5.2.2. Summary of Survey Report

1.0 INTRODUCTION

Acer Environmental, Middle East were contracted by the Japanese International Co-operation Agency (JICA), to carry out a survey of 200 farms and 500 wells in the Al Dhaid area of UAE. This area is made up of six distinct sub-areas, as defined by the Ministry of Agriculture and Fisheries.

The survey is part of a much larger study investigating the development of groundwater resources in the Al Dhaid area.

The surveys involved interviewing farm owners or labourers, as available, in order to evaluate the extent and diversity of agricultural operations within the area. The location and operational details of both functional and defunct wells were collected for each farm to allow the determination of water demand on the basis of farm type and agricultural cropping pattern.

The survey data are presented in a spreadsheet format, simple statistical analyses having been carried out on the data to facilitate interpretation by a wider audience. An electronic version of the final spreadsheets has also been generated and supplied to JICA in order to provide the flexibility to conduct a more in-depth analysis of the data.

Appendix 1 details those farms surveyed during this phase of the study.

2.0 SURVEY METHODOLOGY

2.1 Survey Approach

In accordance with Acer's proposal to JICA, as submitted in April 1995, the survey approach adopted by Acer entailed an initial survey of 5 farms in order to ascertain the reaction of farmers and labourers to the questionnaire and to determine likely timescales for the survey of individual farms.

Following this initial survey a pilot scale survey of 20 farms was carried out across all geographical sub-areas in order to allow final amendment of the questionnaire structure prior to the commencement of the complete survey schedule.

Throughout the survey period close contact was maintained with the JICA project team in order to ensure that the survey findings were achieving all requirements and to allow the insertion of additional questions as required.

This close contact also allowed the JICA specialists to focus the survey to reflect the evolving objectives of the Master Plan Study itself.

2.2 Farm and Well Surveys

It was anticipated from the outset agricultural practices would be differential across the Al Dhaid area. The farms were therefore surveyed on a geographical sub-area basis to allow each survey team to become familiar with the unique characteristics of each sub-area. This allowed the identification of trends specific to certain sub-areas and ensured that the surveyors were familiar with the specific operational constraints placed upon farmers.

At each farm all tube wells, both functional and defunctional, were surveyed and their relationship with other water systems; such as dug wells; determined. The well survey allowed the identification of general hydrological trends and the logging of all well positions using a portable GPS system. This exercise should facilitate the development of aquifer maps to optimise future drilling operations.

GPS systems were calibrated prior to use, using the co-ordinates of known locations and according to the manufacturers instructions.

Wherever practicable, water abstracted from operational tube wells was sampled and analysed on-site using portable meters for Electrical Conductivity, Temperature and pH. Samples were also analysed for Oxidation-Reduction Potential (ORP) where possible.

The portable meters were calibrated at Emirates Industrial Laboratory, Port Rashid, Dubai according to the manufacturers instructions. Calibration was carried out twice during the study period and meters were maintained in optimal environments when not in use to ensure the greatest degree of accuracy.

2.3 Verification of Survey Findings

It was initially intended to direct the survey interviews at the farm owners themselves. However in most cases the farm owners were not resident in the Al Dhaid area and were hence unavailable for interview.

In the absence of farm owners, farm labourers were interviewed. The farm labourers proved to be an invaluable source of information regarding the day to day running of the farms, in many cases proving to be more knowledgeable than the farm owners in this aspect of the questionnaire.

However owners were generally the principal source of financial information pertaining to the farm operations. Where the farm owners were not available during the survey all efforts were made to establish contact via telephone in order to allow verification of data obtained.

2.4 Analysis of Survey Findings

Survey data was entered into spreadsheets specifically designed to reflect the requirements of particular sections of the questionnaire. Eight spreadsheets were used to allow the effective compartmentalisation of the survey findings. The structure of these spreadsheets is presented in Table 1.

Table 2.1 : Speadsheet Structure

Spreadsheet Title	Contents
(1) General Farm Details	All general information relating to the farm, including ownership, area, personal details of the owner, and workforce details
(2) Crops Data	Details of all crops produced on the farm, including production, home consumption and sale volumes, crop specific requirements for fertiliser & pesticides, labour and crop production costs
(3) Fertiliser & Pesticide Inputs Data	Fertiliser & pesticide inputs for the farm, expressed as type, source, totals and average cost
(4) Livestock Data	All details relating to livestock, including number of head, breeding, consumption & sale, and associated costs
(5) Farms Financial Data	Breakdown of the income and expenditure for all farming operations
(6) Farming Intentions Data	Details of the plans farm owners have for their holdings, and financial management
(7) Water Data	Details of all water related issues, including wells, water storage tanks and irrigation
(8) Wells Data	Details of all tube wells located on the farm

At times throughout the survey period, data for particular enquiries was either not known or not immediately available. It was agreed with the JICA team that in the absence of hard data, assumptions should be made based on trends observed for sub-areas and the area as a whole. Details of the assumptions made during data entry are detailed below;

- Where the number of trees cultivated for a particular crop had changed, the area required for cultivating that number of trees was calculated by either extrapolating from the data collected from MAF records, by following area requirements for that crop apparent for the sub-area, or by assuming an area requirement of 0.04 donum per tree.

- Where the area dedicated to grass crops; Methapleon, Alfalfa, Rodas; was expressed as sectors, the area in donums was calculated using either the given/measured sector dimensions, or assuming an average

sector size of 10ft by 15ft. The inverse calculation was also carried out when converting area in donums into sectors.

- Where grass crop areas were not available either as donums or sectors but the production was known, the area was calculated by taking the average production rate per unit area of that crop for the sub-area and applying that to the known production.

- Where production quantities for grass crops have been calculated, theses calculations have been carried out using either information supplied directly by the farmer/labourer, or by applying the standard figures of 5kg per bundle and 260 harvesting days / 11 months per year.

- Standard quantities for particular methods of manure delivery were taken as;

- Wheelbarrow	30kg
- Car	1500kg
- Pickup	2500kg
- Truck	5000kg

- The density of manure was assumed to be 1600kg/m^3 when calculating the mass stored in dedicated storage areas.

Appendix 2 details calculations used to obtain usable data for spreadsheet analysis. These calculations should be taken as guidance only as changes were made to the calculations depending on the individual requirements of each data set and on an evolving basis. Further explanation of the calculation method for particular data sets may be requested from the consultant.

3.0 SURVEY FINDINGS

3.1 Data Analysis

Basic statistical analysis has been carried out on the data, as instructed by the project brief.

All numerical data has been expressed as average, maximum and minimum values, while non-numerical data has, where practicable, been expressed as a percentage frequency for a particular response.

For both numerical and non-numerical data, statistical analysis has been carried out at both sub-area and area levels.

While the questionnaire provided a broad range of 'objective' data, discussion with farm owners and labourers presented an opportunity to collect data of a more subjective nature. The general impressions gained from these discussions have been detailed below in section 3.2 and provide a more

complete and personal account of farming activities and concerns within the Al Dhaid area.

The information presented in section 3.2, by its very nature, cannot be confirmed as accurate and in most cases represents a general impression rather than the impressions of any one farmer. The information has been reported in a transcriptal form and inferences from the information have been avoided as much as possible.

3.2 General Impressions

Some of the more frequently reported complaints are detailed below. It should be noted that the consultant has made no attempt to substantiate these claims which represent the personal views of the respondents concerned.

3.2.1 Common Complaints

It was reported that some MAF personnel visit farms producing vegetables more regularly than other farms, as they are able to obtain produce *Ex Gratis*. One farm reported that they have not been visited by MAF personnel since they stopped production of vegetables!

It was reported that pesticides, fertilisers, etc were not available from MAF when requested, reportedly being out of stock. Farmers reported being directed to the market, and in some cases specific shops. The accusation was made that some MAF personnel own agricultural supplies shops and that they both direct farmers to their own shops and that MAF supplies are used as stock for these privately owned businesses.

It was suggested by several survey respondents that visits by MAF personnel were based on friendships and nationalistic considerations, such that a farm with labourers of the same nationality as the MAF individual would receive visits in preference to other farms.

3.2.2 Farm Labourers

Discussion with farm labourers suggested that a number of issues relating to their conditions of service are being abused.

It was reported that some labourers' visas are only being extended if they agree to a payment to the farm owner (generally 6 months wages). Some labourers were not aware of their legal status within UAE as the farm owner kept all visa details and their passports.

It was reported that some farm owners do not pay their labourers on a regular basis. One labourer reported not being paid for six months. He was aware of his legal rights under the UAE labour law but felt that the farm owner would

then cancel his visa. The labourer reported that he had worked for the owner for eleven years.

It was reported that some farm managers, rather than the farm owner, pay the labourers. One labourer reported that the farm manger (manager for a number of farms) had reduced his monthly pay for no apparent reason a year ago. The labourer had no other contact with the farm management and was forced to accept the situation.

A number of labourers expressed their wishes for a centrally controlled agency to ensure that their working conditions are satisfactory, with minimum standards placed on working conditions and living standards. Some labourers reported having to get up every hour to turn motors on for a set period.

From discussions it was apparent that many farm labourers were frustrated at the limitations placed upon them. They could see the potential of the farms but were not able to achieve the potential; even with the perceived water shortage problems due to lack of support from the farm owners.

3.2.3 Farmers' Requirements

When questioned as to additional services MAF could supply, farm owners generally expressed a requirement for increased quantities of pesticides and fertilisers, and stressed the need for a regular water supply.

Some farmers expressed the need for advice from MAF on the most effective farming methods based on the conditions at each farm. They also wanted regular visits from MAF to monitor farm management methods and address problems before they became too serious. It was reported by several respondents that some assistance given by MAF in the past has not been suited to the conditions, resulting in poor performance and loss of confidence in the ability of MAF.

Livestock veterinary services supplied by MAF were consistently reported as not addressing the requirements of the farms. In most cases animals must be taken to the surgery for treatment, something not possible for many of the farms. A number of farms reported losing large numbers of livestock due to illness and in some cases the farm owners have moved all livestock out of the area.

Some farmers stated the need for a 'fair' market in which to sell their produce. It was suggested that the markets; such as Dubai; are controlled by specific cultural communities and that produce is purchased from the farmers at a controlled, artificially low price and sold on to the consumer at an inflated price. In this way the middleman retains all profit.

It was reported that farmers are forced to use particular markets as the prices at other markets; such as Abu Dhabi, Oman and Al Ain; are government controlled and do not allow free trade.

Other Emirates within the UAE were reported as providing much greater support services to agricultural operations.

It was reported that some countries; such as Oman; restrict the import of crops during their domestic harvesting periods. This ensures that a market is available for all crops produced.

For the larger farmers, the need for aid in marketing of their products was also stated.

A number of farmers suggested that more influential landowners; including members of the government; had sunk deep wells in areas distant from their farms and pumped water from here to their farms. Due to the depth and pumping regimes of these wells farms located in the immediate area are reported as being deprived of water for use on their own farms.

Some farm owners suggested it would be useful to share ideas and experience with other farmers. It was suggested that MAF would be ideal for arranging this type of 'forum' and that it would be valuable to both farm owners and MAF officials alike.

3.2.4 Water Use

From the survey of farms it was apparent that the shortage of water is a key issue which has had a profound impact on the farming methods employed.

On those farms where the owner is more concerned about the aesthetic rather than commercial value of the farm water use tends to be concentrated on those crops which have a 'greening' effect. The use of this water appears to be very poorly managed.

Farm owners who consider the commercial viability of the farm, as well as the aesthetics, were seen to have changed the emphasis of their agricultural production. The quantity of vegetables being produced was greatly reduced and some farmers had obviously decided to concentrate on producing a limited quantity of quality crops rather than greater quantities of lesser quality crops.

Dug wells were seen to be used more in some sub-areas, being used both as a collection system and as underground reservoirs. A number of farmers had gone to great lengths in the design of their water collection systems, some connecting tube wells to a central dug well while others constructed dug wells and tube wells immediately adjacent to each other.

Tube wells appear to be drilled to excessive depths and have high capacity submersible pumps installed without any efficiency testing or assessment of its suitability. This approach to well construction may have serious implications for the water resources and causes unnecessary mechanical difficulties due to pump stress.

Water abstraction appeared to be haphazard and poorly managed on the majority of farms. The more efficient methods of irrigation such as drip systems, sprinklers and bubblers require capital expenditure and as such are used much less than the more water demanding furrow systems. This may be well be due to the fact that no financial cost is associated with the volume of water utilised and as such it is not widely recognised as the valuable commodity it is.

3.3 Survey Results

Volumes II to IX contain the survey results, organised as specific topics were addressed by the questionnaire.

The numbers of farms and tube wells surveyed in specific sub-areas is presented below as Table 3.1.

Table 3.1 : Numbers of Farms and Tube Wells Surveyed, by sub-area

Sub-Area	No. of Farms	No. of Tube Wells
Falaj	25	190
Dhaid I	50	276
Dhaid II	50	220
Kadra	15	52
Melaha	60	306
TOTAL	200	1044

4.0 CONCLUSIONS

While the aim of this phase of project was not to draw conclusions from the data, it is felt that it would be useful to the project to detail the impressions and conclusions drawn by the survey team.

The greatest impression is that farming is generally carried out in an amateur fashion, with no thought being given the actual production of the farm. This leads to serious wastage of resources, water being the most obvious, and the waste of potentially productive land.

A public relations programme to improve the perceived role of MAF would be of great value in encouraging a professional attitude to farming. This public

relations programme would however have to be accompanied by real changes at ground level, probably requiring re-training of personnel, investment in computer technology and education programme for farmers.

The exposure of the consultant to the farming communities of the Al Dhaid area during the survey period, and the knowledge of operational practices gained as a result could prove useful in developing mitigation measures to optimise both agricultural production and water usage. Although beyond the scope of this phase of the study, we would be pleased to discuss our suggestions and thoughts with both the JICA team and the Ministry during the next stages of the study.

Japan International Co-operation Agency (JICA), Ministry of Agriculture and Fisheries, the Government of UAE "Master Plan Study on the Groundwater Resources Development for Agriculture in the Vicinity of Al Dhaid in the UAE"

FORM-A1 QUESTIONNAIRE FOR FARM INVENTORY

(GENERAL TABLE)

1. Reference Details

1.1 Farm Ref No. [_____]

1.2 Date of Survey [_____]

1.3 Name of Investigator [_____]

2. Respondent Details

2.1 Name [_____]

2.2 Position [Owner] [Family] [Employee]

3. Owner Details

3.1. Name: [_____]

3.2. Ethnic or Tribal Group [_____]

3.3. [Full-time farmer] [Side job farmer]

NOTE: If owner is not on site obtain contact details such as telephone number.

4. Location

4.1. Emirate: [_____]

4.2. Region [_____]

4.3. Village [_____]

4.4. Co-ordinates [_____]

5.1. Adult : Male; [_____], Female; [_____], Total : [_____] persons

5.2. Children : Male; [_____], Female; [_____], Total [_____] persons
(14 year old or under)

5.3. Family members engaged in agriculture:

Male ; [_____] Female ; [_____] Total Persons ; [_____]

5.4. Employee (numbers by nationality)

Number of persons : [_____]; Nationality [_____]; Monthly Salary [_____] Dhs.

Number of persons : [_____]; Nationality [_____]; Monthly Salary [_____] Dhs.

Employee Daily Working Hours [_____] day.

5.5 Employee family status : [Yes] [No]

Number of persons in the family : [_____]; Nationality [_____]

Employee Daily Working Hours [_____] day.

6. Farm Details

6.1 Year opened [_____]

6.2.1 Total Acreage of Farm [_____] donum,

6.2.2 Area Available for Cultivation [_____] donum,

6.2.3 Area Cultivated [_____] donum,

6.3 Size Classification: [Small, <20 d] [Medium, 20-40 d] [Large, >40 d]
(NOTE: 1 hectare = 10 donums)

6.4 Area of Lands Owned [_____] donum

[CROPS TABLE]

7.0 Cropping Patterns and Marketing of Products (period 1994/95)

7.1 Cropping and Sale

Crops	Acreage / No. trees (donum)	Cropping month		Production (Kg)	Home Consumption (Kg)	Sale (Kg)	Average unit selling price (Dhs)	Total selling price (Dhs)
		seeding	harvest					

7.2. Marketing Channel of Products (please tick)

(1) Wholesaler [ ] (2) Retailer [ ]
(3) Intermediary [ ] (4) Co-operative [ ]
(5) Governmental Marketing Board [ ] (6) Local Market [ ]
(7) Others [ ]

Crop	Ave Crop Yeild	Crop	Ave Crop Yeild	Crop	Ave Crop Yei
Orchard		Vegetables		Parsley	2.8
Date Palm	2.25	Tomato	2.5	Carrot	2.75
Lime	2.0	Eggplant	4.5	Pepper chilli	1.5
Lemon	2.0	Cucumber	2.5	Bell pepper	1.75
Orange	1.5	Cabbage	2.4	Snake cucumber	3.75
Guava	1.5	Cauliflower	3.5	Beans	1.75
Pear	2.25	Potato	1.6	Bitter gourd	1.75
Mango	0.8	Onion			
		Water Melon	1.2	Fodder crops	
Grains		Sweet Melon		Ulfa	10.0
Wheat	-----	Lettuce	2.0	Rolland grass	7.0
Maize	4.0	Radish	2.2	Methapleon	8.5
Pulses	-----	Squash	3.25		

8.0 Cropping Input/Resources (total amount by kg. unit and expenditure as of 1994/95)

8.1 Fertiliser and Pesticide details:

Description	No of Bags / Bottles	Quantity in each Bag / Bottle (kg, lt)	Cost per Bag / Bottle (Dhs)	Total Cost (dhs)
MAF Supplied				
Fertiliser				
Murakkab (compound)				
Urea (soluble)				
Manure				
Pesticide				
1)				
2)				
3)				
Herbicide				
1)				
2)				
3)				
Privately Purchased				
Fertiliser				
Murakkab (compound)				
Urea (soluble)				
Manure				
Pesticide				
1)				
2)				
3)				
Herbicide				
1)				
2)				
3)				

Proportion of Fertilisers / Pesticides / Herbicides used on different crops

CROP	Fertiliser	Manure	Pesticide	Herbicide	CROP	Fertiliser	Manure	Pesticide	Herbicide

8.2 Labour Requirement by Crop: (Man-day)

Crops	Land Prep, inc Seeding/ Planting, & initial fert. applic.	Weeding	Disease/Pest Control	Fertiliser Application	Watering	Harvesting	Post Harvesting	Total

8.3 Production Cost by Crop:

Crops	Seed/ Seeding Cost) (Dhs)	Fertiliser Cost (Dhs)	Herbicide Cost (Dhs)	Disease/ Pesticide cost (Dhs)	Water / Electric charges (Dhs)	Machinery Cost (Dhs)	Labour Cost (Dhs)		Others	Total (Dhs)
							Home Labour	Employee Labour		

NOTE: Shaded areas may be calculated from earlier information

JICA, GWater, Al Dhaid

(LIVESTOCK TABLE)

9. Livestock Details

9.0 Number of livestock breeding (Beginning and End of 1994-95), Home consumption and Sale as of 1994-95

9.1 Inventory and Sale of Products

S. No.	Livestock	Number of Breeding Stock (head)		Home consumption	Sale	Average unit selling price	Total Selling
		Start	End	(head/kg/doz.)	(head/kg/doz.)	(Dhs)	(Dhs)
1	Camel						
2	Cattle						
3	Sheep						
4	Goat						
5	Donkey						
6	Chicken						
7	Egg						
8	Milks						
9	Others						

9.2 Breeding Cost of livestock

Livestock	Feed stuff cost (Dhs)	Self Support Purchased	Health and Hygiene cost (Dhs)	Labour Cost		Others	Total (Dhs)
				Home Labour	Employed Labour		
Camel							
Cattle							
Sheep							
Goat							
Donkey							
Chicken							
Egg							
Milks							
Others							

9.3. Marketing Channel of Products (please tick)

(1) Wholesaler [ ] (2) Retailer [ ]
(3) Intermediary [ ] (4) Co-operative [ ]
(5) Governmental Marketing Board [ ] (6) Local Market [ ]
(7) Others [ ]

(FINANCE TABLE)

10. FINANCIAL

10.1 ANNUAL TOTAL EXPENDITURE (94/95) - AGRICULTURAL OPERATIONS

	Dhs
Cropping	
Animal Breeding	
Farm Machinery Maintenance, Fuel, etc Capital Machinery Costs for 94/95 Anticipated lifetime of 94/95 machinery	
Others	
TOTAL	

10.2 ANNUAL TOTAL INCOME (94/95) - AGRICULTURAL OPERATIONS

	Dhs
Cropping	
Animal Breeding	
Others	
TOTAL	

(AID SCHEMES)

10.3
Are you satisfied with government extension & support services [YES] [NO]

10.4 Reasoning for response:

10.5 What services do you require from the government extension & support services?

10.6
Are you receiving any agricultural credit? [YES] [NO]

JICA, GAWater, Al Dhaid

10.7 If yes; What category of credit:

Purpose :	
Amount :	Dhs
Repayment Period :	Yrs
Annual Interest :	%

10.8 What are your views on the credit system?

10.9 Do you receive credit on any materials? [YES] [NO]

10.10 Details of credit

(INTENTIONS)

11. FARMING INTENTIONS

11.1
Do you participate in any farmers organisation? [YES] [NO]

11.2 If yes, which organisation?

11.3
Do you intend to keep up your farm? [YES] [NO] [OPPORTUNISTIC]

11.4 Reasoning of response;

11.5
Do you intend to expand your farm? [YES] [NO] [OPPORTUNISTIC]

11.6 Reasoning of response;

11.7 How much would you expect to increase your annual income by?

(WATER TABLE)

12. WATER

12.1 WATER SOURCE

Tube Well	Nos.	[Well Inventory]
Dug Well	Nos.	
Falaj	Km	(length)
Others		

12.2 Total Actual Yield _____ Cu.m/day

PUMPS

12.3 Number of pumps _____ units

Type of pump	Diameter of pump	Power Source	Motor Output (kw / hp)

12.4 IRRIGATION

12.4.1 Types of irrigation systems used;

	Present	In Use	Area / Crops
Basin, border or furrow			donum
Sprinkler, bubbler or same			donum
Drip or same			donum

12.4.2 Total Number of Tanks [_____]

12.4.3 Condition of Tanks [_____]

DRIP IRRIGATION

(Drip Irrigation System (go to section 21 if not applicable))

12.5 Frequency of use

a) Continuously used [ ]

b) Used occasionally (give details) [ ]

JICA, G/Water, Al Dhaid

12.6 Purpose of use

a) Fruit trees [ ] b) Vegetables [ ]

c) Animal feed stock [ ]

12.7 Facilities of Drip System (please tick)

a) Booster pump ? [ ] b) Sand separator ? [ ]

c) Screen filter ? [ ] d) Covered water tank ? [ ]

e) Fertiliser/pesticide injector ? [ ]

12.8 Water Feed Tank

		YES	NO	SPECIFY
(a)	Water in tank is clear	[ ]	[ ]	[ ]
(b)	Water in tank is clear with vegetation growth at the bottom	[ ]	[ ]	[ ]
(c)	No tank associated with Drip System	[ ]	[ ]	[ ]
(d)	Other	[		]

12.9 Problems associated with Drip System

a) Clogged holes on micro-tube ? [ ]

b) Water volume from each hole is different ? [ ]

c) Operation of Drip System is too expensive ? [ ]

d) Others [ ]

WATER ISSUES

12.10 Problems associated with Water

(1) Drawdown of water level in well [Yes] [No[

(2) Shortage of water amount [Yes] [No]

(3) Water salinity [Yes] [No]

(4) Others : [ ]

COSTS & REQUIREMENTS

12.11 Annual total water requirement of farm, inc domestic and livestock, for 94/95 [ ] cu.m

12.12 Annual total cost associated with water for 94/95 [ ] Dhs

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FORM - B : QUESTIONNAIRE FOR "WATER WELLS" INVENTORY

Reference Details

Farm Ref No. :[ ] Date of Survey : [ ]

Tube Well No. : :[ ] Co-ordinates of Well :[N]

[E]

1. Well Details

1.0 Date of Construction: [ ]

1.2 Drilling Firm:
a) Name : [ ]

b) Address : [ ]
[ ]

c) Drilling Method : [Cable Tool] [Rotary] [DTH] [other:]

1.3 Depth of Well : [ ] ft.bgl

1.4 Casing and Screen : [Yes] [No]

1.5 Screen Type : [Steel] [Plastic] [Slotted] [Drilled Hole] [Wire-wrapped]

1.6 Size : [ ] inches

1.7 Screen Position : Depth from [ ]ft to [ ]ft

2. Pump Details

2.1 Pump Installed : [Yes] [No]

2.2 Pump Type : [Centrifugal] [Submersible motor] [Vertical turbine]

2.3 Dish Size : [ ] inches

2.4 Position Installed : [ ] ft.bgl

2.5 Motor/Engine output : [ ] Kw/HP

2.6 Pump operating hours :
a) In survey date : [ ] hrs/day
b) In Summer : [ ] hrs/day
c) In Winter : [ ] hrs/day

2.7 Total Yield :
a) In survey date : [ ] cu. m./hrs
b) In Summer : [ ] cu. m./hrs
c) In Winter : [ ] cu. m./hrs

3. Static Water Table
a) In survey date : [ ] m. bgl
b) In Summer : [ ] m. bgl
c) In Winter : [ ] m. bgl

4. Water Quality at the time of survey
a) Electrical conductivity :[ ] micro-Siemens / cm
b) Temperature : [ ] centi-degree
c) pH : [ ]
d) ORP [ ] mV

5. Major use of Well [Domestic] [Animal watering] [Irrigation]
[others:]

6. Problem on Well

6.1 Any problems with well (Salinity, lack of water) [ ]
[ ]

6.2 Remediation measures undertaken. [ ]
[ ]

VOLUME THREE : APPENDICES

APPENDIX-6: ENVIRONMENT AND WID SECTOR

6.1. Federal Low No. 7 of 1993 for the Establishment of the Federal Environmental Agency

Article 1
Definitions

For the purposes of this law, the following words and expressions shall have the meanings stated below except when the context stipulates otherwise:

State	: Unites Arab Emirates
Minister	: Minister of Health
Agency	: Federal Environmental Agency
Board of Directors	: Board of Directors of the Agency
Chairman	: Chairman of the Board of Directors of the Agency
Director General	: Director General of the Agency
Competent Authorities	: All authorities concerned with environmental affairs and development thereof, in and outside the State.

CHAPTER I
CONSTITUTION AND OBJECTIVES OF THE AGENCY

Article 2

A public agency specialized in environmental affairs called the Federal Environmental Agency is constituted. It shall be an independent entity, with financial and administrative independence, and annexed to the Cabinet.

Article 3

The Agency's headquarters shall be established in the city of Abu Dhabi. It may establish branches elsewhere in the State at the decision of the Board of Directors.

Article 4

The objectives of establishing the Agency shall be: to protect and develop the environment within the State; to determine the necessary plans and policies to safeguard it from damaging effects of activities, particularly those affecting human health, agricultural crops, wildlife, marine life, other natural resources and atmosphere; to implement such plans and policies; to take all suitable measures and actions to prevent deterioration of the environment; to fight environmental pollution of all kinds, and to minimize the effects of pollution for the welfare of present and future generations.

In order to achieve its objectives, the Agency can cooperate and coordinate action with all concerned bodies to:

1. Prepare draft laws, legislation and regulations to ensure environmental safety, protection and development.
2. Conduct research, study and propose plans and general policies for environmental issues at the State level.
3. Study and deliberate plans and policies from ministries, agencies, institutions or companies which might affect the quality of the environment, and suggest solutions to any environmental problems or obstacles facing these programs or projects.
4. Examine, study and provide suggestions and solutions to any environmental problems or matters that might be referred to the Agency by the cabinet or any other official or non-official body within the state.
5. Carry out or commission extensive research and studies on pollution; monitor the effects of pollution on health and environment , and take all necessary preventive measures and actions to minimize environmental pollution in all its forms.
6. Establish the required principles and basis for incorporating environmental considerations into the process of planning and development in the State, by ensuring that environmental matters become part of the planning, execution and follow-up of development projects initiated by government or the private sector, using the process of environmental impact assessment.
7. Control all public and private development projects which might have an adverse effect on the environment and appraise such proposals before authorizing them. The Cabinet will determine the types of project which

might have adverse environmental impacts.

8. Promote and implement studies of air, water, sea and soil pollution, and studies of methods of protecting the physical, natural and living resources of the environment.
9. Pay attention to the development and evolution of wildlife and protected areas.
10. Study the nature of soil, water and energy and propose means by which they can be protected, and prepare guidelines to limit the misuse or exhaustion of these resources, with a particular focus on groundwater and limitation of desertification.
11. Study the nature of the coastal zone and marine environment and prepare policies for the conservation and development of its resources.
12. Determine and develop preventive measures to limit marine pollution; develop and train human resources and specialized personnel for the implementation of policies for protection of the coastal zone.
13. Establish a central environmental laboratory and supply it with appropriate technical staff and equipment.
14. Specify permissible limits and carry out a monitoring program for radioactivity in water, air, soil and food.
15. Give attention to educational, media, sociological and cultural aspects with a view to increasing environmental awareness and promoting active public participation in protection and development of the environment.
16. Establish and implement plans and programs for training of technical personnel in the environmental field.
17. Determine suitable methods for prediction and limiting the effects of natural disasters.
18. Undertake a comprehensive review of human settlement in cities, villages and desert areas. Study the socio-economic effects of human settlement programs and propose and implement programs, particularly for:

    a) Achieving the best possible distribution of population between cities and desert areas.
    b) Ensuring the use of environmentally sympathetic technology in the design and construction of buildings.

c) Ensuring the most suitable conditions for life in planning for cities and villages.

d) Reduction of noise and air pollution by the optimum use of transportation systems.

19. Establish appropriate systems for gathering, storing and exchanging data in collaboration with research institutions and environmental organizations, in or outside the State.

CHAPTER II
AGENCY MANAGEMENT

Article 5

The agency shall be managed by a Board of Directors chaired by the Minister and comprising nine members who will be responsible individuals concerned with environmental and developmental issues within the State, including a Vice-Chairman who will replace the Chairman in his absence and replace him should the position become vacant. The Minister will nominate the Members, whose nominations and remuneration shall be determined by a cabinet resolution.

Article 6

The Board of Directors shall be the competent authority to determine the policies required to enable the Agency to achieve its objectives and to manage its affairs. They shall pass all decisions and instructions on all matters pertaining there, to the Agency, with all the necessary power and authority.

1. Determine the plans and policies of the Agency and supervise the implementation thereof in order to ensure the achievement of the Agency's objectives.
2. Prepare the Agency's annual budget and closing accounts.
3. Prepare the Agency's by-laws, and financial, contracting and warehouse regulations.
4. Prepare the Agency's organization chart and specify the duties and tasks of the principal and secondary units therein.
5. Prepare job descriptions for the Agency staff.

6. Prepare the Agency's personnel regulations including terms and conditions applicable to appointments, salaries, allowances, benefits, leave, disciplinary matters, dismissal and termination of employment and all other related matters.
7. Approve contracts and agreements giving the Agency certain rights or liabilities in accordance with the Agency's regulations.
8. Approve the acceptance of donations and aid that might be offered to the Agency.
9. Examine all matters that the Minister might wish to have discussed under the Agency's jurisdiction.
10. Other responsibilities provided for herein.

Article 7

The Board shall hold periodical meetings, at least four times per year, at the Chairman's discretion. The Board may be convened for an extraordinary meeting on request of the Chairman or from at least four Board members. The Board meetings shall only be valid if they are attended by at least 50 % of the members including the Chairman or Vice- Chairman.
Board decisions shall be passed by an absolute majority of member's votes. The Chairman shall have a casting vote.

Article 8

A record of the deliberations of Board meetings shall be kept in minutes, to be signed by the Chairman. Board decisions are passed by virtue of the Chairman's signature.

Article 9

The Board may form a committee, from among its members or otherwise, for the purpose of supervision and implementation of the Agency's plans and policies or any other duties and tasks that they might see fit to delegate. The Board may also form specialized committees, whether provisional or permanent as dictated by public interest.
Such committees, their powers, authorities and duties, member's remuneration and

conditions of work shall be specified in a decsion to be issued by the Chairman.

Article 10

The term of the Board of Directors is for three years from the date on which the decision on its formation was passed.

Article 11

The Chairman shall represent the Agency before courts of law and in its relationships with third parties.

Article 12

The Board of Directors may authorize any of its members or the Director General to sign, on its behalf, on any matters relevant to its jurisdiction.

Article 13

The Agency shall have a Director General who shall be appointed by Ministerial decision, subject to approval by the Board of Directors. He must have a high level of scientific knowledge, expertise and competence in environmental issues. The Director General shall handle the technical, administrative and financial affairs of the Agency in accordance with the law and regulations of the Agency, and the resolutions of the Board of Directors.

Article 14

The Director General shall have a technical, administrative and financial team working under him, the members of which are to be appointed and their duties approved by the decision of the Chairman with approval by the Board of Directors.

CHAPTER THREE
FINANCIAL MATTERS

Article 15

The Agency shall have an independent budget annexed to the State budget.

Article 16

The financial year of the Agency shall commence on January 1, and end on December 31 of each year.

Article 17

The Director General shall prepare a draft of the Agency's annual budget and present it to the Board of Directors before September 1 of each year. He shall also prepare the Agency's closing accounts.

Article 18

The annual revenues comprise:

1. Annual allocations provided by the State for the Agency from the General Budget.
2. Savings achieved in the Agency's budget from the previous years.
3. Funds received from regional and international organizations concerned with the environment in support or execution of joint programs.
4. Grants and donations which the Board decides to accept.
5. Any other revenues realized by the Agency in pursuit of its activities.

Article 19

The Agency's funds are considered as public funds.

Article 20

The Board of Directors shall establish a system for recruitment of experts and determining their remuneration and expenses.

CHAPTER IV
GENERAL PROVISIONS

Article 21

The Agency's by-laws, organizational chart and job descriptions shall be issued by virtue of a Cabinet resolution.

Article 22

The Agency's personnel and staff members shall, in matters not expressly provided for herein or in the Agency's personnel regulations, be subject to Federal law No. 8 of 1973 regarding public service in the Federal Government.

Article 23

Decisions taken by the Agency, within the scope of its competence, are binding on all concerned authorities in the State.

Article 24

In implementation of the provisions of Article 4 paragraph 7 of this present law, any party applying for a license for a new project with negative environmental implications shall bear the experts' fees and all costs of studies and research done for the evaluation of the project, as determined by the Agency.

Article 25

The provisions of the present law supersede all other conflicting provisions.

Article 26

The present law shall be published in the Official Gazette and shall come into force as from the date of publication.

6.2. Flora and Fauna in UAE

6.2.1. Endemic Spices of Fauna in UAE

Endemic Spices of Fauna in UAE - (1/2)

Gechoes :	Hemidactylus turcicus, Hemidactylus flaviviridis,Teratoscincus scincus, Pristurus rupestris, Stenodactylus doriae, Stenodactylus arabicus, Stenodactylus leptocosymbotes, Asaccus elisae, Asaccus gallagheri, Cyrtodactylus scaber, Bunopus spatalurus hajarensis, Bunopus tuberculatus, Phyllodactylus elisae, Phyllodactylus gallagheri, Pristurus celerrimus, Ptyodactylus hasselquistii, Stenodactylus khobarensis, Stenodactylus slevini
Agamid lizards :	Uromastyx microlepis, Agama jayakari, Agama sinaita, Phrynocephalus arabicus, Phrynocephalus maculatus
Lacertid lizards :	Acanthodactylus boskianus, Acanthodactylus opheodurus, Acanthodactylus schmidti, Mesalina adramitana, Acanthodactylus gongrothynchatus, Acanthodactylus schmidtii, Eremias adramitana, Lacerta jayakari, Lacerta cyanura, Mesalina brevirostris
Shinks :	Mabuya tesellata, Ablepharus pannonicus, Scincus mitranus mitranus, Chalcides ocellatus, Scincus scincus conirostris
Worm lizards :	Diplometopon zarudnyi,
Monitor lizards :	Varanus griseus
Toads :	Bufo arabicus, Bufo dhufarensis
Marine turtles :	Chelpnia mydas
Cobras :	Walterinnesia aegyptia, Naja haje arabica
Vipers :	Cerastes gasperettil, Echis carinatus sochureki
Colubrid snakes :	Psammophis schokari (Venomous), Spalerosophis diadema (Non-venomous), Lytorhynchus gaddi, Coluber rhodorachis,Malopon moilensis, Telescopus dhara
Boas :	Eryx jayakari
Thread snakes :	Leptotyphlops macrorhynchus
Blind snaks :	Ramphotyphlops braminus
Gerbillus nanus :	Gerbillus nanus, Meriones libycus, Meriones crassus, Meriones libycus arimalius, Gerbillus cheesmani, Gerbillus cheesmani arduus, Gerbillus dasyrus gallagheri
Jerboas :	Jaculus jaculus
Rat, mice :	Acomys dimidiatus, Acomys russatus, Mus musculus, Rattus norvegicus, Rattus rattus

Endemic Spices of Fauna in UAE - (2/2)

Hedgehogs :	Paraechinus aethiopicus dorsalis, Lepus capensis cheesmani
Hares :	Lepus capensis cheesmani
Mongooses :	Ichneumia albicauda albicauda, Herpestes edwardsi
Camels :	Camelus dromedarius
Horses :	Equus asinus
Bodgers :	Mellivora capensis
Antelope :	Gazella dorcas saudiya (Very rare), Gazella gazella arabica (Rare)
Dogs :	Vulpes vulpes arabica, Vulpes rueppelli sabaea (Rare)
Cats :	Felis margarita (Endangered)
Bat :	Taphozous nudiventris zayidi, Asellia tridens tridens, Triaenops persicus macdonaldi, Otonycteris hemprichi, Pipistrellus kuhli ikhwanius, Rhinopoma muscatellum
Birds :	Alaemon alaudipes, Ammomanes deserti, Coracias benghalensis, Corvus ruficolis, Eremopterix nigriceps, Francolinus pondicerianus, Galerida cristata, Lanius excubitor, Merope orientalis, Nectarinia asiatica, Passer domesticus, Prinia gracillis, Pterocles exustu, Phenonotus xanthopygos, Streptopelia senegalensis, Turdoides squamiceps

BIRDS SPICIES BY REGION-(1)

Region	Residents	Migrants	Summer Visitors	Winter Visitors
Coastlines	Charadrius alexandrinus, Columbia livia, Egretta gularis, Larus hemprichii, Neophron percnopterns, Pandion haliaetus, Phalacrocorax nigrogularis, Sterna bergii, Streptopelia senegalensis	Apus pallidus, Charadrius dubius, Sterna anaethetus, Sterna bengalensis, Sterna bergii, Sterna repressa,	Phoenicopterus ruber, Sterna sandvicensis	Actitis hypoleucos, Calidris alba, Calidris alpina, Charadrius hiaticula, Charadrius leschenaultii, Dromas ardeola, Haematopus ostralegus, Larus armenicus, Larus brunnicephalus, Larus cachinnans, Larus fuscus, Larus genei, Larus ichthyaetus, Limicola falcinellus, Limosa lapponica, Numenius arguata, Phalacrocorax carbo, Phalatopus lobatus, Phoenicopterus ruber, Pluvialis squatarola, Pluvialis fulva, Puffinus lherminieri, Randionhaliaetus, Stercorarius pomarinus, Sterna sandvicensis, Tringa erythropus, Tringa nebularia, Xenus cinereus
Coastal Plains	Alaemon alaudipes, Coracias benthalensis, Corvus splendens, Eremopterix nigriceps, Euodic malabarica, Francolinus pondicerianus, Galerida cristata, Lanius excubitor, Merops orientalis, Nectarina asiatica, Passer domesticus, Prinia gracilis, Psittacula krameri, Pycnonotus xanthopygos, Streptopelia decaoto, Streptopelia senegalensis, Turdoides squamiceps	Petronia xanthocollis		Actitis hypoleucos, Alauda arvensis, Anas acuta, Anas crecca, Anas clypeata, Anas Platyrthynchos, Anthus campestris, Aythya suligula, Circus aeruginosus, Fulica atra, Lanius isabellinus, Larus ridibundis, Luscinia svecica, Motacilla alba, Oenanthe deserti, Oenanthe isabellina, Phylloscopus collybita, Plivialis fulva, Sturnus vulgaris, Sylvia nana, Tringa glareola, Tringa glareola, Tringa ochropus, Tirdus philomelos

Source:THE NATIONAL ATLAS OF THE UNITED ARAB EMIRATES

BIRDS SPICIES BY REGION-(2)

Region	Residents	Migrants	Summer Visitors	Winter Visitors
Wetlands	Corvus splendens, Egretta gularis, Nectarinia asiatica, Prinia gracillis, Streptopelia senegaiensis	Charadrius dubius	Phoe-nicopterus ruber	Actitis hypoleucos, Alcedo atthis, Anas clypeata, Anas platythynchos, Ardea cinerea, Aythya fuligula, Calidris minuta, Charadrius hiaticula, Charadrius leschenaultii, Charadrius mongolus, Circus aeruginosus, Egretta alba, Haematopus ostralegus, Larus genei, Limosa limosa, Luscinia svecica, Mumenius arquata, Nycticorax nycticorax, Phoenicopterus ruber, Platalea leucorodia, Pluvialis fulva, Pluvialis squatarola, Tringa nebularia, Tringa ochropus, Tringa totanus, Xenus cinereus
Deserts	Alaemon alaudipes, Ammomanes deserti, Coracias benghalensis, Corvus rficollis, Eremopterix nigriceps, Francolinus pondicerianus, Galerida cristata, Lanius excubitor, Merops orientalis, Nectarinia asiatica, Passer domesticus, Prinia gracilis, Pterocles exustu, Pycnonotus cafer, Pycnonotus xanthopygos, Streptopelia senegalensis, Turdoides squamiceps	Petronia xanthocollis	Oenanthe deserti, Oenanthe isabellina, Sturnus vulgaris, Sylvia minula, Turdus philomelos	
Mountains	Acridotheres tristis, Ammonanes deserti, Ammoperdix heyi, Columba livia, Coracias benghalensis, Emberiza striolata, Galerida cristata, Hirundo obsolets, Merops orientalis, Nectarinine asiatica, Neophron percnopterus, Oenanthe alboniger, Prinia gracilis, Pterocles lichtensteinii, Pycnonotus cafer, Pycnonotus xanthopygos, Streptopelis senegalensis, Turdoides squamiceps	Charadrius dubius, Petronia xanthocollis		Alauda arvensis, Alcedo atthis, Anas acuta, Anas clypeata, Anas crecca, Anas platyrthynchos, Anthus campestris, Ardea cinerea, Aythya fuligula, Circus aeruginosus, Charadrius alexandrinus, Charadrius hiaticula, Egretta garzetta, Erithacus rubecula, Falco tinnunculus, Fulica atra, Gallinago gallinago, Lanius isabellinus, Monticola solitarius, Nycticorax nycticorax, Oenanthe deserti, Oenanthe finschii, Oenanthe isabelline,Phalacrocorax carbo, Phoenicurus ochruros, Pluviatis fulva, Phylloscopus collybita, Sylvia nana

Source:THE NATIONAL ATLAS OF THE UNITED ARAB EMIRATES

INDIGENOUS SPECIES OF FLORA BY REGION-(1)

Area	Grasses	Shrubs	Trees	Other Annuals	Other Perennials
Coastal Lowlands (Dubai)	Aeluropus lagopoides, Astenatherum forskalii, Cenchrus ciliaris, Hylopyrum mucronatum, Panicum turgidum	Anabasis setifera,Atriplex leucoclada, Calligonum comosum, Comulaca monacantha, Dipterygium glaucum, Halocnemum strobilaceum, Halopeplis perfoliata, Helianthemum lippii, Heliotropium kotschyi, Indigofera articulata, limonium axillare, Lotus garcinii, Pergularia tomentosa, Salsola baryosma, Taverniera spartea	Acacia tortillis, Prosopis cineraria, Tamarix arabica	Arnebia hispidissima, Chenopodium murale, Eremobium aegyptiacum, Launaea capitata, Plantago boissieri, Savignya parviflora, Silene villosa	Cistanche tubulosa, Convolvulus cephalodopus, Crotalaria persica, Echiochilon kotschyi, Moltkioposis ciliata, Sphaerocoma aucheri
Coastal Lowlands (Umm Al Quwain)	Aeluropus lagopoides, Cenchrus ciliaris, Coelachyrum piercii, Cutandia memphitica, Panicum turgidum, Pennisetum divisum, Sporobolus arabicus	Cornulaca monacantha, Halopeplis perfoliata, Helianthemum lippi, Leptadenia pyrotechnica, Limonium axillare, Lotus garcinii, Lycium shawii	Acacia tortilis, Calotropis procera, Prosopis cineraria	Arnebia hispidissima, Asphodelus tenuifolius, Chenopodium murale, Emex, Eremobium aegyptiacum, Hippocrepis bicontrota, Malva parviflora, Plantago boissieri, Senecio glaucus subsp. coronopifolius	Cistanche tubulosa, Convolvulus cephalodopus, Cyperus conglomeratus, Launaea spp., Moltkiopsis ciliata, Zygophyllum hamiense
Northern Coastal Lowlands	Phragmites australis	Aerva javanica, Atriplex leucoclada, Fagonia indica, Limonium axillare, Limonium carnosum, Physorthynchus chamaerapistrum	Acacia arabica, Acacia tortilis, Avicennia marina, Phoenix dactylifera, Zizyphus apinachristi	Astragalus fasciculifolius, Cassia italica, Chrozophora oblongifolia, Tephrosia apollinea, Scirpus maritimus	
East Coast (Mountains)	Aeluropus lagopoides	Crotalaria aegyptiaca, Indigofera pblongifolia, Jaubertia aucheri, Limonium axillare, Ochradenus aucheri, Pergularia tomentosa, Solanum incanum, Taverniera spartea, apollinea	Acacia tortilis, Phoenix dactylifera, Prosopis cineraria, Zisyphus spinachristi	Cleome dolichostyla, Hippocrepis bicontorta, Neurada procumbens	Abutilon pannosum, Aloe spp., Ephedra foliata, Halophyllum tuberculatum, Launaea massauensis, Veronia arabica

Source:THE NATIONAL ATLAS OF THE UNITED ARAB EMIRATES

INDIGENOUS SPECIES OF FLORA BY REGION-(2)

Area	Grasses	Shrubs	Trees	Other Annuals	Other Perennials
East Coast (Plains)	Aeluropus lagopoides, Dactyloctenium aegyptium	Arthrocnemum macrostachyum, Halocnemum strobilaceum, Heliotropium kotschyi, Jauberta aucheri, Limonium axillare, Solanum incanum	Acacia tortilis, Avicennia marina	Cleome cf. dolichostyla, Neurada procumbens, Zygophyllum simplex	Corchorus depressus, Haplophyllum tuberculatum, Tibulus terrestris
Central Coastal Lowlands	Aeluropus lagopoides, Astenatherum forskalii, Halopyrum mucronatum, Panicum turgidum, Pennisetum divisum, Sporbolus arabicus	Abasis setifera, Arthrocnemum macrostachyum, Atriplex leucoclada, Cornulaca monacantha, Dipterygum glaucum, Halocnemum strobilaceum, Halopeplis perfoliata, Hammada elegans, Heliotropium kotschyi, Indigofera argentea, Limonium axillare, Rhynchosia schimperi, Salsola baryosma, Salsola rubescens, Suaeda vermiculata	Avicennia marina, Tamarix arabica	Chennopodium murale, Zygophyllum simplex	Astragalus hauarensis, Cistanche tubulosa, Convolvulus deserti, Cyperus conglomeratus, Sphaerocoma aucheri, Zygophyllum hamiense
Offshore Islands	Cynodon dactylon, Echinocloa colona, Poa annua, Sporobolus spicatus, Stipa capensis	Anabasis setifera, Capparis spinosa, Salsola baryosma, Salsola schweinfurthii, Salsola tetrandra, Suaeda vermiculate		Euphorbia serpens, Malva parviflora, Portulaca oleracea, Reseda aucheri, Spergula fallax, Zygophyllum simplex	Argyrolobium roseum, Convolvulus prostratus, Suaeda aegyptiaca, Zygophyllum hamiense
Jiri Alluvial Plain	Cynodon dactylon, Stipagrostis plumosa	Calligonum comosum, Crotalaria aegyptiaca, Hammada elegans, Heliotropium kotschyi, Leptadenia pyrotechnica, Lycium shawii, Ochradenus arabicus, Ochradenus aucheri, Rhazya stricta	Acacia tortillis, Calotropis procera, Prosopis cineraria	Ammi majus, Asphodelus tenuifolius, Cichorium intybus, Emex spinosus, Heliotropium calcareum, Malva parviflora, Savignya parviflora, Schweinfurthia papilionacea, Vicoa pentanema	Pulicaria undulata, Rhanterium eppaposum
Al Ain Alluvial Plain	Astenatherum forskalii, Stipagrostis plumosa	Aerva javanica, Fagonia ovalifolia, Heliotropium kotschyi, Indigofera argentea, Rhazya stricta		Melilotus indicus, Savignya parviflora	Astragalus spp., Centaurea pseudosinaica, Zilla spinosa

INDIGENOUS SPECIES OF FLORA BY REGION-(3)

Area	Grasses	Shrubs	Trees	Other Annuals	Other Perennials
Adh Dhed and Al Madam Alluvial Plains	Astenatherum forskalii, Cenchrus pennisetiformis, Stipagrostis plumosa, Tragus berteronianus	Capparis cartilaginea, Hammada elegans, Leptadenie pyrotechnica, Ochradenus arabicus, Ochradenus aucheri, Rhazya stricta, Salyadora persica, Tephrosia persica	Acacia tortilis, Calotropis procera, Prosopis cineraria	Asphodelus tenuifolius, Savignya parviflora, Schweinfurthia papilionacea	Cyperus conglomeratus, Morettia parviflora, Polycarpea spp.
Western Coastal Lowlands	Astenatherum forskalii, Panicum turgidum, Stipagrostis plumosa	Bienertia cycloptera, Cornulaca monacantha, Fagonia bruguieri, Fagonia ovalifolia, Halopeplis perfoliata, Hammada elegans, Heliotropium kotschyi, Limonium axillare, Lotus garcinii, Salsola barvosma, Suaeda vermiculata		Savignya parviflora, Zygophyllum simplex	Cyperus conglomeratus, Dipcadi erythraeum, Monsonia nivea, Suaeda aegyptiaca, Zygophyllum hamiense
Western Dune Plains	Astenatherum forskalii, Panicum turgidum, Stipagrastid phumosa	Calligonum comosum, Fagonia ovalifolia, Halopeplis perfoliata, Hammada elegans, Heliotropium digynum, Limeum arabicum, Limonium axillare, Salsola rubescens			Cistanche tubulosa, Cyperus conglomeratus, Monsonia nivea, Tribulus omanense, Zygophyllum hamiense

Source:THE NATIONAL ATLAS OF THE UNITED ARAB EMIRATES

INDIGENOUS SPECIES OF FLORA BY REGION-(4)

Area	Grasses	Shrubs	Trees	Other Annuals	Other Perennials
Coastal Desert	Astenatherum forskalii, Cenchrus ciliaris, Cenchrus cilliaris, Cenchrus pennisetiformis, Coelachyrum brevifolium, Eragrostis barrelieri, Pennisetum divisum, Phragnites australis, Saccharum ravennae, Setafia verticillata, Stipagrostis plumosa	Calligonum comosum, Cornulaca monacantha, Crotalaria aegyptiaca, Haloxylon persicum, Hammada elegans, Heliotropium digynum, Heliotropium kotschyi, Indigofera argentea, Leptadenia pyrotechnica, Salvadora persica	Acacia tortilis, Calotropis procera, Prosopis cineraria, Tamarix aucherana	Arnebia hispidissima, Cleome amblyocarpa, Eremobium aegyptiacum, Neurada procumbens, Savignya parviflora, Silene villosa	Chrozophora oblongifolia, Citrullus colocynthis, Cyperus conglomeratus, Monsonia nivea, Seetzonia lanata, Tribulus omanense
Mountains	Aeluropus lagopoides, Aristida adscensionis, Cymbopogon parkeri, Eleusine compressa	Amygdalus arabicus, Capparis cartilaginea, Dodonaea viscosa, Euphorbia larica, Fagonia indica, Indigofera arabica, Jaubertia aucheri, Launaea spinosa, Ochradenus aucheri, Physorthynchus chamaerapistrum, Pteropyrum scoparium, Salsola rubescens	Acacia tortilis, Ficus carica, Ficus salicifolia, Moringa peregrina, Zizyphus spina-christi	Asphodelus tenuifolius, Cometes surattensis, Erodium neuradifolium, Filago desertorum, Forskaolea tenacissima, Hippocrepis constricta, Ifloga spicata, Nerium mascatense, Onychium divaricatum, Reichardia tingitana, Reseda aucheri, Senecio flavus, Spergula fallax, Trichodesma africana, Urospermum picroides, Viola cinerea	Adiantum capillus-veneris, Argyrolobium roseum, Bacopa monnieri, Boerthavia elegans, Cassia italica, Convolvilus prostratus, Ducrosia anethifolia, Echinops sp., Farsetia linearis, Helichrysum maranicum, Oxalis corniculata, Pimpinella puberula, Pulicaria glutinosa, Pycnocycla caespitosa

Source:THE NATIONAL ATLAS OF THE UNITED ARAB EMIRATES