SECTION 4

ENVIRONMENTAL BASELINE DATA

Section Summary

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4.1 Site location

LAB site is located in South-West part of Syria, about 25 km south of Damascus (**Fig.4.1**), not very far from political borders with *Lebanon* (about 50 km North-West), *Israel* (about 70 km West), *Jordan* (about 80-90 km South). It has a coastline of about 183 km in length.

An important highway crosses Damascus Countryside along direction North-South (Fig.4.1), connecting Damascus to *Daraa* (near South border with Jordan) and to *Homs* and *Epiphania* (important cities in central-western Syria) up to *Aleppo* (near northern border with Turkey). Another highway route connects Homs with *Latakia*, principal commercial port in Syrian coast.

From the morphological point of view, LAB site is located in a plain upland area, about 700m above sea level, situated between two main mountain groups (see **Fig.4.2** and Map in **Annex IV.1**):

- *Jabal Maani*, in North East (maximum elevation about 1077m above sea level)
- *Tell Salalem* and *Jabal Aba*, in South West (elevation 800-890m above sea level).

Height values above sea level in the LAB site plain are slightly decreasing form North to South (see Ouady Majdye valley near LAB site in Fig.4.2). LAB site is located to a minimum distance of about 3 km from Jabal Maani slope side and of about 1.5 km from Tell Salalem and Jabal Aba slope side.

Hydrographically, the area is located inside Barada basin. Barada is the river flowing in Damascus city. No river with regular flow are present near the site.

From the administrative point of view, LAB site is located in the Province of "Damascus Countryside", in the territory pertaining to the Municipality of Deir Ali village, which is also the principal center near the site (see **Fig.4.3** and Maps in **Annex IV.2**). In Deir Ali village 1800 inhabitants are living.

Fig. 4.1: Site location in South-West Syria

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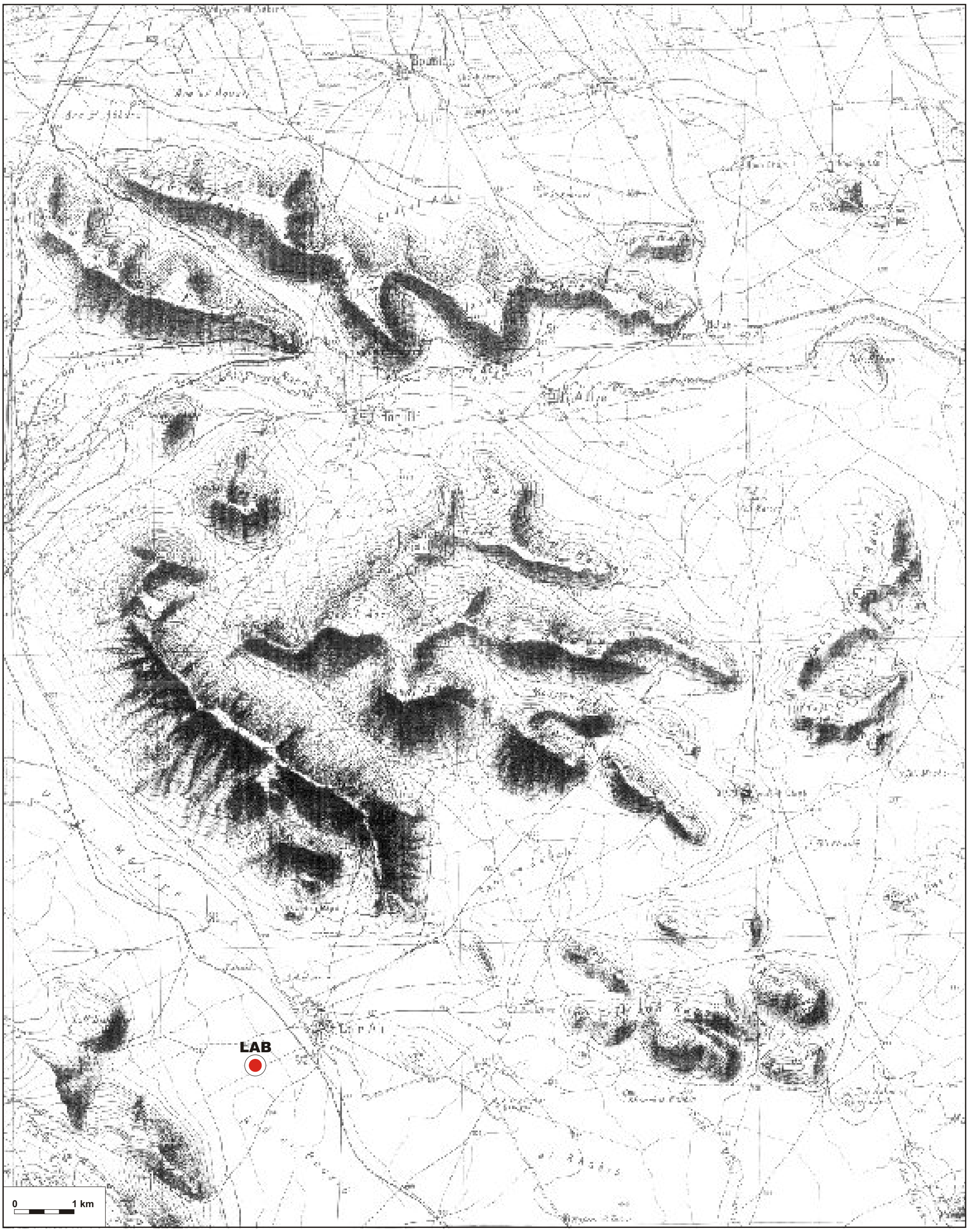

Fig. 4.2: Morphology

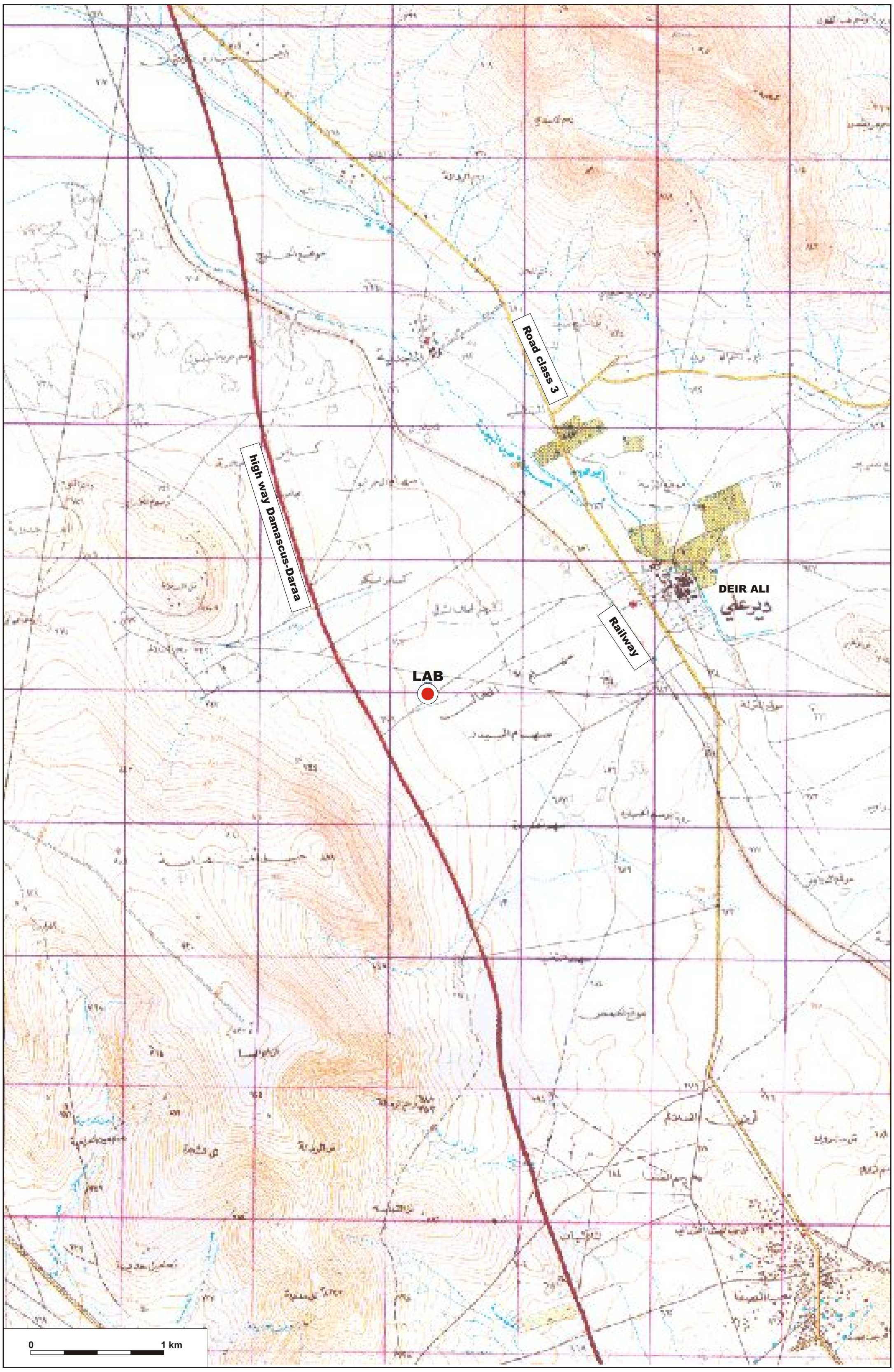

Fig. 4.3: Site location in the area of study

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4.2 Overview on environment in Syria

Much of Syria's biophysical base is rapidly deteriorating, and in some cases disappearing, as a result of increasing user demands and resource mismanagement. Industrial, agricultural and domestic demands provide a major challenge to increasingly scarce and degraded natural resources. Water and air pollution, loss of biodiversity, inadequate waste treatment facilities, and degradation of the land and its biota are dramatic. Inappropriate agricultural practices, particularly on marginal sites, contribute to desertification and, particularly in the Euphrates irrigation schemes, soil salinization [1*].

In the following, a general overview on the environment status in Syria and its main "hot spots" is given, with information and data from the same source [1*] and more recent sources, when available.

4.2.1 Air

4.2.1.1 Previous monitoring results

In 1984, the monitoring of air quality was transferred from the Meteorology Department of the Ministry of Defence to the Scientific Studies Research Centre (SSRC).

Up to 1986 [1], it was stated that the main sources of air pollution were factories, traffic and domestic heating stoves. Air pollution studies have been carried out at sites in Banias (Banias is on the coast near Lebanon border), Damascus and Homs (Homs is about 130 Km north of Damascus) with the results in following table.

Air Pollution Monitoring in some cities (1984).

Sample site	***SO_2 (ppm)***	***H_2S (ppm)***	***NO_x (ppm)***	***CO (ppm)***	***HC (ppm)***
Banias	0,1-6,75	0-0,38	0-0,39	--	1,66-3,43
Damascus	0,01-0,09	0,01-0,04	0,06-0,25	0,57-10,56	--
Homs	0,2-6,6	3,8-0,41	0,4-9,6	0-9,6	0-23,66
Quality standard (WHO)	0,04	0,005	0,04	0,09	--

* [1] "State of the Enviroment Report", Syrian Arab Republic, UNEP, 1986, see **Annex II.1**

It seems that these sites had been chosen to monitor the effect of emissions from area of Damascus, the oil refineries at Homs and Banias and the fertilizer complex at Homs.

It is possible to calculate the amount of sulphur dioxide released to atmosphere, based on the annual output of the two refineries (data up to 1986):

Banias - 6 million tonnes at 3.5% sulphur produces 420,000 tonnes as $S0_2$

Homs - 5 million tonnes at 4.5% sulphur produces 441,000 tonnes as $S0_2$.

At the fertilizer factory, 130,000 tonnes of sulphur is imported and if it is assumed 5% of this quantity is lost to atmosphere, then a further 13,000 tonnes will be released as sulphur dioxide.

4.2.1.2 Recent monitoring results

In October 2000 Ministry of Environment issued a report describing recent monitoring activities, in various Syrian cities, among which Damascus city, and their results [2*].

Results are synthetically described in **Fig.4.4**, as percentage of limit values exceedance.

With particular reference to Damascus, the topographical nature of the basin where the city lies, enhances the problems of air pollution particularly over the city, by trapping emissions within the stability of the valley from about 300 to 1,500 meters. The increased traffic flow is resulting in high levels of particulate matter and lead concentrations.

Air pollution monitoring is undertaken in the city by stationary monitoring equipment located throughout the city. The following tables indicate the number of days per year in which pollutant levels have exceeded those prescribed as standard health guidelines by WHO. Samples are recorded for industrial areas and residential areas in general, and for specific monitoring sites in the city.

* [2] "Sanitary map in Syria", Syrian Arab Republic, Ministry of Environment, Damascus, October 2000, see **Annex IV.3**

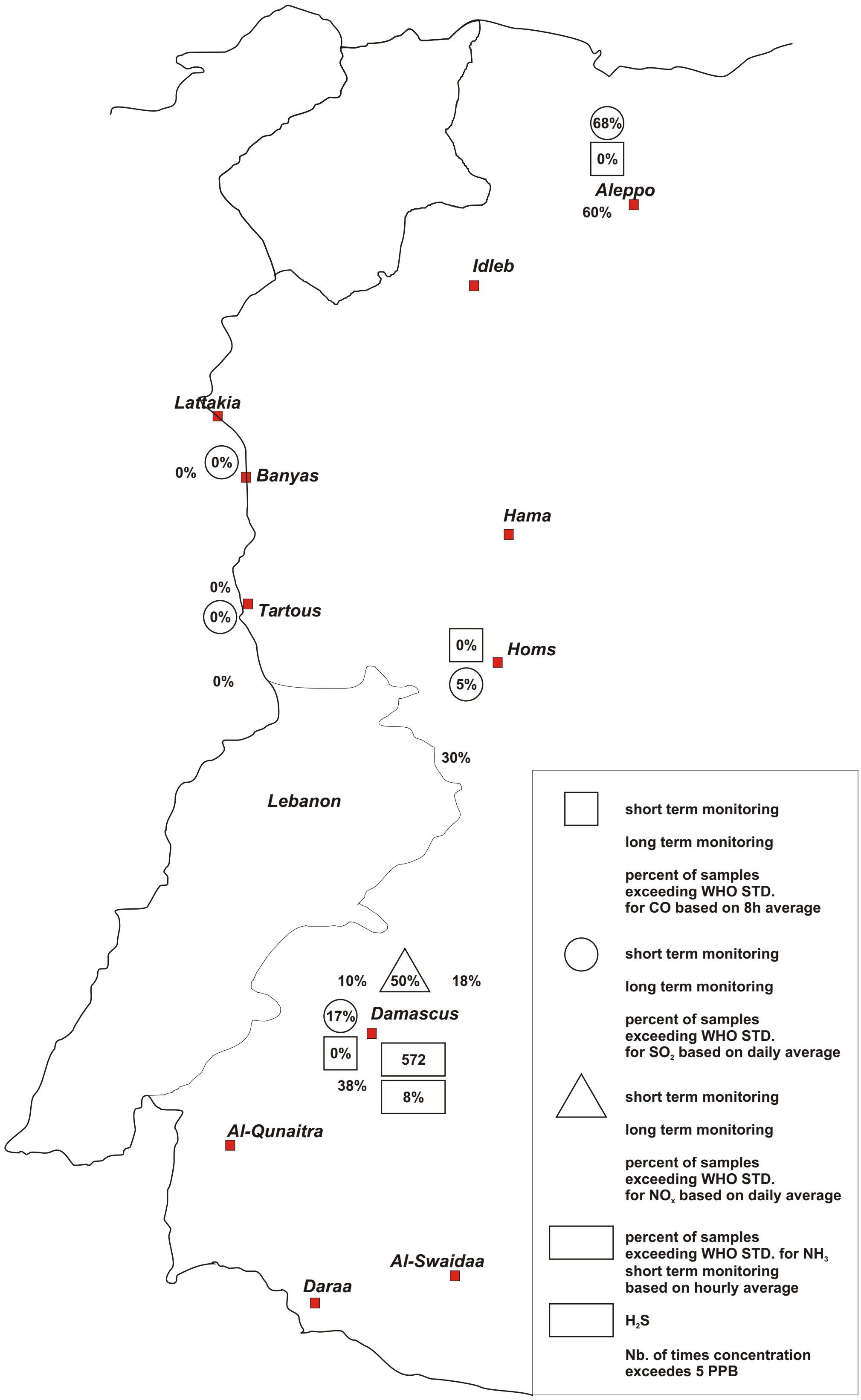

Fig. 4.4: Air monitoring results

Air Pollution Monitoring in Damascus City (2000).

Site N°	Site Name	Type of pollutant	Exceedance of WHO guidelines hourly average *	Exceedance of WHO guidelines daily average *
1	Kasar Adli	$S0_2$	0	0
		NOx	14	9
2	Mouhafazat square	$S0_2$	3	2
		NOx	70	11
		CO	0	1
3	Kaboon Park	S02	38	14
		NOx	184	21
		CO	2	6
4	Tejara square	S02	0	4
		NOx	11	3
5	Zahira	S02	1	0
		NOx	5	4
6	Zokak jin	S02	0	0
		NOx	10	8
7	Mazah	S02	0	0
		NOx	3	2

*: number of days per year in which pollutant levels exceeded WHO standards.

AIR POLLUTION RESULTING FROM INDUSTRIAL ACTIVITIES

There are 170 different factories and 250 tanneries in the Barada basin. Monitoring of air quality showed the following:

- in Zeqaq Al-Gen where many small scale industries of metal and car repairing are located showed above permissible limits of lead, cadmium, zinc, and nickel;

- in Areas around Adra cement factory and the power station, concentrations of TSP downwind of Adra cement factory reach values that are orders of magnitude greater than permissible limits;
- in the vicinity of the public rubber and plastic industries, concentration of benzene exceed WHO limits.

POOR URBAN ENVIRONMENT

Poor urban environment can be due mainly to the following reasons:

- a large number of small scale industries concentrated in residential areas including old Damascus, resulting in air pollution;
- traffic jams especially at peak times;
- growth of illegal settlements and lack of services and basic infrastructure in these areas.

4.2.2 Water

4.2.2.1 Surface water

Syria is rich in surface waters. The main rivers, the Euphrates, Khabour, Barada, Al Assi, As-Sin, Al K'ebir, are used for irrigation and water supply [1]. The policy adopted in Syria is to develop the water resources in the whole country in order to increase the irrigated areas and to improve the water supply of the rural areas. Different parts of the country have a good reserve of underground water, but some aquifers are relatively saline in the steppe area .

In the southwest of Syria, the Barada, the Aawaj and the Yairmouk rivers drain the eastern parts of the Anti-Lebanon Mountains, the Jabal as Shaykh and the Hauran volcanic plateau. The most important of these is the Barada, which is responsible for Syria's largest oasis, the Al Ghutah, in the site of Damascus. Rivers in the northwest region of Syria included the Qoueik, the Afrin, and the Sajour Rivers. The Syrian steppe, which covers some 60% of the country, is characterized by closed desert basins. (Khouri and Rasouli Agha 1977).

The LAB site is inside the Barada basin, that is located in the south west area of Syria (see **Fig.4.5** and **Fig.4.6**), bordered by Orantes basin to the north, by Al-Badia to the

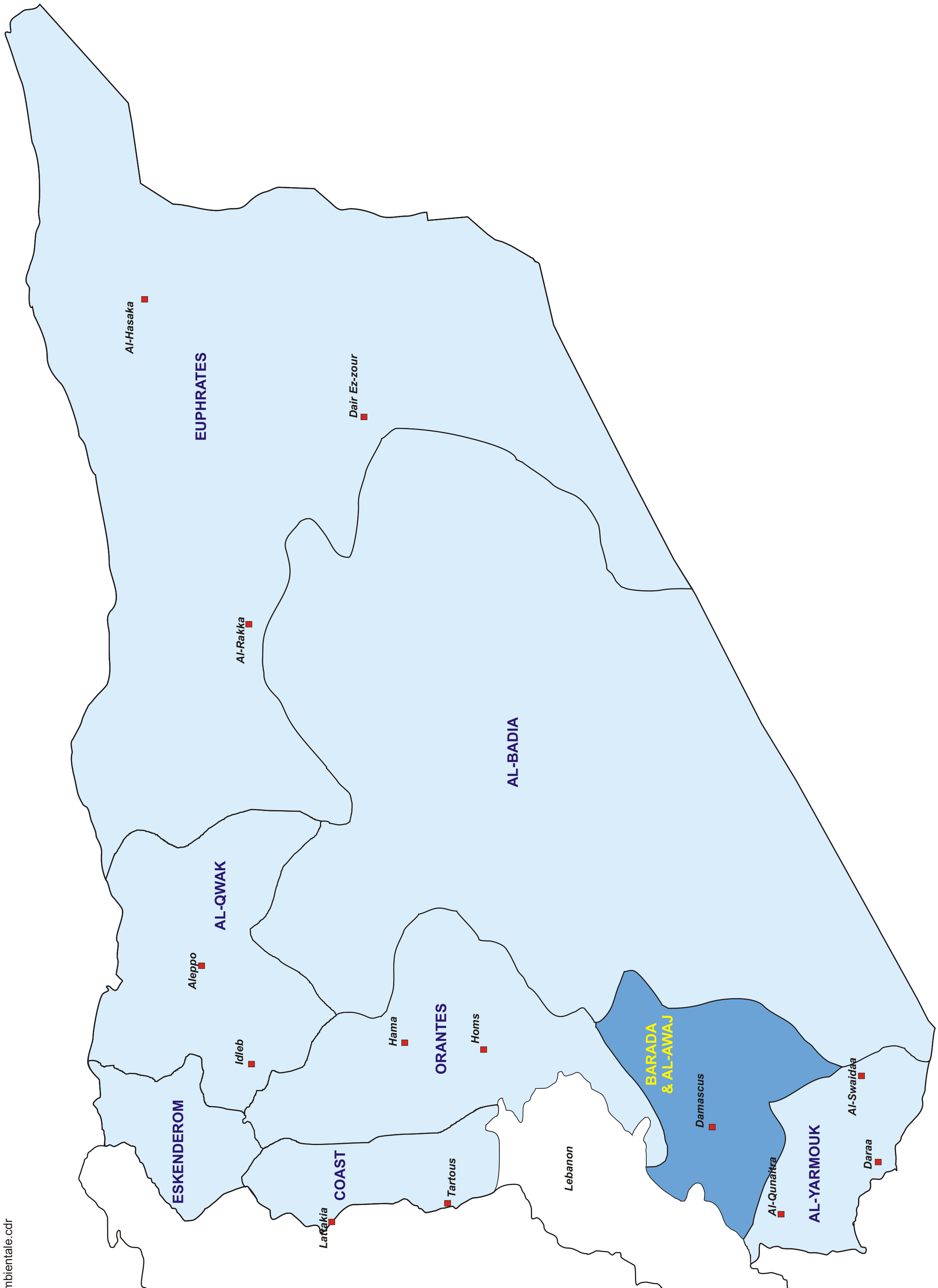

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Fig. 4.5: Hydrological basins contours (Barada basin is evidenced)

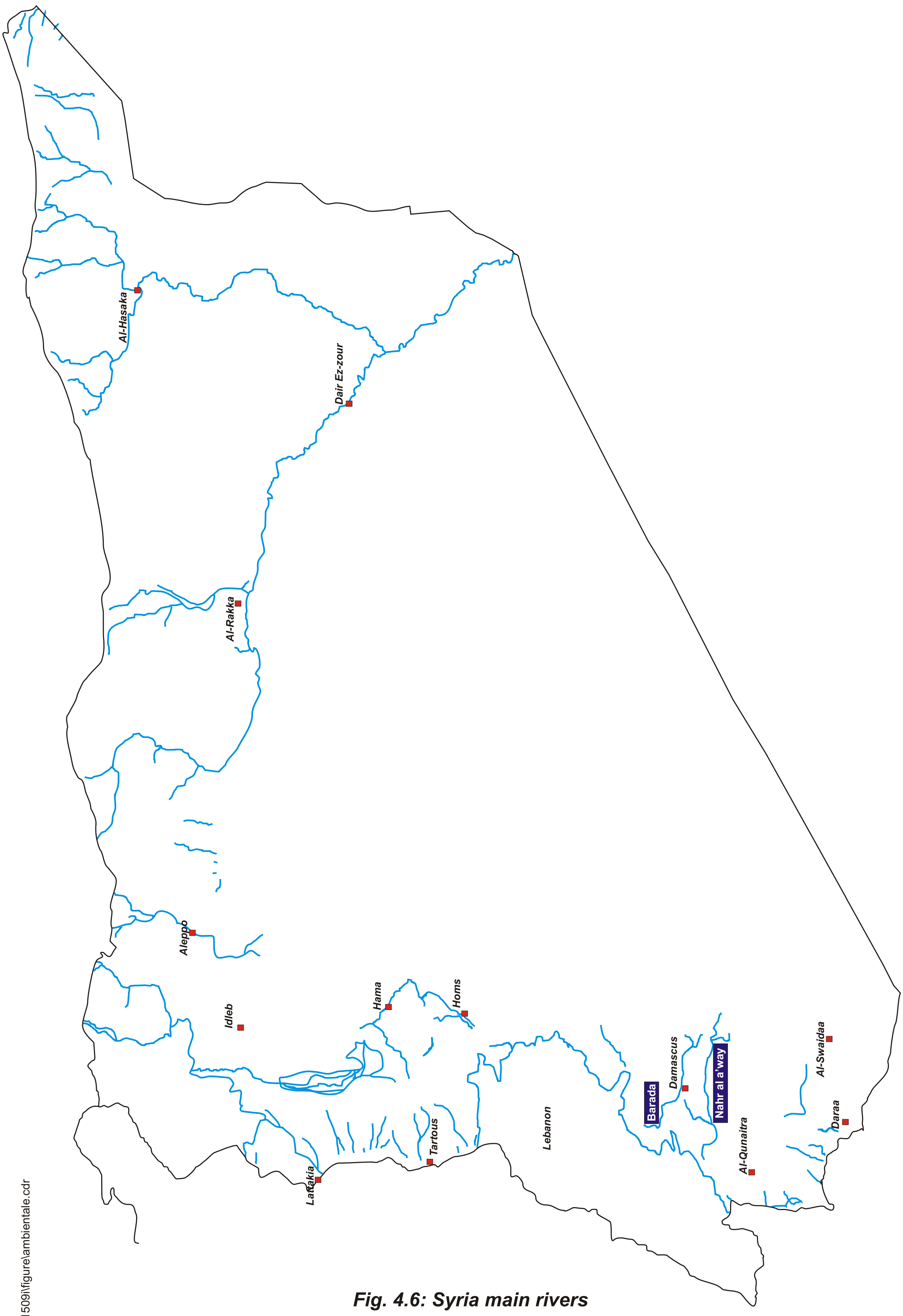

Fig. 4.6: Syria main rivers

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east, by Yarmouk basin to the south, and by the Lebanese boundaries and the occupied territories to the west. The basin occupies an area of 8.630km^2 distributed between Damascus city, its surrounding rural areas, and Sweida and Daraa governorates.

The total annual average rain fall ranges between 1,800mm in altitudes of 2,000m and over, and 90mm in the lower areas. Prevailing winds are north westerly in the north western part of the basin and south westerly in the south east .

The basin can be divided into two distinct landscapes:

- A mountainous area - the north western mountain range - occupying 3.500km^2, consisting of the East Lebanese and Palmyra Mountains, with an altitude of 2.814m at the AlSheikh Mountain Peak.
- A plain area (where LAB site is located) - including the Ghouta lands i.e. Damascus, Ghouta and the surrounding plains - with an area of approximately 5.100km^2 ranging from about 595m to 1,400m above sea level.

4.2.2.2 Groundwater

According to figures provided for the United Nations Water Conference in 1976, groundwater production in Syria comes to approximately 1,600 million m^3 per year [1]. The western and northern areas of Syria and the areas immediately adjacent to the Euphrates River are the most favourable for groundwater production.

The west and northeast are characterized by limestone and basaltic aquifers whose capacity to store and transmit water is usually relatively high. Syria has been divided into four basic groundwater regions:

1) the Western mountain ranges;
2) the Hawrane volcanic plateau;
3) the Syrian Steppe;
4) the northern plains.

Springs issuing from underground water sources are of great importance in Syria. Of particular significance are the karstic springs issuing from the Western mountain ranges and from the hills forming the northeastern border with Turkey. The overall quality of Syrian groundwater, as reported for the 1976 UN Water Conference, is good to fair (ESCWA 1976 p. 20). The highest quality groundwater, as judged by salinity levels, is found in the northeast and in the western areas of the country, the lowest in the arid steppes.

4.2.2.3 Fresh Water quality and use

In its review of the environmental situation for the 1972 UN Conference on the Human Environment, Syria named water pollution as one of its most serious environmental problems. Causes of this pollution were said to be lack of sanitary sewerage disposal systems on a country-wide basis and industrial wastes, including wastes from petroleum processing, textile mills, tanneries and fertilizer production in the country's more important basins of the Euphrates, the Oronte and, above all, the Barada (Human Environment, 1972) [1].

The water pollution problem appears to have persisted through the 1970's. The Barada River had become more of a means for carrying sewer water and liquid wastes than a conveyor of natural waters, especially during the dry season. The Ministry of Public Works and Water Resources reported at the First Scientific Conference for the Protection of Damascus and Its Environs, that Al-Ghutah, the oasis which encircles the city of Damascus, was threatened with complete destruction from the wastes pouring into the rivers and streams of the Barada Basin at an estimated rate of 4 to 5 m3 per second.

Although studies have been undertaken to assess the pollution problem in Damascus and its environs and although efforts have been made to force industrial plants to treat their wastes before dumping them into canals and rivers, little progress has been made in this area. Water pollution problems also extend to the Oronte and Euphrates Rivers. Furthermore, in southern Aleppo and Lattakia, there have been difficulties with soil pollution arising from the use of polluted sewage water for irrigation.

The development and exploitation of groundwater have gained momentum in recent years, bringing the problems in their wake. Some problems have occurred because of overpumping, while salt water intrusion following upon overpumping, has become a serious threat in the coastal plains and in some arid regions (Ramadan and Beida) in which saline aquifers occur. Deterioration of water quality is also found in areas irrigated by brackish waters and in multi-layered aquifers such as those found in the Lower Radd area, where fresh water is underlain or overlain by saline groundwater.

In the semi-arid regions of Syria, several groundwater reservoirs have been over-developed during the past decade. In these areas, overpumping followed by drought conditions has caused storage depletion because withdrawals have exceeded recharge. These aquifers include the Oalamoun, Salamyeh, Mouselmyeh, El Bab, Menbej and Jeiroud aquifers, all of which are characterized by limited thickness, high water table and medium to high transmissivity. Most of the areas are those with good agricultural potential. Measures taken to alleviate the situation have included reduction of pumping from production wells, prohibition of further development and artificial groundwater replenishment from surface run-off. In some areas, small dams have been constructed and integrated use of surface and groundwater has been practiced to good advantage. In other areas, however, water must be imported (Khouri and Rasoul Agha, 1977 p. 49).

The main sources of pollution of fresh water can be summarized as:

- toxic materials and solid wastes from industry and public facilities which include compounds of mercury, lead, cyanide, copper and other heavy metals;
- biological pollutants which come mainly from untreated sewage water, slaughterhouse wastes, food production industries and animal production farms. The major pollutants are protozoa, invertebrates, bacteria and viruses that cause disease to man, animals and plants;
- oil pollutants which come mainly from car service stations, inlandbased oil refineries, power plants and other oil-fueled power units of industries;
- pesticides used in plant protection and urban and household pest control.

The scale of surface fresh water pollution from chemical pollutants, biological pollutants, oil pollutants,and pesticides were estimated as moderate, significant, minor and moderate, respectively. (Source S. Elgasmi, 1984) [1].

Results of some monitoring of Barada river water quality are presented in following table.

Water Quality Monitoring in Barada River [1].

Monitoring Point	***BOD***	***Cu (mg/l)***	***Fe (mg/l)***	***Cr (mg/l)***
Source	1	0,02	0,05	0,039
Before Damascus	20	0,025	0,08	0,04
After Damascus	300/400	0,06	0,08	0,2

The major causes of Barada river pollution is the input of partially treated or untreated domestic and industrial effluent from the regional sewage network. Secondary issues are the problems of eutrophication through high nutrient levels in agricultural run-off. Industrial activity in the basin includes 170 different factories and 250 tanneries. The latter being the cause of extremely high levels of chromium recorded in the river, 1.22mg (two orders of magnitude above the WHO health guideline, Tebodin 1997). Concentration of BOD and ammonia exceed Syrian standards in all samples taken from Barada river. Suspended solids exceed Syrian standards in 86 % of the samples. The figures of BOD and SS are slightly higher than they were in the early eighties, but the difference is not significant. This indicates a long term pollution problem [2].

WATER USE

Up to 1986 agricolture was the principal user of water in Syria [1]. Water use projections for 1985 were 6,400 million m3 per year – 6,000 for agricultural purposes and 400 for domestic purposes; no figures for industrial uses were supplied. According to the same source, irrigation currently accounted for about 94% of water use in Syria (98% of surface water usage and about 97% of groundwater usage). Estimates on the total irrigated area give 530,800 hectares – about 39% irrigated bay groundwater, the remaining 61% by surface water.

4.2.3 Land

4.2.3.1 Soil quality and use

About 50% of the irrigated land in the Euphrates Valley is seriously affected by salinity and waterlogging, annual losses to the main crops coming to about 300 million dollars. It is feared that the limited amount of surface water during certain months of the year and the spreading of these scarce water resources over a greater land area may lead to soil salinization, as a result of insufficient leaching. The problem is said to develop very quickly when the quality of irrigation water is poor as is often the case (Elgabaly, 1976) [1].

Waterlogging may also occur because of seapage from irrigation canals during conveyance and during other parts of the irrigation operation. Such losses are said to account for over 70% of the water used in the Near East region as a whole. These losses raise the groundwater table gradually until a critical point is reached after which waterlogging and salinization result through water and salts raised through capillary action to the plant root zone.

In order to relieve this problem, large horizontal drainage programmes are presently being planned, as well as in other Near Eastern countries.

Calcareious soils constitute a large part of land resources. These soils have several disadvantages: low water-holding capacity; deterioration of structure under irrigation; and formation of surface crust when irrigated. Irrigation efficiency on these soils is low and irrigation creates problems of waterlogging and secondary salinization.

Sandy soils, present in large quantities, have very low water-holding capacity. Efficiency of water use on these soils by traditional methods is very low and these soils are very expensive to develop (Elgabaly, 1976).

The principal characteristics of the soils from an agricultural point of view are as follows:

- high percentage of calcium carbonate which can exceed 50%;
- low content of organic matter;
- presence of gypsum in some soils in arid and semi-arid zones;
- presence of saline soils in the irrigated areas (in arid and semi-arid zones, Euphrates);
- deficiency in phosphorus and essential oligo-elements;
- shallowness of the soils in general particularly due to erosion; the deep soils are concentrated in depressions and river beds and terraces.

The Al-Ghouta region of the Barada basin has been severely affected by the encroachment of housing and urbanization. The region was predominately agricultural, though the development of road connections and industrial expansion has led to the area occupied by housing increasing from 503 km^2 in 1982 to 750 km^2 in 1989. The rate of increase in the area allocated for buildings (public and private) is 38 % in the period between 1985-95. It is worth noting that between 1985-1995, the rate of decrease in cultivable agricultural land is 5% in the whole basin. In addition, inappropriate irrigation techniques in the region have led to increases in soil salinity in the eastern parts of Al-Ghouta and Al-Utiba.

Problems of soil erosion are also experienced in Al-demir and Al-Hejam, where strong winds are blowing soil particulate broken up and dislodged through the movement of heavy vehicles. Soil is also vulnerable to erosion in the western parts of the basin and mountain areas of Al-Keswa, where high rainfall is causing soil run-off from deforested areas.

4.2.3.2 Seismic data

Data about seismic events registered in Lebanon, Karaa Observatory, have been consulted [[a]3] . Lebanon borders are quite near to LAB site area (50 km).

Many seismic events are listed, since 590 B.C up to the 60ies, both with epicentre in Lebanon and outside, but with sufficient intensity to be revealed also in Lebanon. Intensity has been estimated in Mercalli scale (1÷12 intensity levels, IL). Levels between 9 and 12 has destructive potential.

The complete seismic events list is reported in **Annex IV.5**. The most important events in last century occurred in:

- 1951, with epicentre near Oronte river sources (Lebanon) IL=7
- 1956, with epicentre in Chouf (Libanon) IL=7 in Beyrouth and IL=5 in Damascus.

4.2.4 Other components

4.2.4.1 Noise

No monitoring activity about noise levels in Syria has been found.

Anyway, some general considerations can be done: Damascus city noise levels should be certainly raised by the whole of human activities present; in other parts of the Country noise hot spots should be found in very limited zones, near industrial installations and near principal traffic infrastructures.

[a] "Catalogue des seismes ressentis au Liban" by J.Plassard, B.Kogoj, Observatoire de Kaara. See **Annex IV.4**

4.2.4.2 Landscape

In southern part of Syria (south of Damascus) bare mountain areas alternate to green valleys and wide rocky deserts; dark basaltic rocks , volcanic in origin, are present, especially in Hawran region, a dry plain, between Gebel Druso (near Jordan borders) and Golan heights.

In Hawran region some important archeological sites are present: Bosra, Shabba, Shaqqa, as SuWayda.

4.2.4.3 Flora and fauna

Wild mammals found in many areas of Syria include varieties of deer, wildcat, porcupines, squirrels, hares, rats and mice, while antelopes and gazelles have been common in the desert east of Hama and occasional wolves are found in the Anti-Lebanon Mountains and the Jabal al Nusayriyah in the west [1]. Reptiles common to the desert areas are lizards, chameleons and vipers. Birdlife includes waterfowl, particularly pelicans and flamingoes in the marshes, eagles, owls, vultures and partridges in many areas of the country. Common insects are mosquitoes, sandflies and grasshoppers; locusts occasionally threaten crops.

The IUCN Red Data Book lists four endangered species of mammals for Syria:

- Wolf - Canis lupis.
- Anatolian leopard - Panthera pardus tullians.
- Syrian wild ass - Equus hemionus hemippus.
- Saudi Arabian dorcas gazelle - Gazella dorcas saydiya.

The list of endangered Species and Plants issued by the US Fish and Wildlife Service lists no animals as being specifically endangered in Syria.

Deterioration of animal wildlife as a result of uncontrolled hunting was estimated as at its largest scale regarding mammals and as moderate with regard to birds. Deterioration of plant wildlife as a result of uncontrolled exploitation of rangelands, forests, medicinal and edible plants, "was estimated as moderate". (Source - S.Elgasmi, 1984).

4.2.4.4 Human health

Syria is a country in transition from a traditional pattern of morbidity and mortality to an industrialized pattern. Typical health hazards of a traditional society are *communicable diseases* , including parasitic diseases and under-nutrition [2]. Typical health hazards of an industrialized country are *non-communicable diseases* associated with poisoning over-nutrition, intentional unintentional and self - induced injuries and psycho-social disorders.

As communities or individuals move from their rural homes into the urban and peri urban environment or from a traditional to an industrialized economy, the traditional hazards are expected to decline and the industrial hazards to increase. At the intermediate point, which may characterize many communities in Syria, both kinds of hazards may be present.

Thus communities may be afflicted with both tuberculosis associated with crowded living conditions and lung diseases associated with air pollution or cholera associated with fecal contamination of water supplies, and heavy metal intoxication associated with industrial wastes. Communities of this kind are often found in the per- urban informal settlements that characterize many developing country cities.

Such communities are often outside the jurisdiction of municipal authorities and not provided with water supplies, sanitation or solid waste disposal they frequently buy their water from vendors at extortionate priced and dispose of their waste indiscriminately. Informal settlements of this nature occur around Syria cities.

COMMUNICABLE DISEASES

The frequencies of traditional (communicable) environmental diseases in Syria are reported in following table.

These include diarrhoea under 5 years of age (u5), acute respiratory infection u5 (ARI u5) cholera, typhoid, viral hepatitis, leishmaniasis, malaria and brucellosis. Ministry of health (MOH) statistics were used for constructing tables but represent only a fraction of the actual number of cases of each condition however the tables are helpful for appreciating the distribution and relative frequency of the condition under question per governatorate basin and nationally.

Number of cases of communicable diseases in Rural Damascus Governorate (1992-1997)

Diseases/Year	1992	1993	1994	1995	1996	1997	1998
Diarrhoea in children under 5 year	2.523	3.837	11.351	21.285	20.166	26.047	31.300
Summer epidemic diarrhoea	1	1.549	57	80	71	0	30
Typhoid	2	7	273	1.315	1.044	1.590	2.340
Malaria	2	0	0	0	0	0	0
Viral hepatitis	16	66	231	332	479	677	710
Cuteneaos Leishmaniasis	1.219	1.581	1.793	1.243	483	121	310
Malta Fever	--	26	221	853	856	1.276	2.013
Acute respiratory diseases	--	--	--	--	106.455	139.490	132.100
Total	**3.763**	**7.066**	**13.926**	**25.108**	**129.554**	**169.201**	**168.803**

Rates of diarrhoea u5 shows a noticeable variation between governorates. For example, DAMASCUS city reported higher rate, more that double, of diarrhoea u5 relative to Rural DAMASCUS. This may be partially attributed to better reporting of the disease in DAMASCUS city. However, there seems to be a case for claiming a genuinely significantly higher rate of diarrhoea u5 in DAMASCUS city. One would have expected the reverse since Rural DAMASCUS has relatively poorer drinking water and, presumably, less hygiene-aware people. The vast amounts of unhygienically handled foods consumed by DAMASCUS city residents may be to blame. Wastewater irrigated raw vegetables and fruits from Al Ghouta area are probably the single most important cause. The relatively lesser rate of diarrhoea in Rural DAMASCUS may be attributed to the fact that rain and well water rather than wastewater is used in irrigation. There is a widespread practice of decontaminating fruits and vegetables with disinfectants, but it is largely ineffective.

Typhoid, like cholera, is an excreta-related disease associated with use of contaminated water. In Rural Damascus, rural Aleppo, DARAA and Hasakeh the cause would more likely be drinking water which is frequently inadequate in quantity and quality resulting from shortcomings of the water supply and control systems. In some of these areas safe drinking water may sometimes be rationed to only being supplied two times per week. In Damascus City and urban Aleppo the more likely cause is consumption of contaminated food.

A recent study commissioned by Damascus Governorate Authority (Howard Humphreys, 1997) describes findings of detailed environmental health risk assessment associated with effluent and sludge reuse in the Ghouta area of Damascus. This covers communicable and non communicable diseases. Communicable diseases studied include Diarrhoea u5 amongst other diseases. Although the study covers only peri-urban Damascus the findings are relevant for the country as whole. Wastewater reuse in irrigation is a wide scale practice in Syria which has serious environmental health implications when poorly managed. The aforementioned study includes a detailed health risk management approach to wastewater reuse. Appropriate environmental management of wastewater reuse is proposed as a priority action to reduce associated health risks.

NON-COMMUNICABLE DISEASES

Modern environmental diseases include non-communicable diseases associated with environmental pollution, for example, lead poisoning and pesticides poisoning. They also include diseases and injuries related to the work-environment. Available information in this category was very limited.

One of the most serious health risks of lead poisoning is its effect on children's intelligence and mental abilities. One study reported that the average blood lead concentration among Damascus city children was higher than that of children in Rural Damascus and significantly exceeded WHO lead level. Blood lead concentration was higher in children coming from areas of the city with relatively high traffic congestion and hence more air pollution. A number of indicators of child health in relation to lead poisoning were measured. Behavioral disorders, school performance and absenteeism increased with increase in lead blood level. The problem of high lead exposure seem to be of concern to the MOH who are planning to survey it in most exposed cities particularly Damascus and Aleppo. In addition to vehicular lead pollution in Aleppo there is the lead pollution from the active small-scale informal lead batteries industry.

More information is required on lead poisoning to enable concerned authorities addressing related issues and problems constructing appropriate intervention measure. A recent, June 1997, statement of commitment to programme for further implementation of Agenda 21, from the United Nations General Assembly adopted in a special session, emphasised that, given the sever and irreversible health effects of lead poisoning, particularly on children, its important to accelerate the process of eliminating the unsafe use of lead, including the use of lead in gasoline.

WORK-ENVIRONMENT RELATED DISEASES AND INJURIES

Information with regard to work-environment related diseases and injuries was relatively more available. The data on this sub-category is regularly collected and processed by the Organisation for Social Insurance (OSI) of the Ministry of Labour and Social Affairs (MOL&SA). However, only some of the national-level, i.e. not the govemorate-level, data sets were useable for the purposes of this report. More than 60 different conditions fall in this sub-category of diseases and injuries. This covers a wide range of conditions including chemical poisonings of all sorts; ill health due to exposure to dust, heat, high pressure, noise and light; psychiatric disorders; cancers due to any of the 18 substances officially recognised as cancerous in the work place; musculo-skeletal problems and physical injuries.

PESTICIDES POISONING

Some national information on pesticides was available but was not desegregated by governorate or basin. Pesticides in Syria are used to control agricultural pests and for public health purposes. These are respectively the responsibilities of the Ministry of Agriculture and Agricultural reform (MOAAR);of local Administration (MOLA); and of health (MOH). The respective quantities of pesticides per annum used by these ministries is:3585 tons agricultural pesticides (55tons insecticides, 75 tons rodenticide; 22tons insecticides and 1.5 snailcides). In addition to the above ministries several other agencies are involved in one or more aspect of pesticides importation, distribution, production, analysis and inspection.

Most of the agricultural work force, 902,597 constituting around 28% of the total workforce and 7% of the total population, could be considered to be moderately exposed to pesticides and its acute effects. The population at large, as consumers, could be under low chronic pesticide exposure. There is no scientific information on the concentration of pesticides in the environment or the food chain or the health consequences of pesticides use in Syria. However a recent study conducted by the Atomic Energy Commission found out that one third of a sample of people exposed to pesticides showed chromosomal aberration, well above general population rate.

4.3 Area of study

As already mentioned, LAB site is located in a plain upland area, about 700m above sea level, situated between two main mountain groups (*Jabal Maan*, in the North-East, 3 km minimum distance from site, and *Tell Salalem* and *Jabal Aba* , in the South-West, 1.5 km minimum distance from site).

Height values above sea level in the LAB site plain are slightly decreasing from North to South.

With reference to the following **Fig.4.7**, which shows the area of study, the most significant infrastructures and built-up areas near LAB site are the following ones:

- Village Deir Ali: about 2 Km North-East
- Highway Daraa-Damascus: 400m West
- Road type 3[b] near village Deir Ali: 1,7 Km North-East
- Railway Damascus-Daraa: about 1,5Km East

Another village is located about 5 km South of the site.

Near LAB site (**Fig.4.8**), an industrial structure is already present (a ceramic factory with about 200 workers) on the North side (about 700 meters far), while a house with a small cultivated area is present on the South side (250 meters far). Immediately next to LAB plant another part of Daaboul propriety is present, at the moment partially used for yard structures.

[b] In Syria four roads classification level are present; Road 1 is first class

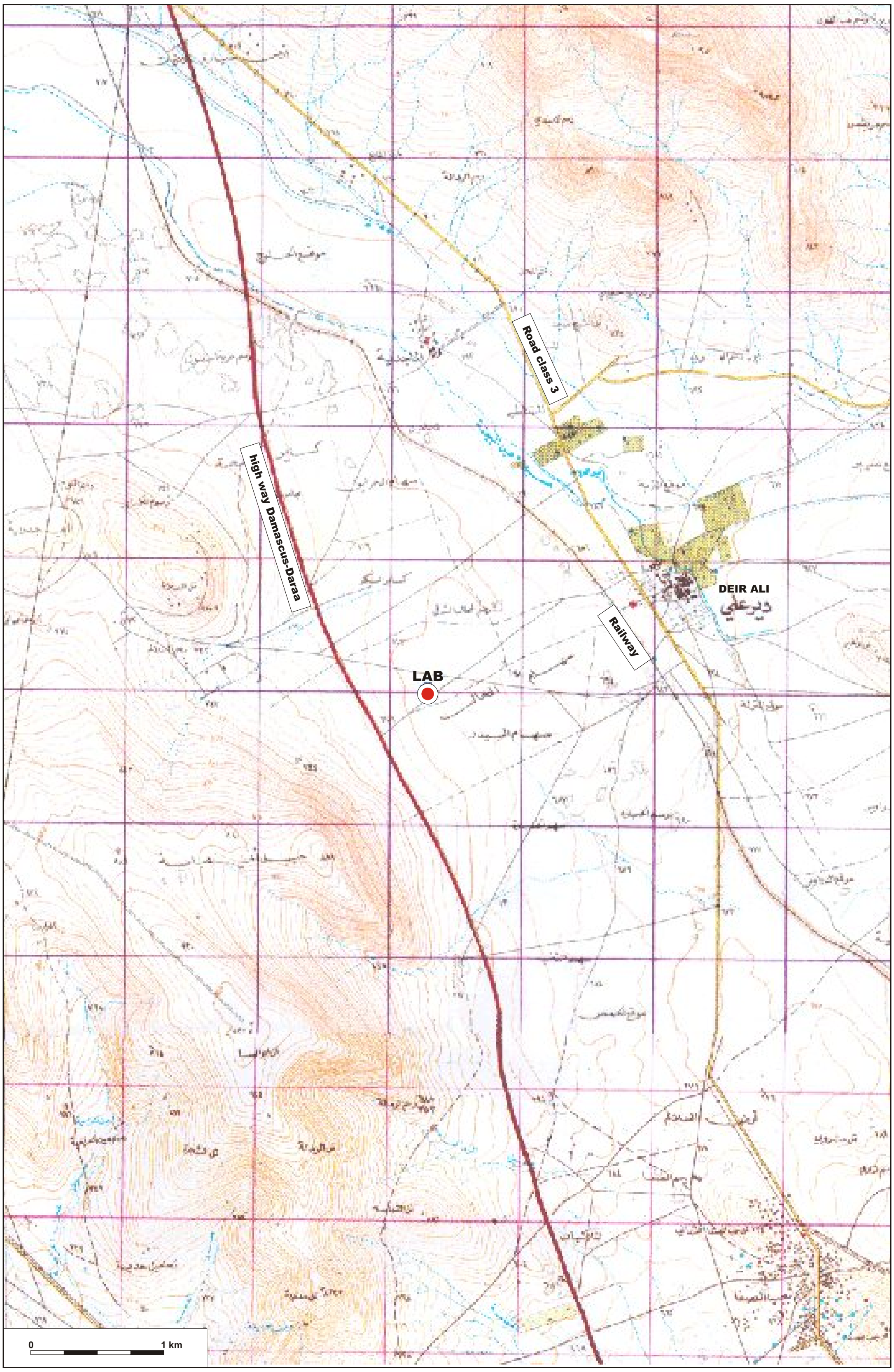

Fig. 4.7: Site location in the area of study

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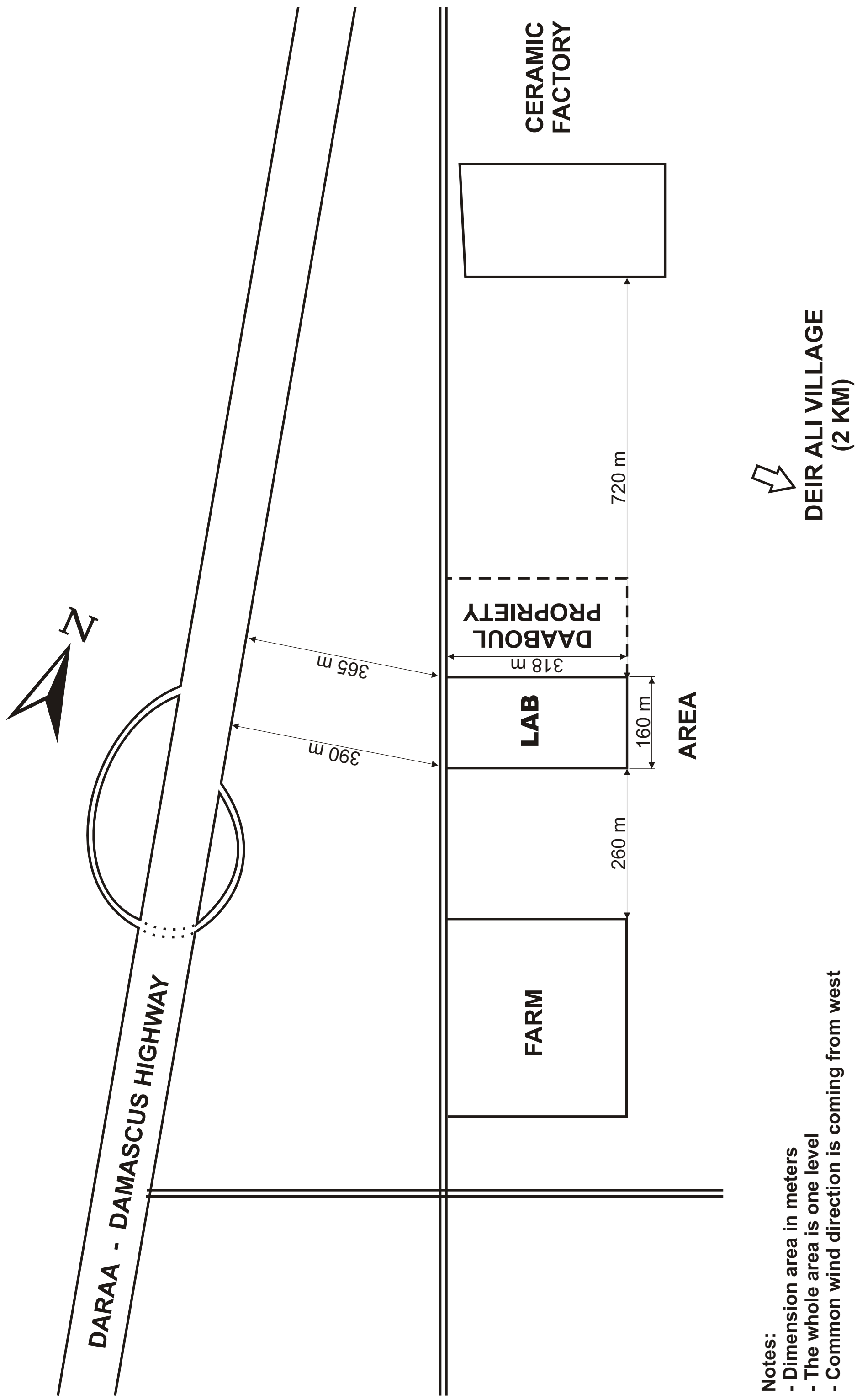

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Fig. 4.8: Area around the site: structures and infrastructures present

4.3.1 Air

The most relevant air pollutant source in the area is the traffic in the highway.

A significant sample of highway traffic near LAB site has been recently examined, giving the figures reported in the following table. Data referring to hour intervals have been counted, while total daily number has been estimated.

Traffic on the Highway near LAB site

Time ***(hour control)***	***Small cars*** *Number of vehicles*	***Microbuses*** *Number of vehicles*	***Trucks & Buses*** *Number of vehicles*
3-4	60	140	120
9-11	140	660	510
14-16	290	474	406
20-21	146	146	160
Total in 24 hours*	**2500**	**5680**	**4780**

A rough estimate of traffic emissions into the air, along 1 km North and 1 km South of LAB site, based on European standard emission factors (the so called CORINAIR emission factors), leads to the following values:

Traffic on the Highway near LAB site: Estimated emissions (tons/year)

SOx	***NOx***	***CO***	***COV***	***PTS***
12,3	84,5	57,2	12,7	19,9

The only industrial source present in the area is the ceramic factory.

LOCAL METEOCLIMATC DATA

Local meteoclimatic data are reported in **Annex IV.5**.

Prevailing winds come from West-NorthWest, with mean monthly speed between 2 and 4.5 m/s (statistical elaborations of data in the period 1951-1994). Mean annual temperature is 16 °C, annual precipitation is 167 mm.

* Calculated value : [(Number of vehicles in every hour interval)/6]*24

4.3.2 Water

No river with regular flow is present in the area.

The area is not provided with public water distribution system nor with sewer system. Water requirements are satisfied by groundwater supplying. In the next figure (**Fig.4.9**) a wide area around LAB site up to Damascus outskirts is shown, with wells localization (light blue spots in the map).

Looking at the map, a series of wells around Deir Ali are visible (North-East and South of the village), in zones devoted to agriculture.

Other wide areas with agriculture activities and a number of wells are visible about 6-7 km North-West of LAB site, in the zone of Al Kiswah, and 25 km North, in Damascus outskirts.

Hydrogeological studies conducted in LAB site and more general information on the area show that the water bearing formation is composed of basalt; the main groundwater direction is approximately from North to South.

The region is broken by numerous faults in many direction. The faults are accompanied by numerous faulting fissures and cracks by vertical direction which are important for transport of water in the region.

The composition of the basalt is distinguished by many water bearing formation; LAB site investigation permitted to identify two water bearing formation:

- one on the level 80-90m depth with small flow-rate
- another on the level 150-160m depth with more flow-rate.

Chemical and physical analysis for groundwater pumped out in LAB site (made in July 2001, see certificate in **Annex IV.6**) give the parameter values reported in the following table.

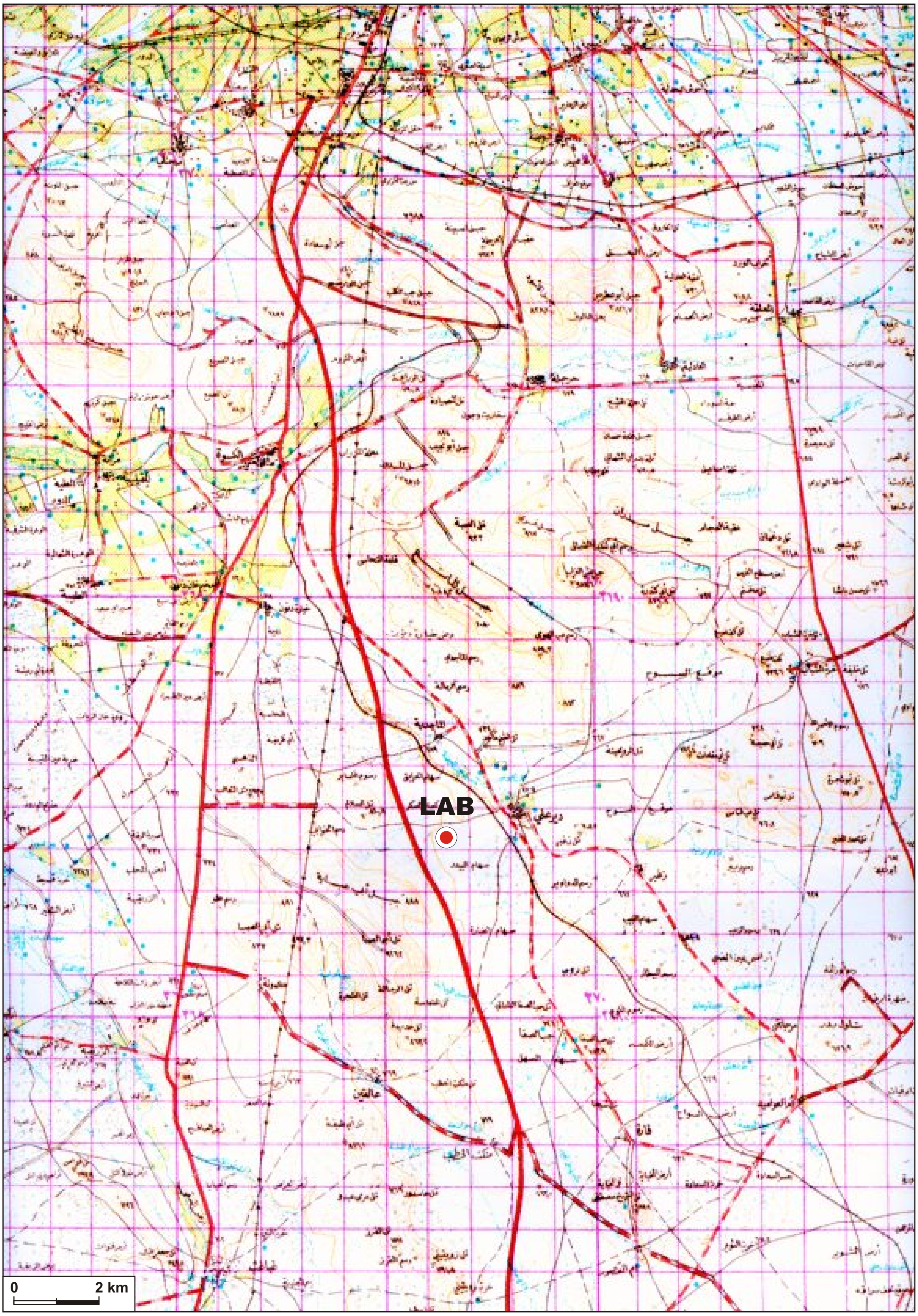

Fig. 4.9: Main wells in the area (light blue spots)

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The results obtained in the analysis are reported in the following table.

Parameter			***July 01 Analysis***	
Colour			Colourless	
Appearance			Clear	
Conductivity			704 µS/cm	
Total hardness			11 °F	
Dissolved O_2			6,8 mg/l	
Parameter	***July 01 Analysis***		***Parameter***	***July 01 Analysis***
Cations	***mg/l***		***Anions***	***mg/l***
NH_4	0,34		**F**	0,29
Li	0,1		**Cl**	106,5
Na	82,8		**SO_4**	48
K	4,6		**CO_3**	0,0
Ca	24		**HCO_3**	109,8
Mg	12,2		**NO_3**	9,24
Cu	--		**NO_2**	0,15
Total	124,7		**PO_4**	0,76
			Total	399,4