PWA Water Information System

Prepared By:
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May 13, 2007

General Background Of PWA

The Palestinian Water Authority (PWA) is the official body which regulates and is responsible for overall water and Wastewater sectors in Palestine

PWA Needs for Water Information System

To ensure efficient management& Planning for water & wastewater sectors.

PWA

realized since established the need to establish a **Comprehensive Water Information System** that includes all available water related data

Main **purpose** of the **WIS**

To create a software environment which allows for the ease of recording, archiving & manipulating a wide variety of technical & scientific water – related information that are geographically spread and vary with time.

General Database Concepts

Databases

- By definition:
  - An organized or structured collection of data arranged to allow a set of activities to occur, and so it can be accessed and altered in an efficient manner

Purposes of a Database

- Reduce data redundancy and inconsistency
- Allow for easy access to the data
- Allow multiple users access to the same data
- Data security and integrity

Database Management Systems

- Database Management Systems (DBMS) are often confused with Databases
- For Example:
  - Microsoft Access is a DBMS. The database engine is a Microsoft Jet Database
  - The Borland Database Engine is used by Paradox and dBase

Database Management Systems

- Provide:
  - A way to define ‘containers’ to hold data (ie. tables)
  - Methods to search, sort, insert, modify, view, and delete data
  - A graphical user interface (GUI)
  - Enforce Referential Integrity Rules
  - Manage simultaneous data access among multiple users
  - Analyze relationships

Common DBMS

- Microsoft – Access, SQL Server, Visual FoxPro
- Oracle
- mySQL
- Paradox
- dBase

Relational Databases

- A collection of data indicating relationships among data elements
  - More simply, a collection of related data
- Data Elements:
  - Fields
  - Records
  - Tables

Normalizing a Database

- Normalization is the process of refining a database structure to improve its speed and data integrity.
- The main purpose is:
  - to limit redundant or duplicate data
  - to group related columns of data
- Normalization is a step by step procedure

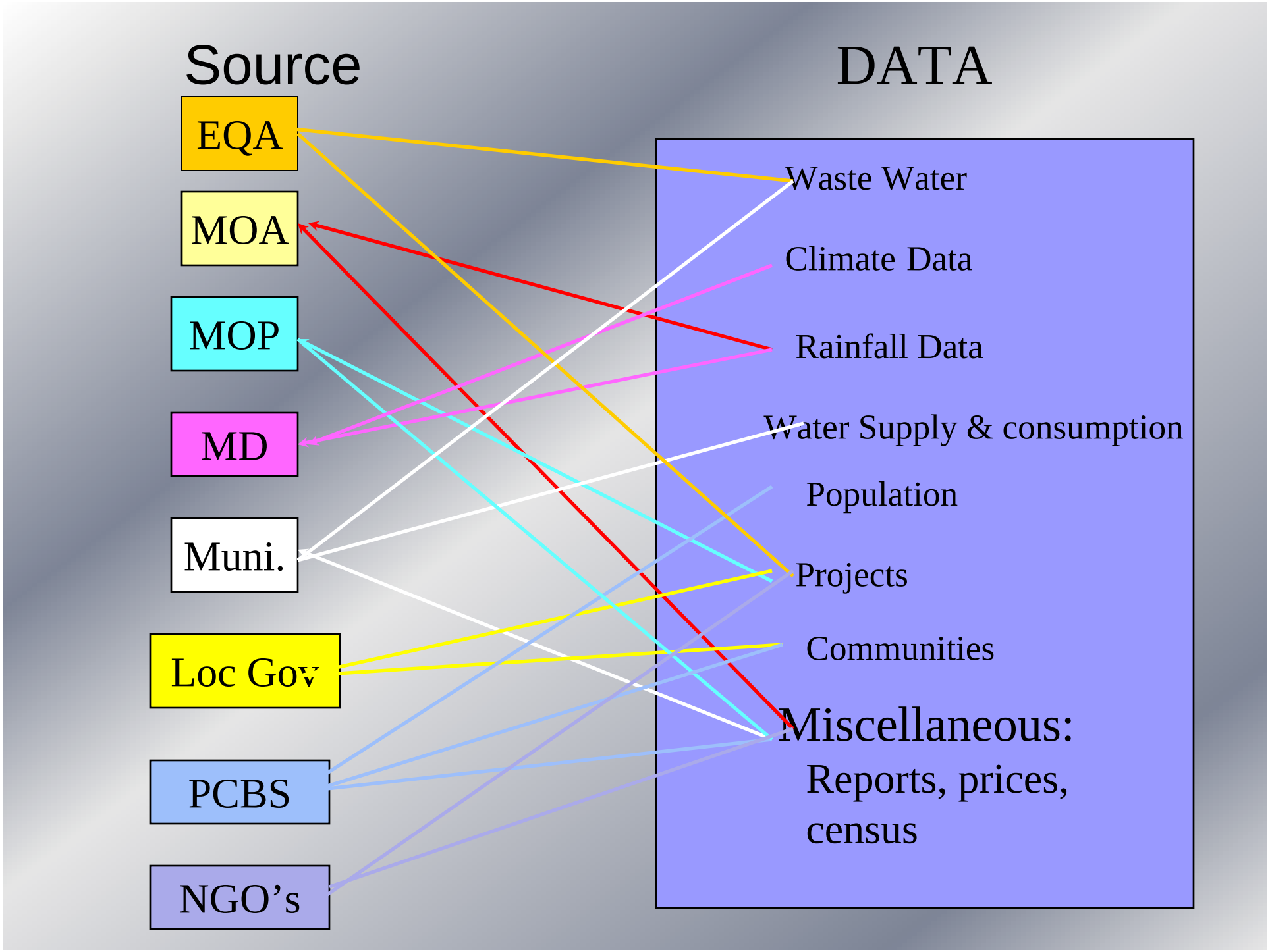
PWA Databases

Database Design Objectives

- Provide a secure, central location for storing water related data
- Provide easy methods of importing, exporting and viewing this data
- Provide a method of linking data of different types, eg. water level data with stratigraphic information

Characteristics of the WIS at PWA

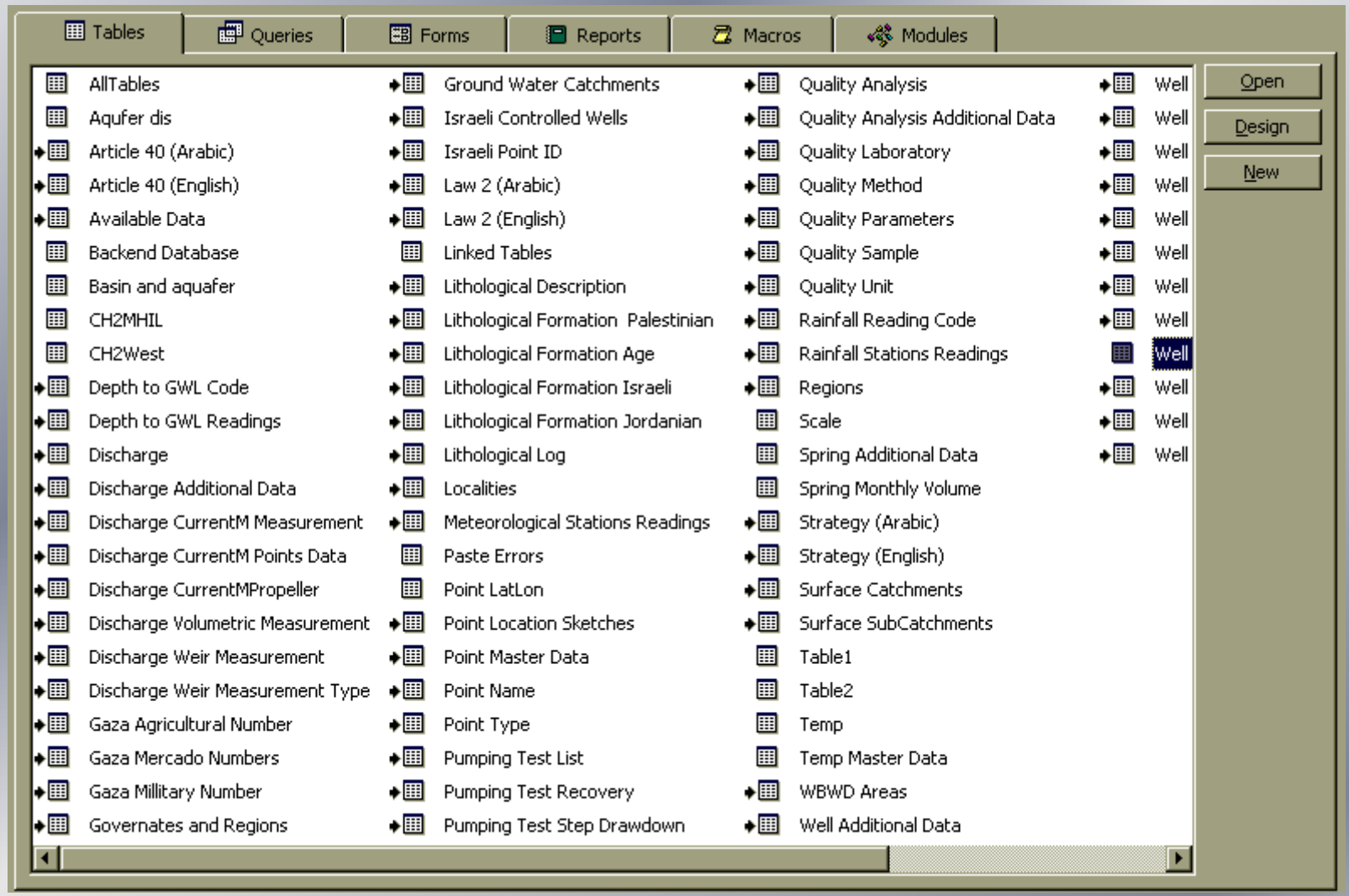
- Point related data
- Data: spatial and time series data
- Data Includes: WB and GS data
- Relational DBMS
- Outputs: graphs,reports, maps
- Data export to Excel
- Interface: Arabic and English
- Security: Different User levels
- Designed for GIS


Source
DATA
EQA
MOA
MOP
MD
Muni.
Loc Gov
PCBS
NGO's
Waste Water
Climate Data
Rainfall Data
Water Supply & consumption
Population
Projects
Communities
Miscellaneous:
Reports, prices, census

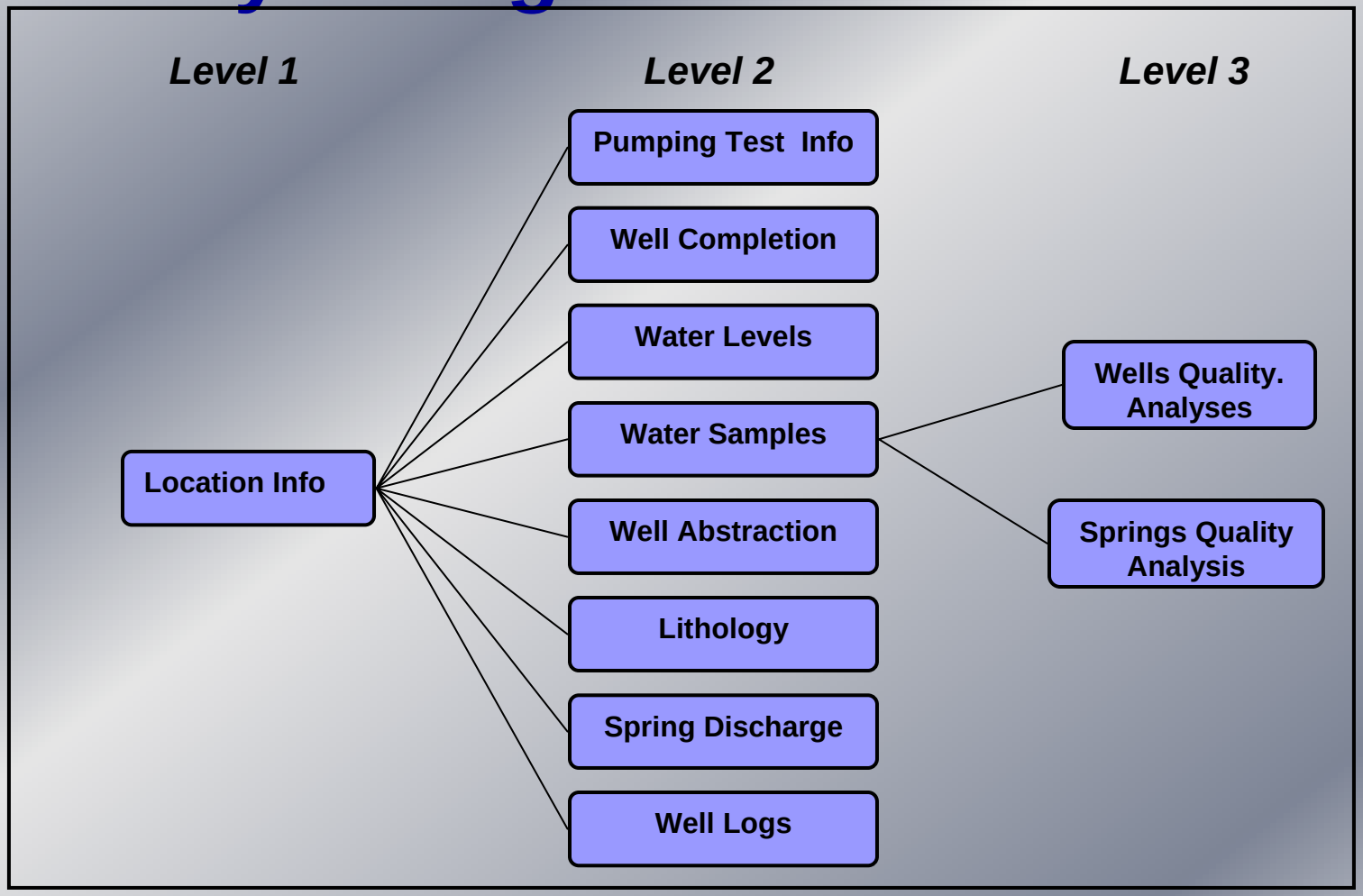
PWA Hydrogeology Database

- Well & Springs Master Data
- Water Level Data
- Water Quality Data
- Lithology Data
- Discharge
- Well Abstraction
- Pumping Test Data


Palestinian National Authority
Palestinian Water Authority
Central Water Information System
السلطة الوطنية الفلسطينية
سلطة المياه الفلسطينية
نظام معلومات المياه المركزي
Master Data بيانات رئيسة
Identification Data
بيانات معرفة
File No.
رقم الملف
18-18/013
Agriculture No.
رقم الزراعة
Mercado No.
رقم ميركادو
Millitary Ref.
الرقم العسكري
Israeli No.
الرقم الإسرائيلي
18218701
Point Type
نوع النقطة
Well
بئر
Name/Owner
'ABDALLAH 'ABED AL HADI
عبد الله عبد الهادي
الاسم / المالك
Catchments
الأحواض
SW Sub-Catch.
حوض السطحي الفرعي
SW Catchment
حوض السطحي الرئيس
GW Catchment
الحوض الجوفي
Location
الموقع
Locality
WADI AL FAR'AH
وادي الفارعة
المحلة
District
NABLUS
نابلس
المحافظة
Region
WEST BANK
الضفة الغربية
الإقليم
Data Availability
توافر البيانات
Groundwater Levels
مستوى المياه الجوفية
Well Abstractions
ضخ البئر
Discharges
التصريف
Compl. Meteo Data
بيانات الرصد الجوي
Rainfall Data
بيانات الأمطار
Water Quality Data
بيانات نوعية المياه
Lithological Log
السجل الليثولوجي
Well License Data
بيانات رخصة البئر
Location Sketch
خارطة الموقع
Pumping Test
تجربة الضخ
Construction Well
بنية البئر
Coordinates
الإحداثيات
X
س
187,290
Y
ص
182,440
Z
ع
-36.092
Total No. of Points 935
عدد النقاط الكلي
Date and Time 02-04-2000 10:47
الوقت والتاريخ
User BASEMA BASHIR
المستعمل


Tables
Queries
Forms
Reports
Macros
Modules
Open
Design
New
AllTables
Aqufer dis
Article 40 (Arabic)
Article 40 (English)
Available Data
Backend Database
Basin and aquafer
CH2MHIL
CH2West
Depth to GWL Code
Depth to GWL Readings
Discharge
Discharge Additional Data
Discharge CurrentM Measurement
Discharge CurrentM Points Data
Discharge CurrentMPropeller
Discharge Volumetric Measurement
Discharge Weir Measurement
Discharge Weir Measurement Type
Gaza Agricultural Number
Gaza Mercado Numbers
Gaza Millitary Number
Governates and Regions
Ground Water Catchments
Israeli Controlled Wells
Israeli Point ID
Law 2 (Arabic)
Law 2 (English)
Linked Tables
Lithological Description
Lithological Formation Palestinian
Lithological Formation Age
Lithological Formation Israeli
Lithological Formation Jordanian
Lithological Log
Localities
Meteorological Stations Readings
Paste Errors
Point LatLon
Point Location Sketches
Point Master Data
Point Name
Point Type
Pumping Test List
Pumping Test Recovery
Pumping Test Step Drawdown
Quality Analysis
Quality Analysis Additional Data
Quality Laboratory
Quality Method
Quality Parameters
Quality Sample
Quality Unit
Rainfall Reading Code
Rainfall Stations Readings
Regions
Scale
Spring Additional Data
Spring Monthly Volume
Strategy (Arabic)
Strategy (English)
Surface Catchments
Surface SubCatchments
Table1
Table2
Temp
Temp Master Data
WBWD Areas
Well Additional Data
Well
Well
Well
Well
Well
Well
Well
Well
Well
Well
Well
Well

Conceptualization of the Hydrological Databases



PWA Rainfall Database

- Raingauges Master Data
- Daily Rainfall
- Rainfall Intensity
- Climatological Data (Evaporation, Temperature, Relative Humidity, Solar radiation…etc)

PWA Supply& consumption Database

- Purchased Water
- Local Produced Water
- Consumed Water
- Water Prices
- Water Losses
- Connected & Non Connected Communities

PWA Projects Database

- Projects Types (Water, Wastewater.. etc)
- Projects Status (implemented, ongoing..etc)
- Donors
- Costs
- Beneficiaries

Designed for GIS

- All of the data in the PWA databases is related to a location
- Having the location of each event as the ‘starting point’ for our data collection, make our databases GIS friendly

Geographic Information Systems

Why PWA needs GIS

To track and use information on water resources, facilities, operation, maintenance, management, planning, and to assist in policy and decision making.

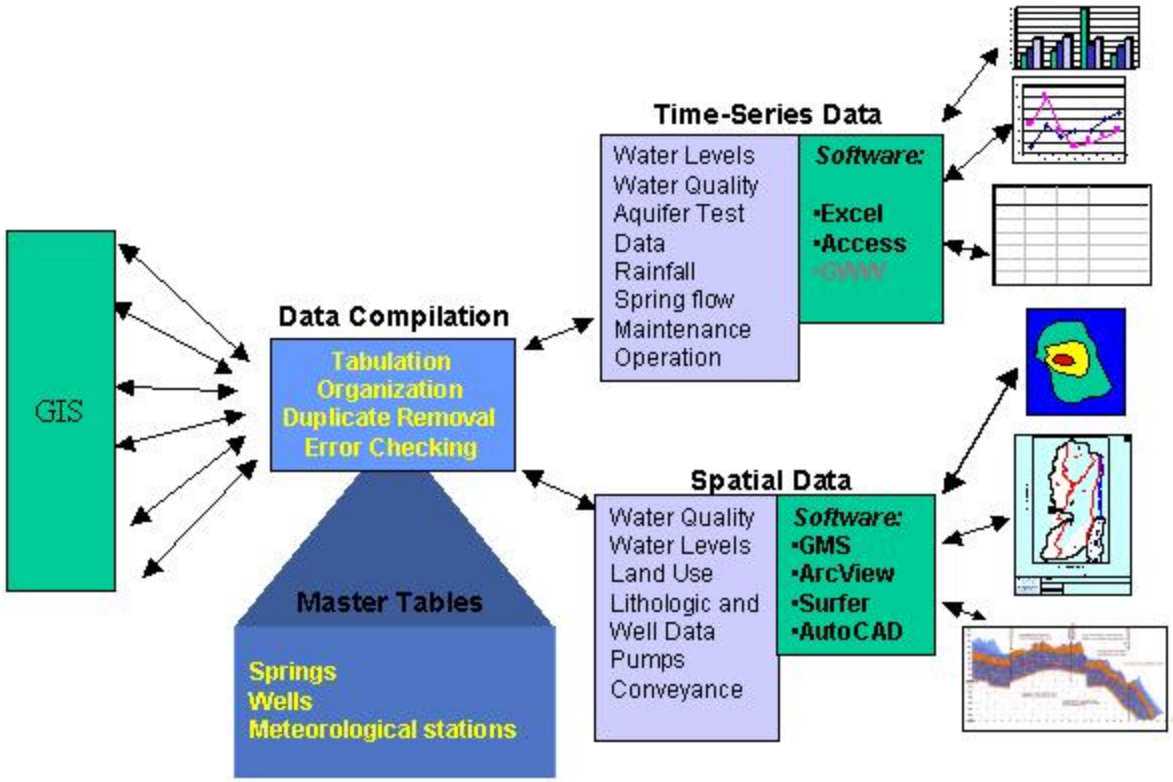
Examples:

- Water Resources Tasks (Models, Monitoring, Management plan, etc.)
- Engineering Tasks (Water and Wastewater Designed Facilities)
- Construction Tasks (Wells, Conveyance, Reservoirs, etc.)

GIS SOFTWARE in use at PWA

- ESRI products:
  - Initially started with ArcView 3.1
  - Currently use ArcView 3.3 and ArcGIS 9.1, (ArcMap, ArcCatalog & ArcToolbox)
- Extension:
  - Spatial Analyst - Adds grid functionality to GIS
  - 3D Analyst – Adds tin functionality and 3d visualization

Information Sources and Formats



Future Directions

Future Directions

- Data
  - Continue to QA/QC the data
  - Collect more relevant & accurate data
  - Disseminate more reports & publications
- Database
  - Convert to Oracle DBMS
  - More active and user friendly Database
  - Improve connectivity with GIS software

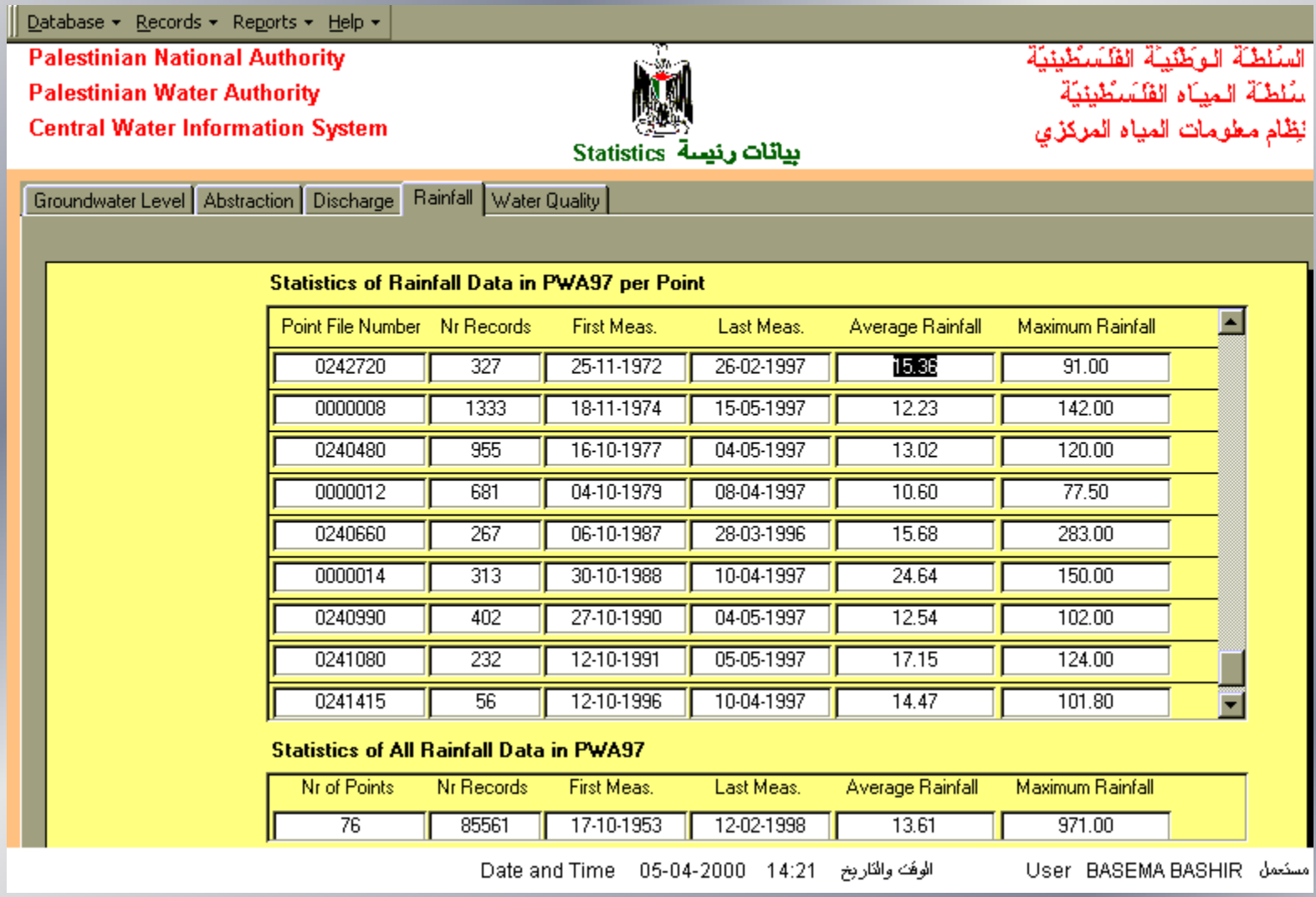
How Can PWA WIS serve EMWIS

Direct links to Databases

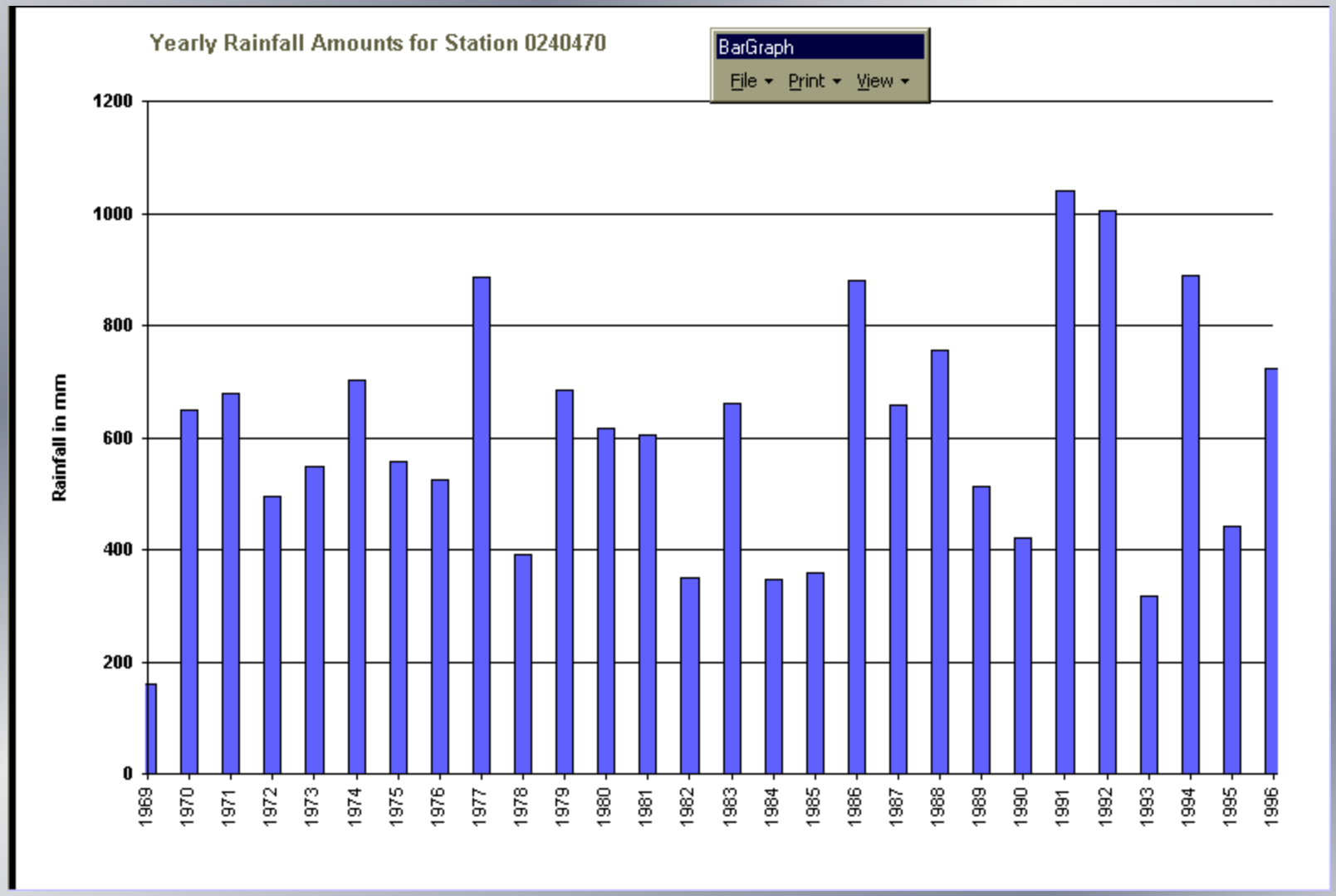
With defined access, Users can easily

- View Data either tables or graphs
- View maps
- Make Queries
- Print already Designed reports

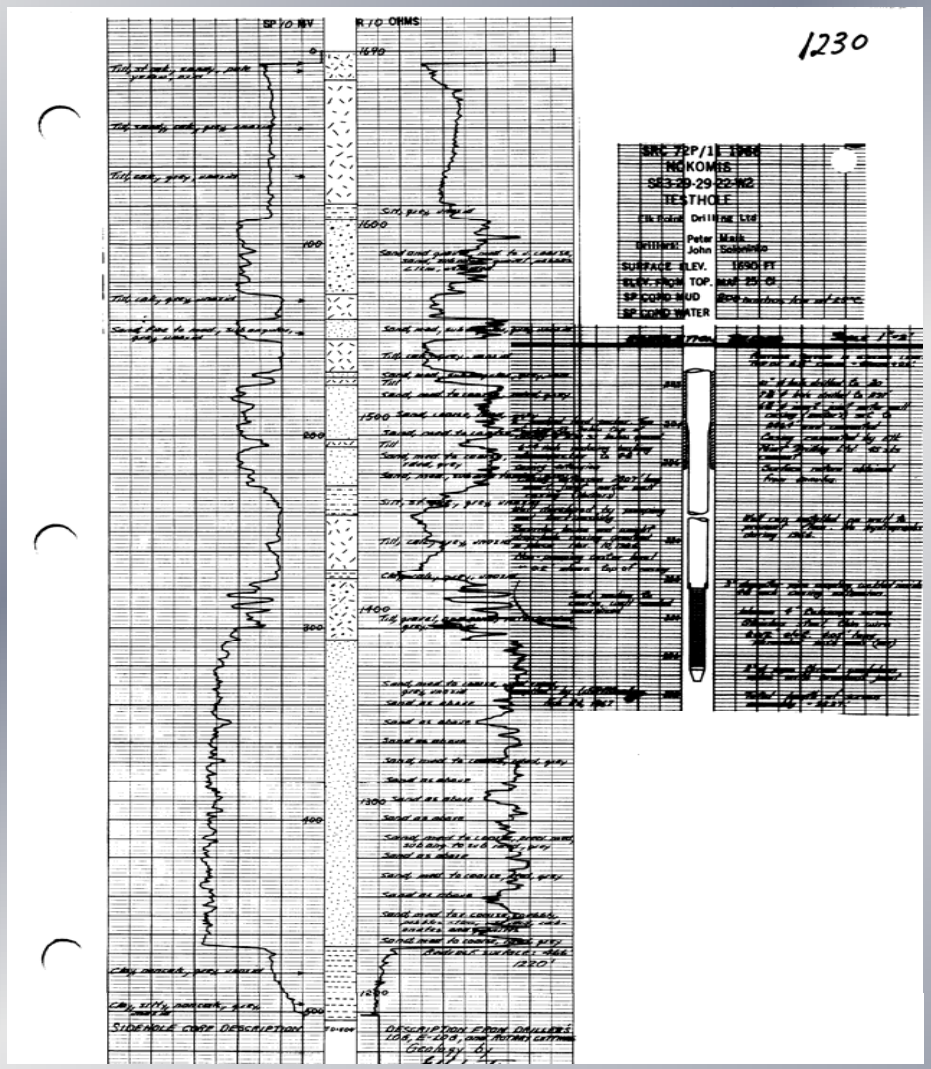
Viewing data table



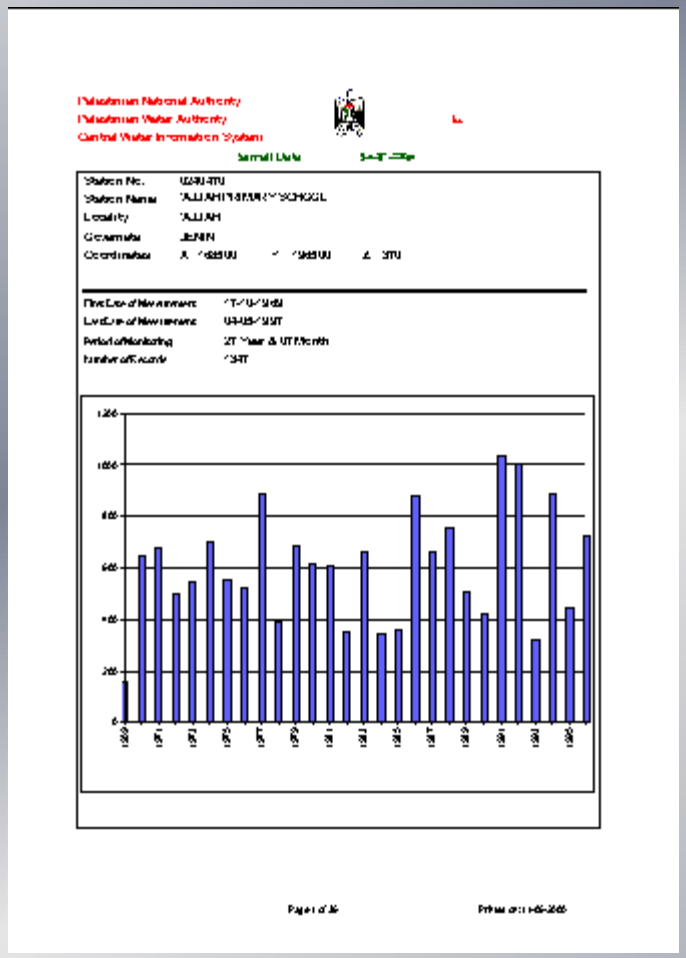
Viewing graphs



Viewing logs sketch



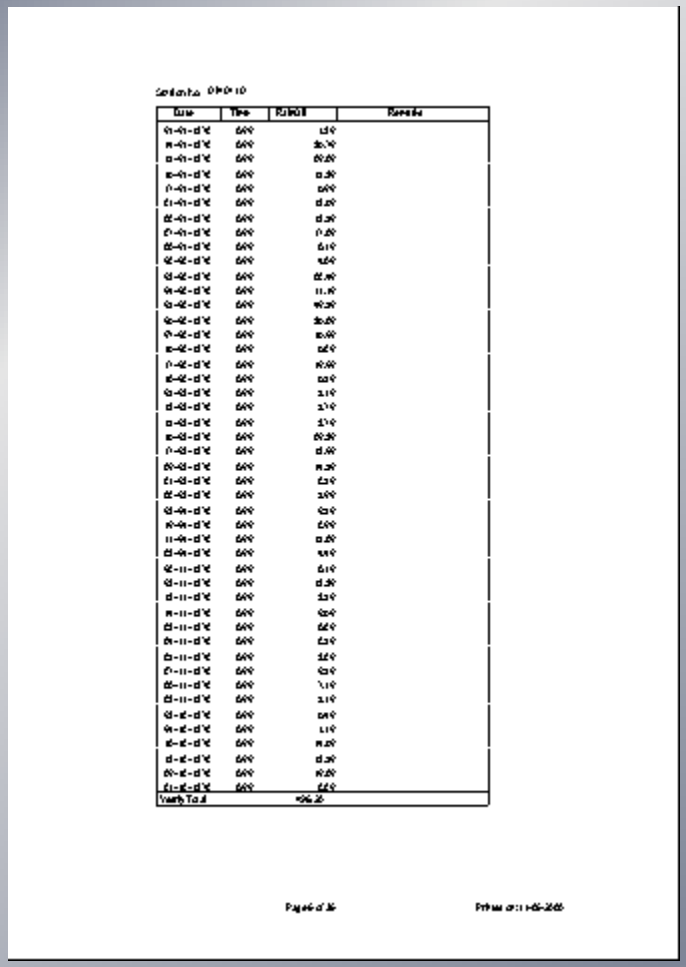
Printing Reports



Palestinian National Authority
Palestinian Water Authority
Central Water Information System

Station No.
Station Name
Locality
Governorate
Coordinates

First Date of Measurement
Last Date of Measurement
Period of Monitoring
Number of Records



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04-03-9[illegible]	0[illegible]	0[illegible]	
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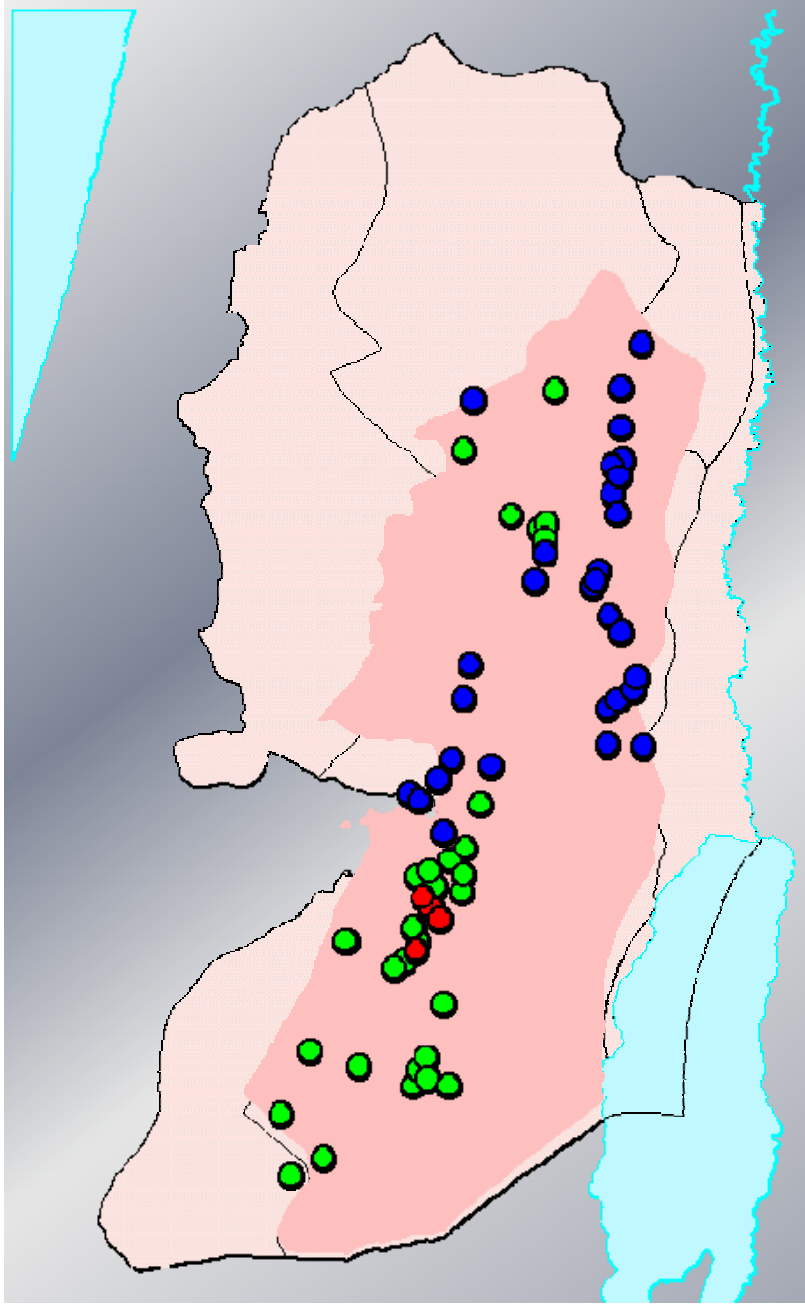
Yearly Total		[illegible]	

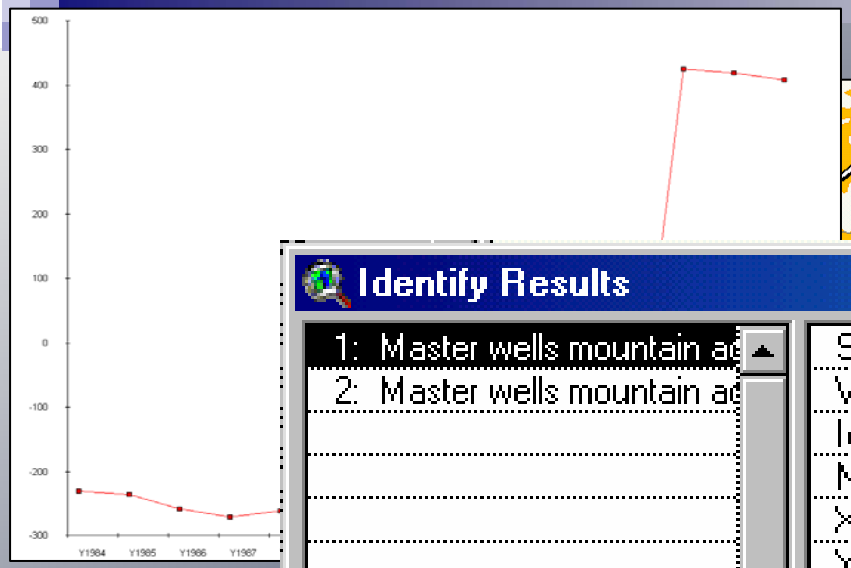


Viewing Maps

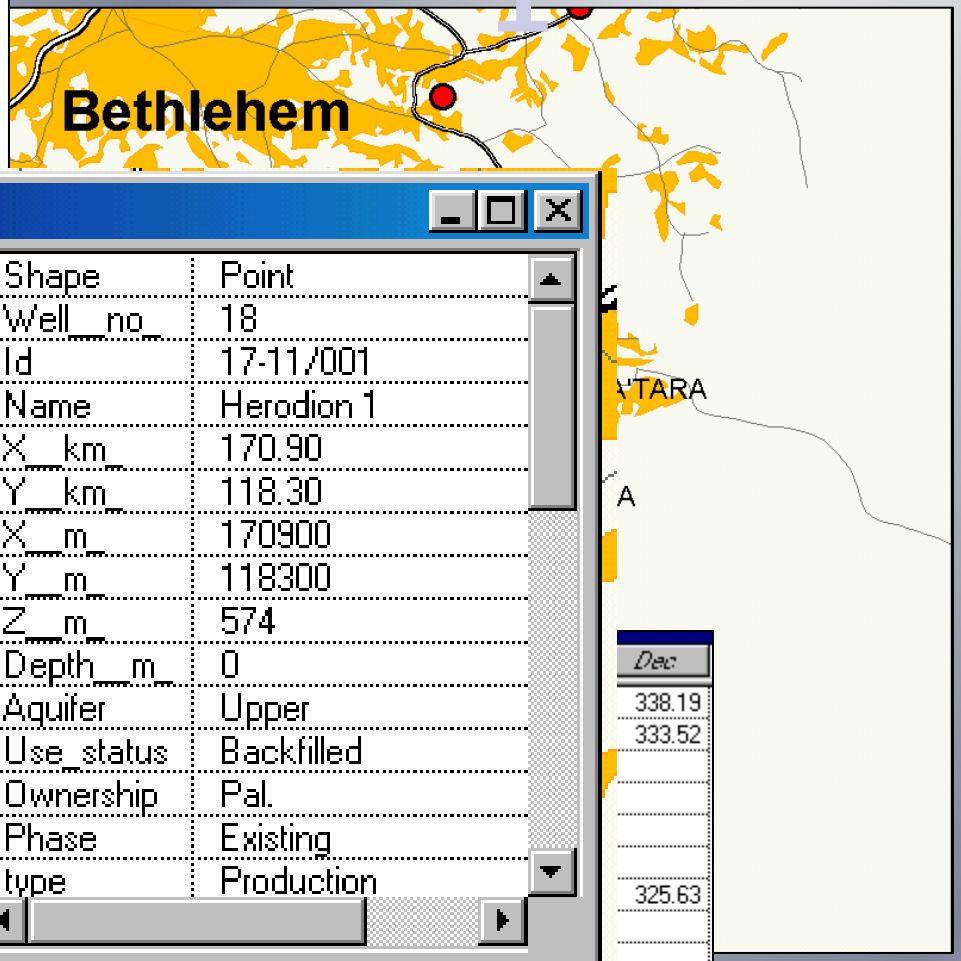
Wells in Eastern Basin categorized according to ownership:

- Palestinian Ownership
- Israeli Ownership
- Mixed Ownership (Pal. + Israeli)

- Annual Water Elevation 1984-2000



Herodian 1



Identify Results

1: Master wells mountain ac
2: Master wells mountain ac

Shape	Point
Well_no_	18
Id	17-11/001
Name	Herodion 1
X_km_	170.90
Y_km_	118.30
X_m_	170900
Y_m_	118300
Z_m_	574
Depth_m_	0
Aquifer	Upper
Use_status	Backfilled
Ownership	Pal.
Phase	Existing
type	Production

Clear | Clear All

Monthly Wat

Year	Jan											Dec
1972												338.19
1973												333.52
1974		33										
1975		32										
1976												
1978												
1983												325.63
1984												
1985	322.91											
1986		322.79										
1987				312.74							309.94	
1988	309.38					309.29						
1989			310.52							307.28		309.52
1990				313.42								
1991			302.96			300.90	303.53					301.67
1992		311.30										
1997	301.39											

Providing published reports& Maps

- Summary of Palestinian Hydrologic Data
- Series of Water Supply in West Bank
- Water Resources in West Bank
- Wells and Springs Field Book
- Wells inventory
- Several Published Maps

Palestinian National Authority
Palestinian Water Authority

Summary of Palestinian Hydrologic Data

Western Basin

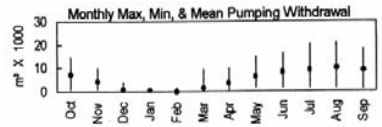
Well-ID: 14-17/036 Water Use: Agricultural

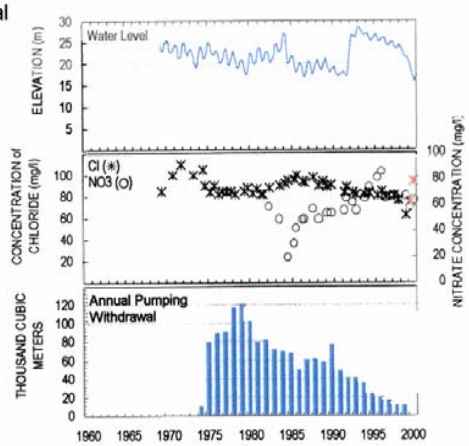
Aquifer: Upper Cenomanian Number: 17714701
Owner: MUSTAFA NAZZAL
Governate: Qalqilia Locality: QALQILYA

East (m): 147,360 North (m): 177,680
Latitude: 34°58' Longitude: 32°12'

Measuring Point Elevation (m): 76.
Well depth (m): 119.
Ground Elev. (m): 76.

Periods of Record
Water Levels: 1969 to 2000
Abstractions: 1974 to 1999
Water Quality: 1968 to 1999





	WATER ELEVATION		WATER-QUALITY SAMPLE CONCENTRATIONS (mg/l)								ANNUAL WITHDRAWALS	
	meters	Date	Cl	NO^3	Na	Ca	Mg	K	HCO^3	SO4	m^3	Date
Maximum	28.32	03/1993	110	85	40	44	42	3	287	22	119,605	1979
Mean	22.03		88	58	40	43	38	3	282	22	58,563	
Minimum	15.78	11/1999	63	19	40	41	33	2	277	22	9,255	1974
No. of Samples			46	26	2	2	2	2	2	1		

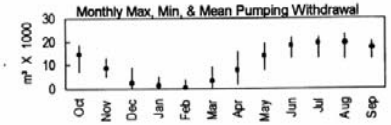
Well-ID: 14-17/037 Water Use: Agricultural

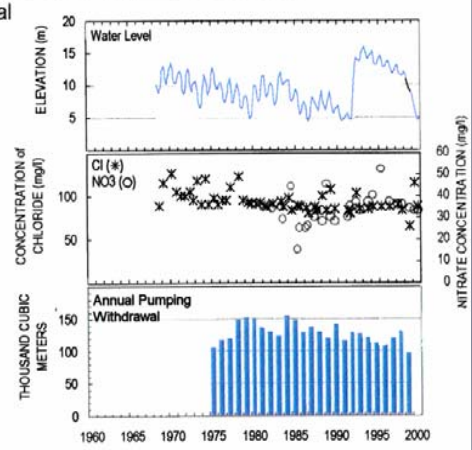
Aquifer: Upper Cenomanian Number: 17614901
Owner: 'ABED AL RAHEEM HASAN
Governate: Qalqilia Locality: QALQILYA

East (m): 149,650 North (m): 176,900
Latitude: 34°60' Longitude: 32°11'

Measuring Point Elevation (m): 110.
Well depth (m): 185.
Ground Elev. (m): 110.

Periods of Record
Water Levels: 1968 to 2000
Abstractions: 1975 to 1999
Water Quality: 1968 to 1999





	WATER ELEVATION		WATER-QUALITY SAMPLE CONCENTRATIONS (mg/l)								ANNUAL WITHDRAWALS	
	meters	Date	Cl	NO^3	Na	Ca	Mg	K	HCO^3	SO4	m^3	Date
Maximum	15.86	05/1993	126	52	39	46	67	2	335	30	153,364	1984
Mean	9.68		94	33	38	45	61	2	327	30	126,538	
Minimum	4.42	09/1986	65	15	36	44	54	1	319	30	95,308	1999
No. of Samples			53	27	2	2	2	2	2	1		

Wells and Springs Field Book

Palestinian National Authority
Palestinian Water Authority
Water Resources & Planning Department
Information Services & Technology Division

السلطة الوطنية الفلسطينية
سلطة المياه الفلسطينية
دائرة مصادر المياه والتخطيط
قسم خدمات وتكنولوجيا المعلومات

Field Book دفتر حقل

بيانات تعريفية

رقم الملف : 18-13/001   الرقم التسلسلي : 13418801   الاستعمال : ميكروت

إسم البئر : مزبة أريحا رقم 2   الموقع / المحافظة : واد القلط / أريحا   العمق (م) :

الضخ السنوي المرخص (م³) : غير محدد   تاريخ الحفر :

X : 188,220   خط الطول :   مستوى الارض (م): 13-

Y : 134,300   خط العرض :   ارتفاع نقطة القياس (م):

احداثيات النقطة

التاريخ	قراءات GPS		
	خط الطول	خط العرض	منسوب الارض
/ / 1999			
/ / 1999			
/ / 1999			

بيانات المضخة/المحرك

	نوع	القدرة	تاريخ التركيب	سنة الانتاج
محرك				
مضخة				

بيانات العداد

رقم العداد	تاريخ الزيارة	القراءة	الضخ (م³/س)
1284710	1/28/99	4,009,600	

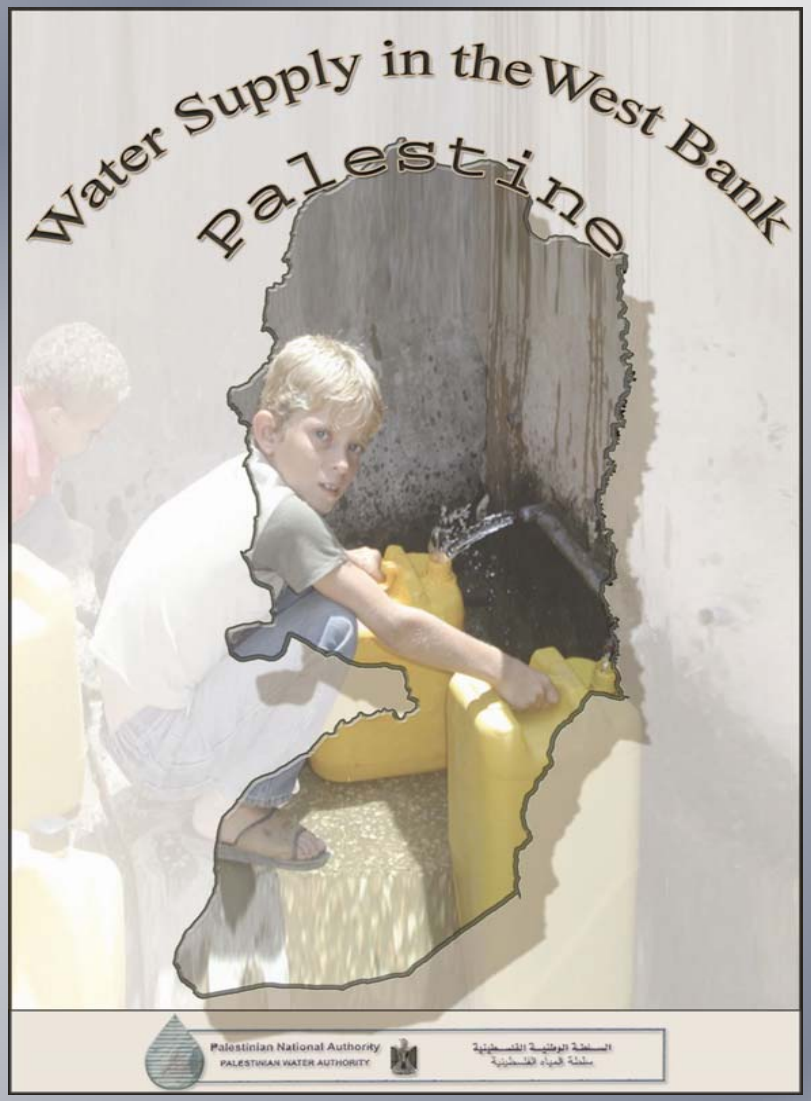
البيانات المتوفرة

☐ المسح الجيولوجي   ☐ مخطط موقع   ☐ سجلات جيوفيزيائية   ☐ تفاصيل الانشاء

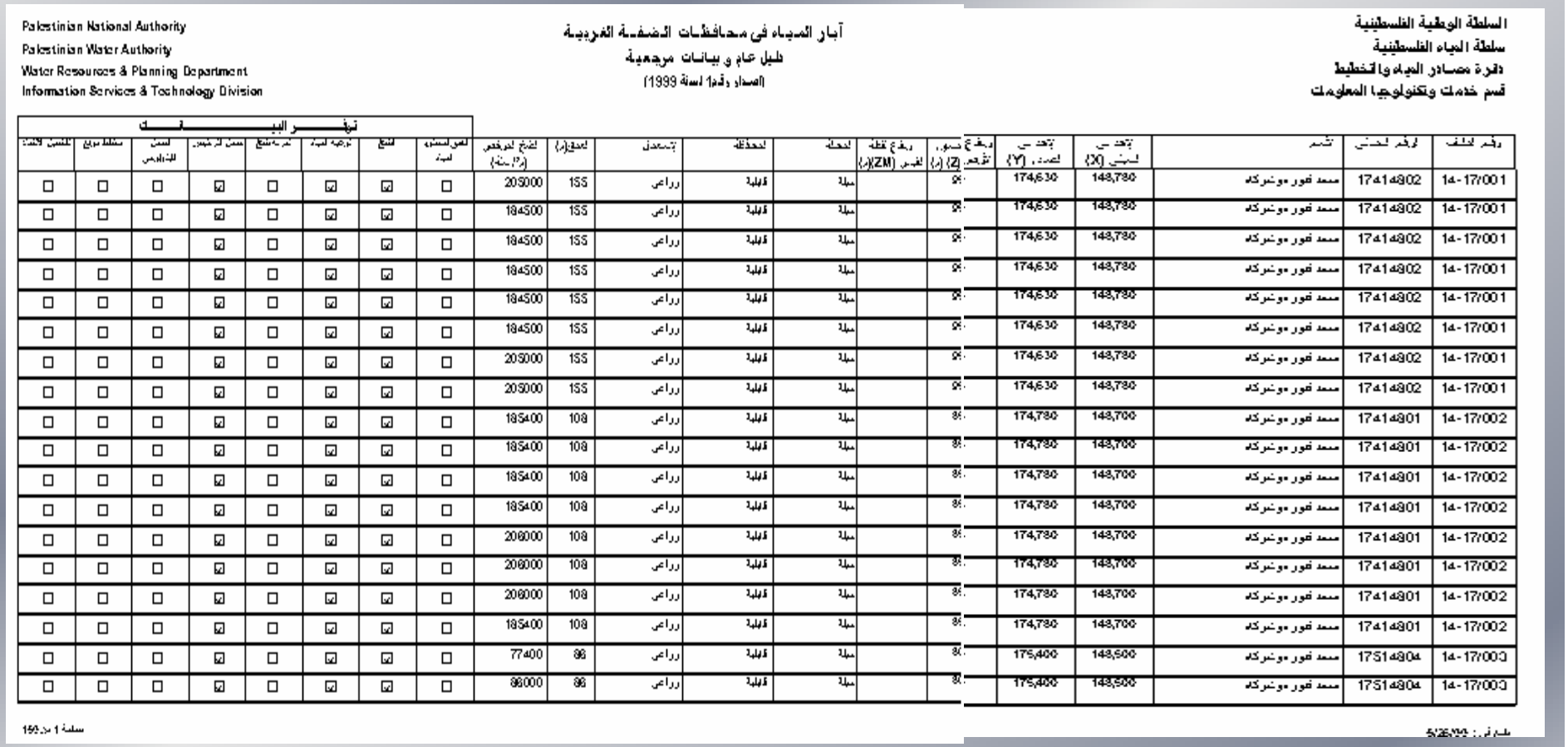
☑ سجل الترخيص   ☐ تجربة ضخ   ☐ تحليل حجم الحبيبات

القراءات المتوفرة	[illegible]		[illegible]		[illegible]		[illegible]		عدد السجلات
	القراءة	التاريخ	القراءة	التاريخ	القراءة	التاريخ	القراءة	التاريخ	
العمق لمستوى المياه(م)	324.80	1/28/99	324.80	1/28/99	324.80	1/28/99	324.80	1/28/99	1
الضخ (م³/ سنة)									
Temp (°c)									0
EC(µmho/cm)									0
TDS (mg/l)									0
pH									0
Eh (mv)									0
DO (mg/l)									0
Ca (mg/l)									0
Mg (mg/l)									0

Published Reports



Well Inventory



Palestinian National Authority
Palestinian Water Authority
Water Resources & Planning Department
Information Services & Technology Division

آبار المياه في محافظات الضفة الغربية
دليل عام و بيانات مرجعية
(اصدار رقم 1 لسنة 1999)

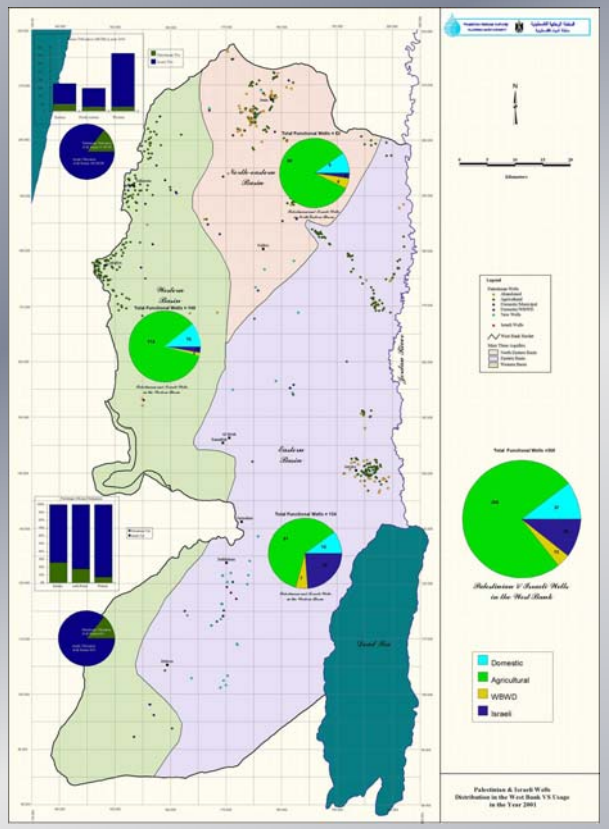
السلطة الوطنية الفلسطينية
سلطة المياه الفلسطينية
دائرة مصادر المياه والتخطيط
قسم خدمات وتكنولوجيا المعلومات

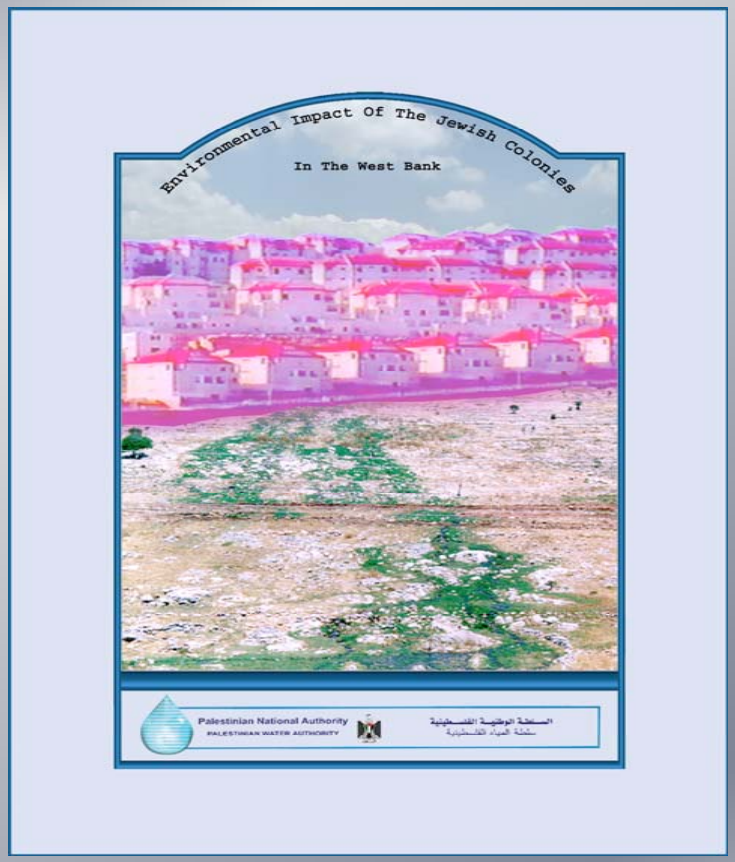
													توفر البيانات							
رقم الملف	الرقم المحلي	الاسم	الإحداثي [illegible] (X)	الإحداثي [illegible] (Y)	ارتفاع [illegible]	[illegible] (Z) (م)	ارتفاع نقطة القياس (ZM)(م)	المحلة	المحافظة	الاستعمال	العمق(م)	الضخ المرخص (م³/سنة)	[illegible]	الضخ	نوعية المياه	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	205000	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	184500	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	184500	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	184500	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	184500	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	184500	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	205000	☐	☑	☑	☐	☑	☐	☐	☐
14-17/001	17414802	محمد فوز وشركاه	148,780	174,630		9[illegible]		حبلة	قلقيلية	زراعي	155	205000	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	185400	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	185400	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	185400	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	185400	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	206000	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	206000	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	206000	☐	☑	☑	☐	☑	☐	☐	☐
14-17/002	17414801	محمد فوز وشركاه	148,700	174,780		8[illegible]		حبلة	قلقيلية	زراعي	108	185400	☐	☑	☑	☐	☑	☐	☐	☐
14-17/003	17514804	محمد فوز وشركاه	148,500	175,400		8[illegible]		حبلة	قلقيلية	زراعي	86	77400	☐	☑	☑	☐	☑	☐	☐	☐
14-17/003	17514804	محمد فوز وشركاه	148,500	175,400		8[illegible]		حبلة	قلقيلية	زراعي	86	86000	☐	☑	☑	☐	☑	☐	☐	☐

صفحة 1 من 150

طبع في : 5/26/99

Published Maps





Thank you …