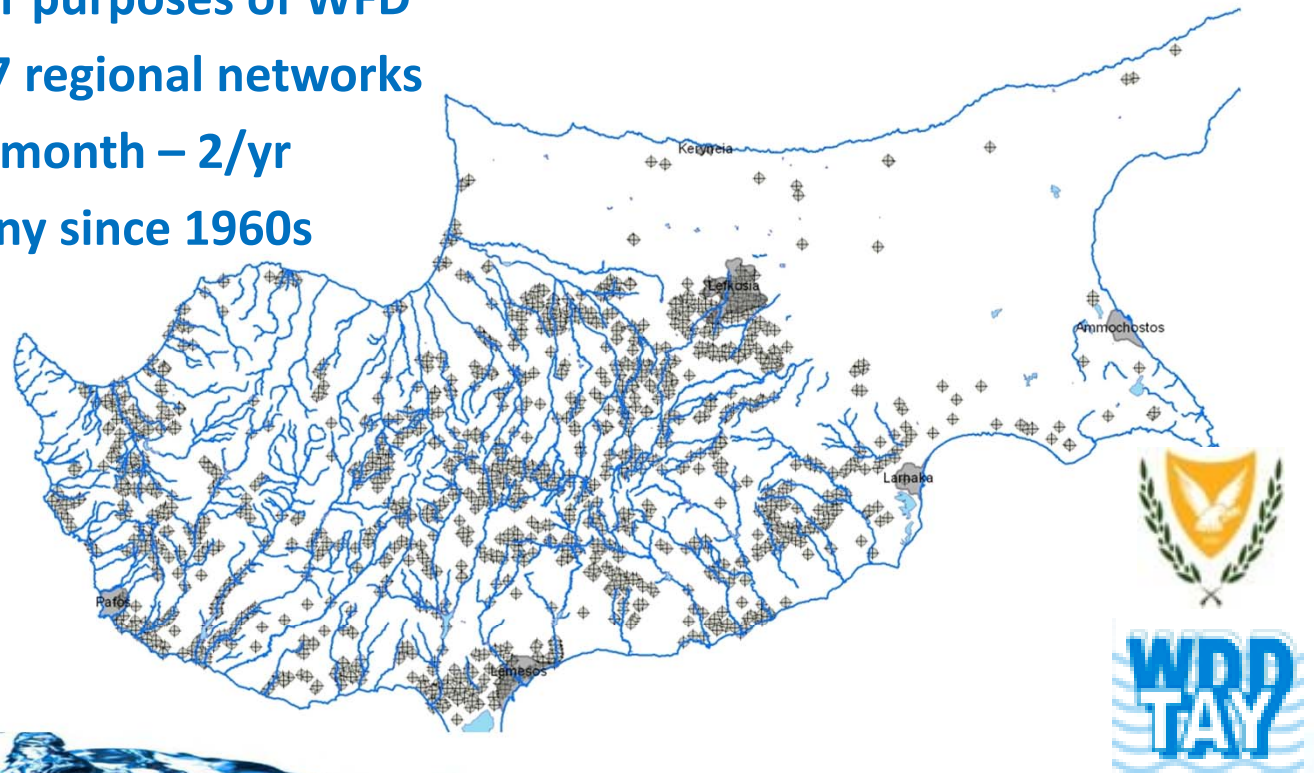
## Water Quantity (5)



# Data collection – monitoring programmes

## Water Quantity (6)

- **Groundwater levels**
  - More than 1100 boreholes are currently monitored
  - 84 boreholes for purposes of WFD
  - Organized in 27 regional networks
  - Frequencies: 2/month – 2/yr
  - Timeseries: Many since 1960s



# Data collection – monitoring programmes

## Water Quantity (7)

14 December 2011

Reservoir	Capacity MCM	Inflow		Storage				Maximum storage	
		Last 24hours MCM	Total since 1/10 2011	Present storage		Storage, same day, last year		2011	
				MCM	% storage	MCM	% storage	MCM	Date
<b>Kouris</b>	115,000	0,023	0,773	<b>44,872</b>	39,0	54,425	47,3	68,904	26/4
<b>Asprokremmos</b>	52,375	0,000	0,106	<b>32,713</b>	62,5	31,084	59,3	40,116	9/5
<b>Evretou</b>	24,000	0,000	0,014	<b>12,814</b>	53,4	12,918	53,8	17,687	29/4
<b>Kannaviou</b>	17,168	0,000	0,028	<b>9,935</b>	57,9	11,867	69,1	15,756	13/4
<b>Kalavassos</b>	17,100	0,000	0,105	<b>5,945</b>	34,8	5,761	33,7	7,794	16/5
<b>Lefkara</b>	13,850	0,000	0,036	<b>3,135</b>	22,6	3,960	28,6	5,091	16/5
<b>Dipotamos</b>	15,500	0,000	0,099	<b>3,643</b>	23,5	4,496	29,0	6,033	17/4
<b>Germasogeia</b>	13,500	0,000	0,042	<b>3,218</b>	23,8	5,824	43,1	8,016	3/5
<b>Arminou</b>	4,300	0,015	0,988	<b>1,529</b>	35,6	2,071	48,2	4,044	17/6
<b>Polemida</b>	3,400	0,000	0,006	<b>0,915</b>	26,9	0,770	22,6	1,709	15/4
<b>Mavrokolympos</b>	2,180	0,000	0,000	<b>0,177</b>	8,1	0,944	43,3	1,379	7/4
<b>Vyzakia</b>	1,690	0,000	0,000	<b>1,004</b>	59,4	0,959	56,7	1,690	26/4-11/5
<b>Xyliatos</b>	1,430	0,000	0,044	<b>0,772</b>	54,0	0,695	48,6	1,430	25/3-10/5
<b>Argaka</b>	0,990	0,000	0,005	<b>0,189</b>	19,1	0,128	12,9	0,990	11/3-27/4
<b>Pomos</b>	0,860	0,000	0,000	<b>0,302</b>	35,1	0,214	24,9	0,860	23/2-6/5
<b>Kalopanagiotis</b>	0,363	0,000	0,107	<b>0,363</b>	100,0	0,363	100,0	0,363	1/1-5/7
<b>Agia Marina</b>	0,298	0,000	0,000	<b>0,048</b>	16,0	0,145	48,7	0,298	13/4
<b>Achna</b>	6,800	0,000	0,000	<b>0,083</b>	1,2	1,240	18,2	1,566	18/4
<b>TOTAL</b>	<b>290,804</b>	<b>0,038</b>	<b>2,354</b>	<b>121,656</b>	<b>41,8</b>	<b>137,864</b>	<b>47,4</b>	<b>182,177</b>	<b>2/5</b>

Water category	Reservoirs
Monitoring programme	Storage
# sites	18
Frequency	Daily
Parameters	Water Level, Storage
Time series	Varies, most since 1990s



# Data collection – monitoring programmes

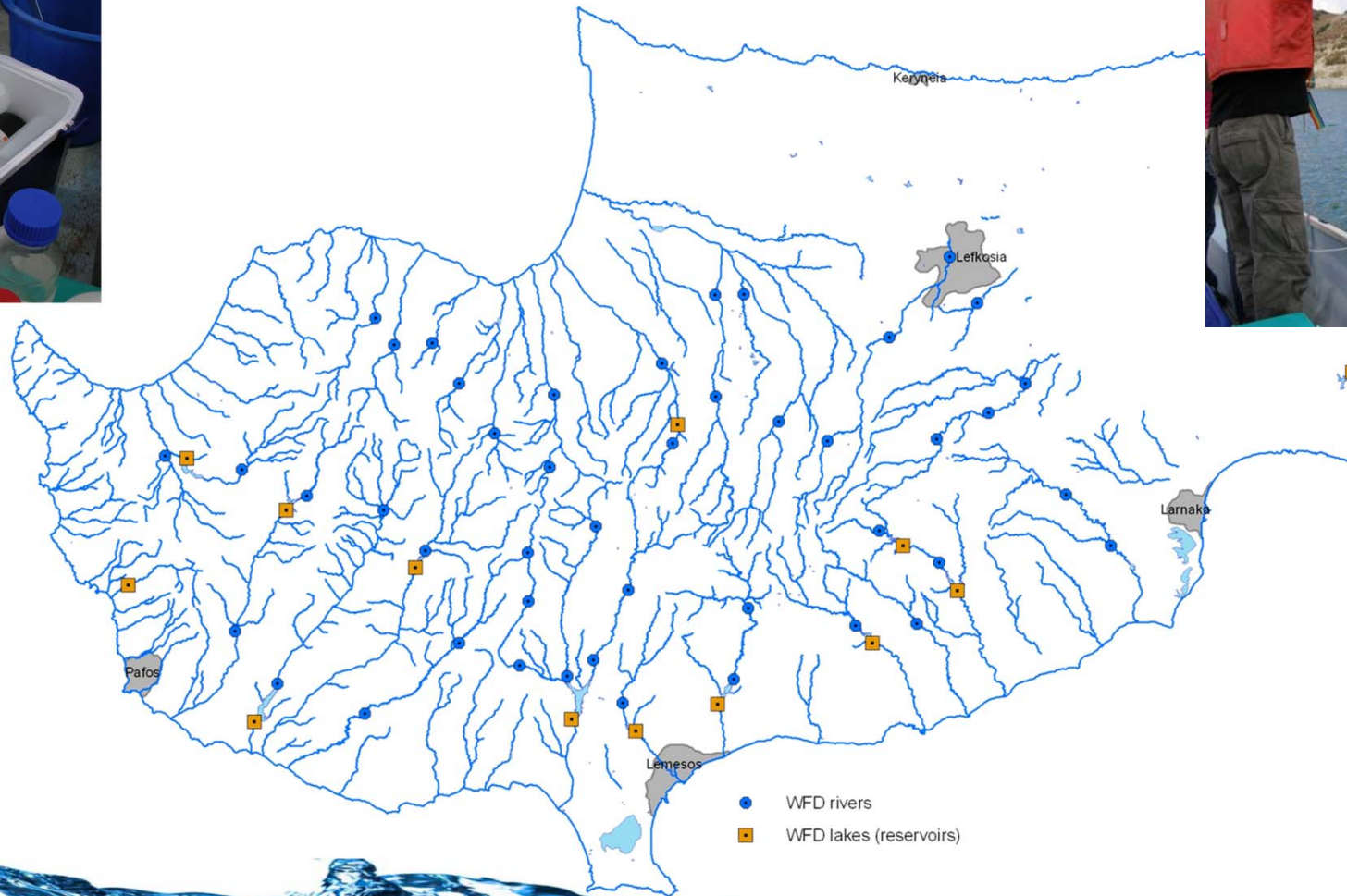
## Water Quality (1)

- **Monitoring for implementation of the EU Water Framework Directive – Surface Waters**
  - 45 river monitoring stations, frequency: 9/yr
  - 13 lake (reservoir) monitoring stations, frequency: 4/yr, 6/yr
  - Elements for biological monitoring: macroinvertebrates, phytobenthos, macrophytes, chlorophyll a
  - Parameters for chemical monitoring: Metals, VOCs, Pesticides, PCBs, PAHs
  - Supporting parameters: nutrients, microbiology, exotoxicology, physico-chemical parameters (Temp., pH, EC, DO, Turbidity)



# Data collection – monitoring programmes

## Water Quality (2)



# Data collection – monitoring programmes

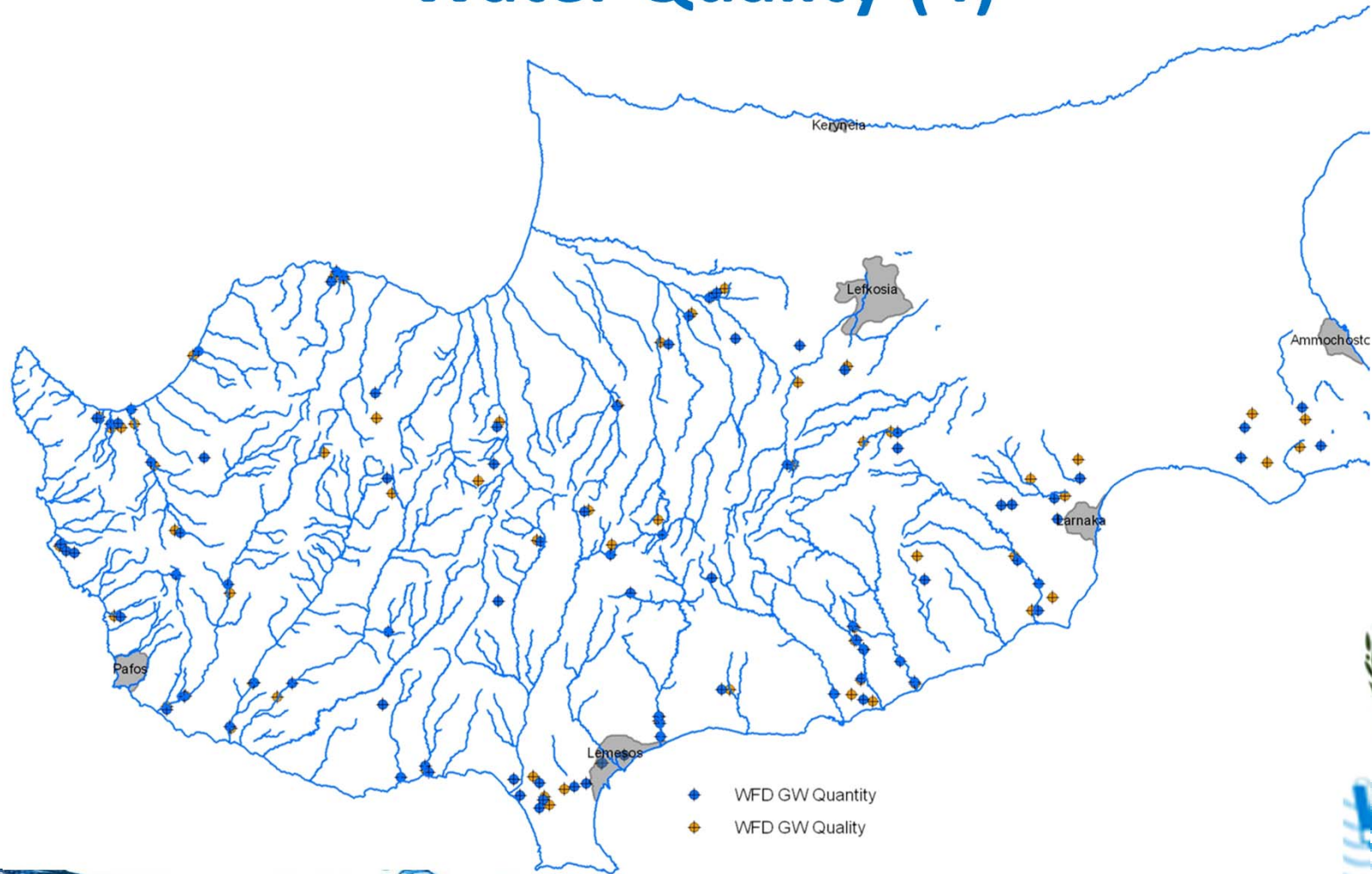
## Water Quality (3)

- Monitoring for implementation of the EU Water Framework Directive – Groundwater
  - 88 monitoring stations: 85 boreholes, 3 springs
  - Frequency: 2/yr
  - Parameters for chemical monitoring: Metals, VOCs, Pesticides
  - Supporting parameters: ionic analyses, physico-chemical parameters



# Data collection – monitoring programmes

## Water Quality (4)

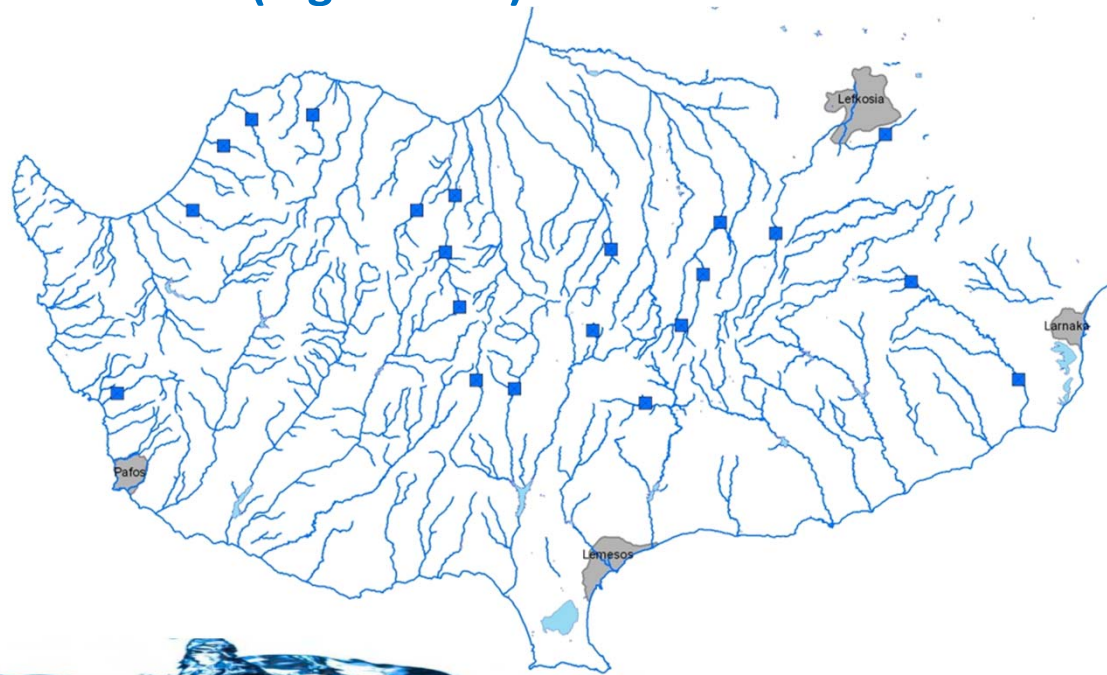




# Data collection – monitoring programmes

## Water Quality (5)

- **Small reservoirs monitoring programme**
  - 21 reservoirs, frequency: 3/yr
  - Parameters: Ionic analysis, nutrients, physico-chemical parameters; other parameters (e.g. metals) are added if needed



# Data collection – monitoring programmes

## Water Quality (6)

- **Major springs monitoring programme**
  - 50 springs, frequency: 2/yr
  - Parameters: Ionic analysis, physico-chemical parameters; other parameters (e.g. metals) are added if needed
- **Monitoring of village drinking water sources**
  - Large number of boreholes and springs, frequency: 1/yr
  - Ad-hoc samplings are undertaken if needed
- **Monitoring of water temperature of major reservoirs**
  - All major reservoirs, frequency: 2/week, since 2009
- **Monitoring of physico-chemical parameters in rivers**
  - >60 sites, frequency: 1/month

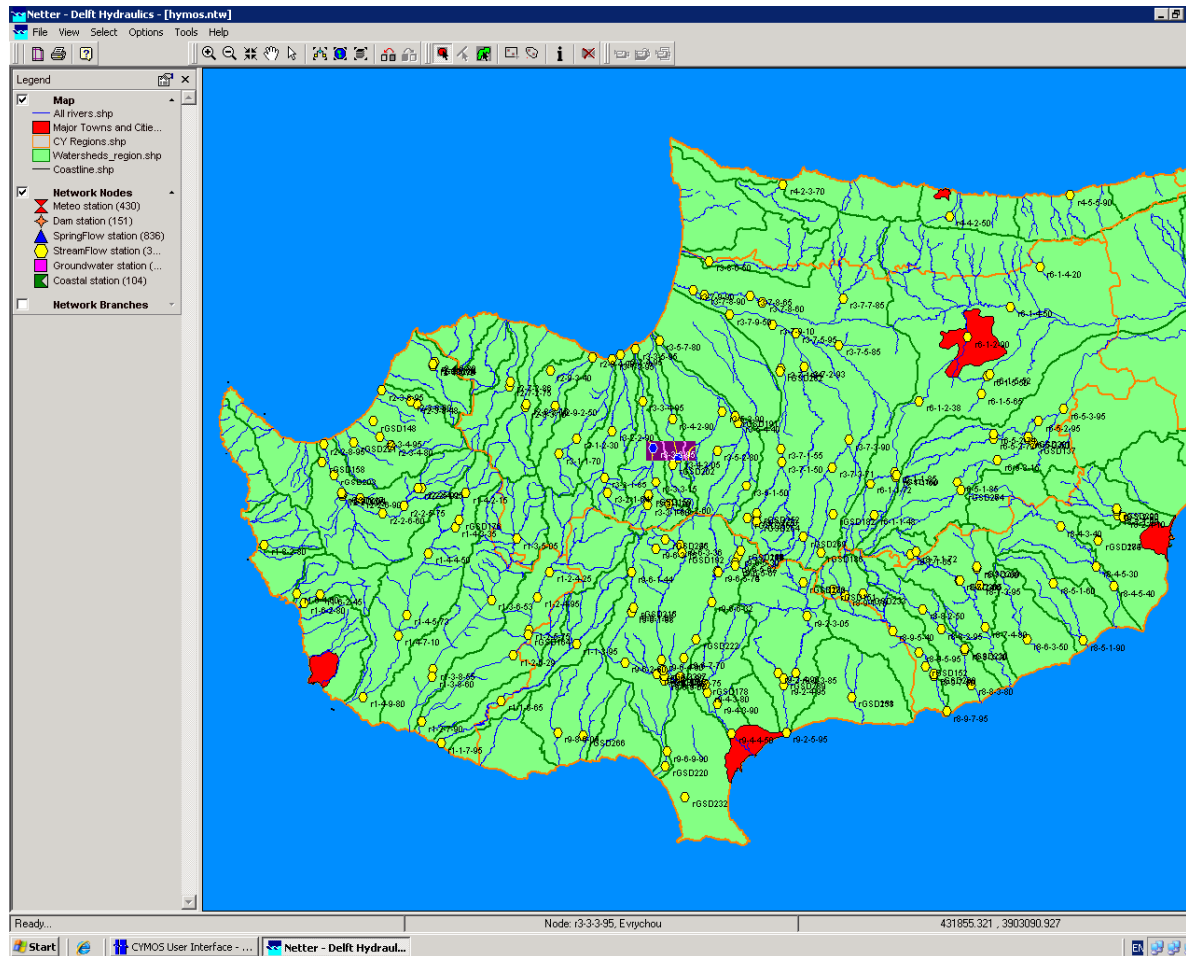


# Main data base “Cymos” (1)

- How does the data get in?
  - Dedicated import tool for water quality results from the State General Laboratory (connection with LIMS)
  - MS Excel import templates for most other data
    - Excel import templates can be customized for each specific data type
  - Bulk imports of historical data (by db manager)
  - Dedicated import interface for *manual* input of water quality data (related to samples)
  - “Normal” manual input



# Main data base “Cymos” (2)



- Map interface for station selection



# Main data base "Cymos" (3)

- Information on available data for selected station(s)

The screenshot displays the Netter - Delft Hydraulics software interface. The main window shows a map of a river network with various stations marked. A dialog box titled "Cymos Functions" is open, showing a list of functions such as "Entry and Edit", "Time series validation and completion", "Stage Discharge", "Data Compilation", "Time series analysis", and "Presentation". The "Go to Function" button is highlighted. Below the dialog box, the "Selection Info" panel is visible, showing details for a selected station (r3-3-95) and a list of parameters available for that station.

Station ID	Station name	Station Type
r3-3-95	Evrychou	Streamflow S

Parameter ID	Parameter name
*	All parameters

Station ID	ParID	Start d
r3-3-95	Alachlor	
r3-3-95	Alkalinity	
r3-3-95	Atrazine	
r3-3-95	B	16-02-
r3-3-95	BICARBONATE	
r3-3-95	BOD5	
r3-3-95	BOD5_diss	
r3-3-95	BORON	
r3-3-95	Ca	16-02-
r3-3-95	Cd	
r3-3-95	Cl	16-02-
r3-3-95	ClFerVirPhos	
r3-3-95	Co	16-02-
r3-3-95	CO3	16-02-
r3-3-95	COD	
r3-3-95	coli_total	
r3-3-95	colour	
r3-3-95	Cr	
r3-3-95	Cu	16-02-
r3-3-95	DO	16-05-
r3-3-95	DO%	
r3-3-95	DO%_field	13-02-
r3-3-95	DO_field	13-02-
r3-3-95	DummySGL	
r3-3-95	E.Coli	
r3-3-95	EC_field_mS	



# Main data base "Cymos" (4)

- Query interface for station selection
- Time period selection

**Cymos Functions**  
Start date: 01-09-1960 00:00:00

Stations | Time | Parameters | Series | Samples | Functions

+ - LocationID LIKE %3-1-1% AND

Execute Query

[LocationID] LIKE %3-1-1%

LocationID	LocationNar	Type	Networks	Region	District	Village	MajorBasin	River
r3-1-1-70	Kamos	Streamflow	All Streamflo	3 - Morfou	Lefkosa	1427 - Kamp		XERO
r3-1-1-70	Kamos	Streamflow	WFD Groun	3 - Morfou	Lefkosa	1427 - Kamp		XERO
r3-1-1-70	Kamos	Streamflow	StreamflowL	3 - Morfou	Lefkosa	1427 - Kamp		XERO
r3-1-1-70	Kamos	Streamflow	parameters	3 - Morfou	Lefkosa	1427 - Kamp		XERO
s3-1-1-10	Ayia Trias	Springflow	All Springflo	3 - Morfou	Lefkosa	1425 - Geral		YERAI
s3-1-1-10	Ayia Trias	Springflow	WFD Groun	3 - Morfou	Lefkosa	1425 - Geral		YERAI
s3-1-1-10	Ayia Trias	Springflow	parameters	3 - Morfou	Lefkosa	1425 - Geral		YERAI
s3-1-1-20	Chrome Mini	Springflow	All Springflo	3 - Morfou	Lemesos	5013.02 - Pc		TROO
s3-1-1-20	Chrome Mini	Springflow	WFD Groun	3 - Morfou	Lemesos	5013.02 - Pc		TROO
s3-1-1-20	Chrome Mini	Springflow	parameters	3 - Morfou	Lemesos	5013.02 - Pc		TROO

**Cymos Functions**  
Start date: 01-09-1960 00:00:00

Stations | Time | Parameters | Series | Samples

Station ID	Parameter	Start Date	End Date
r3-1-1-70	B		
r3-1-1-70	Ca		
r3-1-1-70	Cl		
r3-1-1-70	CO3		
r3-1-1-70	EC_lab		
r3-1-1-70	hardns_total		
r3-1-1-70	HCO3		
r3-1-1-70	K		
r3-1-1-70	Mg		
r3-1-1-70	Na		
r3-1-1-70	NO3-N		
r3-1-1-70	pH_lab		
r3-1-1-70	Q.instant		
r3-1-1-70	SO4		
r3-1-1-70	TDS		
s3-1-1-10	Q.Spring	04-05-1955	03-12-1976
s3-1-1-20	Q.Spring	29-10-1971	05-10-2006

**Cymos Functions**  
Start date: 01-09-1960 00:00:00

Stations | Time | Parameters | Series | Samples | Functions

Active Period | Time base

Start date: 01-09-1960 00:00:00 Calendar...

End date: 30-09-2011 00:00:00 Calendar...



# Main data base "Cymos" (5)

- Possibility of inspection, entry and editing of time series
- Graphical editing is possible

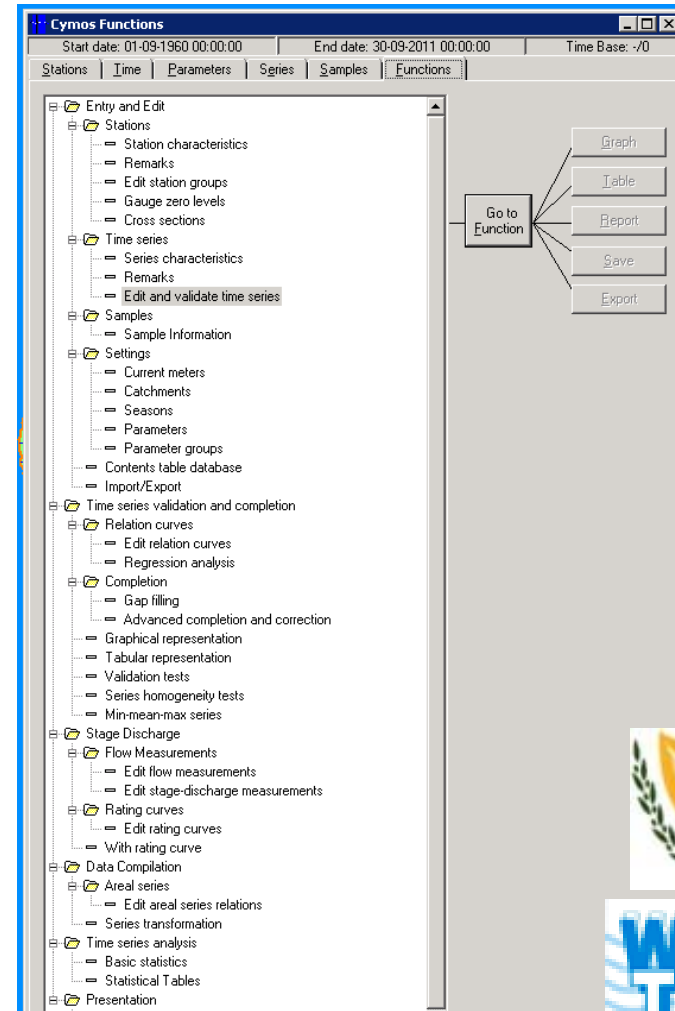
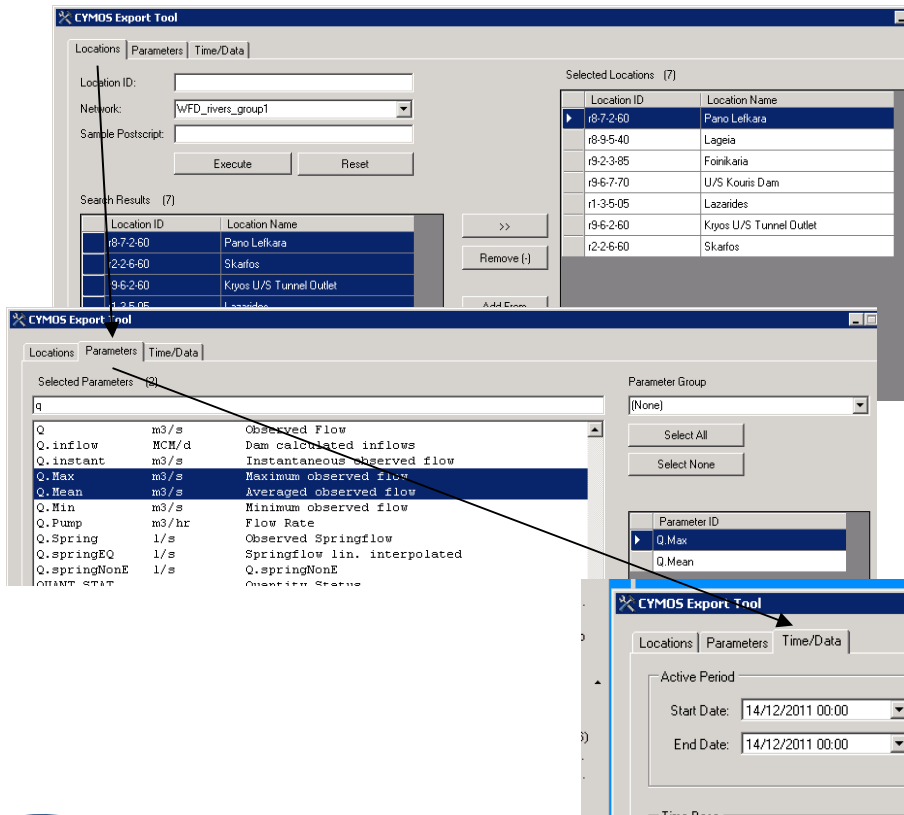
The screenshot displays the Cymos software interface with several components:

- Series List (Left):** A scrollable list of chemical and biological parameters such as Enterococcus, Ethylbenzene, Faecal coli, Ni, and various pesticides.
- Table (Top Center):** A table showing data for the series 'r3-31-60 Ni'. It includes columns for Date, Value, and Remarks. A row is highlighted: 20-11-2008 00:00:00 with a value of < 0.1 and a remark 'replaced 0.03 with 50% of LOQ (0.2); LOD = 0.03'.
- Table (Bottom Center):** A detailed view of the 'r3-31-60 Ni' series, showing a list of dates and values from 05-08-2005 to 18-05-2011. A value of 0.2559 is highlighted for the date 05-08-2005.
- Graph (Right):** A line graph showing the time series for 'r3-31-60 Ni'. The x-axis represents time from 04/12/2005 to 03/12/2010, and the y-axis represents the concentration value from 0.01 to 0.33. The graph shows several peaks, with the highest reaching approximately 0.33.
- Series Selection (Bottom Left):** A panel for selecting and viewing series information, including 'Data properties in period' and 'Sample information'.



# Main data base “Cymos” (6)

- Dedicated export tool
- Numerous other functions





# Other data bases @ WDD

Αιτήσεις Αδειών Γεωτρήσεων

Αρ. Αιτητή : 11223

## Αιτήσεις Αδειών Γεωτρήσεων

Σύνολο Φακέλων - 15807

Αιτητής

Όνομα (α):	ΕΛΕΝΗ	Επίθετο (α):	ΘΕΟΔΩΡΟΥ	Αρ. Ταυτότητας (α):	503430
Όνομα (β):		Επίθετο (β):		Αρ. Ταυτότητας (β):	
Όνομα (γ):		Επίθετο (γ):		Αρ. Ταυτότητας (γ):	

Άλλοι:

Διεύθυνση : ΚΟΡΥΔΑΛΛΩΗ 8 Α ΛΑΑΤΑΜΙΑ 2321 Επαρχία : ΑΕΥΚΩΣΙΑ Αρ. Εταιρείας:

Κινητό Τηλ. : 99387470 Τηλέφωνο : Φαξ :

Δημιουργήθηκε Από : Ιραγουτι Δημιουργήθηκε Στις : 8/10/2009 10:42

Αναζήτηση με :

Αριθμός Φακέλου  Επίθετο Αιτητή  Αρ. Ταυτότητας / Εταιρείας  Τηλ. Αιτητή  Χωριό  Τεμάχιο Αναζήτηση: 2.11.100.02.02.54.15

Αρ. Φακ.: 2.11.100.02.02.54.15 Εκτύπωση

Γενικές Πληροφορίες | Λεπτομέρειες Αίτησης | Συνυμμένα Έγγραφα | Λεπτομέρειες Έργου | Επικορήγηση | Υδρομετρήτες | Δοκιμαστική Άντληση | Χημικές Αναλύσεις

### Αιτήσεις

Αρ. Φακέλου	Επαρχία	Χωριό	Χρήση	Φύλλο	Σχέδιο	Τεμάχιο	Μέθοδος Λήψης	EastED50	NorthED50	EastWGS8	NorthWGS8
▶ 2.11.100.02.02.54.15	ΑΕΥΚΩΣΙΑ	ΠΑΝΩ ΔΕΥΤΕΡΑ	Άρδευση & Οικιακή Χρήση	30	19	544				524440	3884012

### Τύποι Αιτήσεων

Τύπος Αίτησης	Ποσότητα Νερού	Ημερομηνία Εισαγωγής	Ημερομηνία Εξαγωγής	Κατάσταση	Εγκρίθηκε	Αρ. Άδειας	Αρ. Άδειας (Κεφ. 351)
28_Κεφ.351_Ανάρξη Φρέατος	250	17/09/2009	07/10/2009		Yes		04546
1_N79_80_ΑΕΥ_Ανάρξη	500	31/05/2011	06/07/2011	Εκδόθηκε Άδεια	Yes	ΑΕΥ/2/54/6	
▶ 11_N79_82_Άδεια Υδροληψίας - Έργο Υδροληψ...	500	24/10/2011	15/12/2011	Εκδόθηκε Άδεια	Yes	ΑΥ/2/54/9	

Νέος Τύπος Διαγραφή Τύπου

Νέος Αιτητής + Αίτηση Νέα Αίτηση Αποβήγεια Διαγραφή Αίτησης Διαγραφή Αίτησης Επεξεργασία Ακύρωση Ανανέωση Έξοδος

- Well permits database
  - Includes also:
    - Information on abstraction from private wells
    - Water quality data from private wells
    - Results of pumping tests from private wells



# Other data bases @ WDD

- **Water invoicing system**
  - Data on water use in Government Water Schemes
- **Various other data are collected, e.g.:**
  - Quantities of produced desalination water
  - Quantities of re-cycled and re-used water
  - Quantities of water supplied to Water Boards
  - etc.



# Regular data provision to E.U. and international organizations

- Obligatory reporting to the European Commission in the framework of WFD implementation
- Annual data flow to WISE-SoE Eionet (European Environment Agency)
  - Water quality of rivers, lakes (reservoirs) & groundwater (Basic quality, priority substances, biology)
  - Water quantity (streamflows, reservoir storage, groundwater levels, water balance, ...)
- Eurostat: Water balance, ...
- WHO - HYDROLARE: Reservoir storage and water temperatures



# Procedures for accessing and utilizing data

- Written request to the Director is needed
- A data preparation fee is charged if the data is provided for commercial purposes
- For clearly scientific and research purposes no fee is charged
- The interested party has to accept the conditions set out in the “AGREEMENT FOR THE PROVISION AND USE OF DIGITAL DATA ”. The form he has to be completed, signed and returned to WDD before the data are provided.



# Procedures for accessing and utilizing data

- Conditions of the “AGREEMENT FOR THE PROVISION AND USE OF DIGITAL DATA ”:
- The Data or any product derived from the Data, either digital or hardcopy, must not be sold, given away, traded, or leased.
- Copies of the derived data must be given to the Water Development Department in digital form if available.
- *The User must supply Water Development Department with a hardcopy (or a soft copy) of the report and publications produced on the above project.*
- The User is permitted to use the Data in demonstrations and displays provided that *the source is properly quoted or a statement acknowledging that the Data were supplied by the “Cyprus Water Development Department”* is displayed on the demonstrated or displayed object.



# Procedures for accessing and utilizing data

- **Conditions of the “AGREEMENT FOR THE PROVISION AND USE OF DIGITAL DATA ”: (cont’d)**
- **The Data are put at the disposal of the User until the end of ....., at which time the Data have to be deleted from all computers of the User and the CDs or floppy discs have to be returned to the Distributor.**
- **This Agreement can be modified or terminated by mutual consent of User and Distributor. This must be done in writing.**
- **Legal measures will be taken in the case that this contract is breached. This contract is subject to Cyprus Law.**



**Thank you for your attention**



**Gerald Dörflinger  
Hydrologist  
Water Development Department**

