

DISI-MUDAWARRA TO AMMAN  
WATER  
CONVEYANCE SYSTEM

**ENVIRONMENTAL & SOCIAL MANAGEMENT  
PLAN PART 2 (ESMP 2)**

July 2009

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## **EXECUTIVE SUMMARY**

The Government of Jordan (GOJ), through its Ministry for Water and Irrigation (MWI), has specific environmental and social responsibilities in relation to the Disi Project under the Sovereign Loan Agreements with the Agence Française de Développement (AFD), and the European Investment Bank (EIB). GOJ's responsibilities are outlined in the two documents forming the Disi Project's Environmental and Social Management Plan (ESMP and ESMP 2).

This ESMP 2 outlines GOJ and MWI's responsibilities in the areas of water resources management, water quality compliance and economical compensation to individuals affected by the project.

### **Water Resources**

In February 2009, MWI produced a Groundwater Reduction Plan for Amman-Zarqa & Azraq Basins (see Appendix A). The plan outlines MWI's proposed actions for reducing over abstraction from the Amman-Zarqa Basin and the Azraq Basin. This plan was approved by MWI/WAJ under Decision No. 80 dated 15 February 2009 and its delivery is enforced through this ESMP 2.

The water supply from the Disi Project is intended to alleviate the pressure on water resources in the Amman-Zarqa and Azraq Basins. Supply to Amman from these basins will terminate on commissioning of the Disi Project. Over abstraction of water resources in the Amman area will reduce to a sustainable level at the rate identified in the plan.

### **Water Quality Compliance**

MWI's required monitoring regime under this ESMP 2, for the Disi Project is based on the principles of the Jordanian Drinking Water Standards 286:2008 – 5<sup>th</sup> Edition (JS 286), the WHO Guidelines for Drinking-Water Quality, information provided by MWI to Lenders and the requirements under the Sovereign Loans. The water quality and flow monitoring procedure and the blending requirements are specifically targeted at ensuring that the water supply from the Disi Project is compliant with JS 286 by the time that it reaches drinking water users.

### **Compensation Plan**

The roles and responsibilities for the implementation of separate phases and components of the project ESMP are outlined in ESMP Chapter 8, Table 8.1. Although the majority of the actions fall under the responsibility of the Project Company, the Compensation Plan is primarily the responsibility of MWI. This ESMP 2 reinforces MWI's key responsibilities under the ESMP with respect to the Compensation Plan.

## **1 INTRODUCTION**

### **1.1 Environmental and Social Management Plan (ESMP)**

The objective of the Environmental and Social Management Plan (ESMP) is to set out the measures to be taken in addressing the potential adverse impacts of the project.

ESMP has been prepared in response to the findings of the original ESIA, the findings of the studies prepared for the ESIA Addendum 2 March 2008, and to the adoption of a BOT approach to project implementation.

ESMP sets out the mitigation, monitoring, and institutional measures to be taken during construction and operation of the project to eliminate, reduce or offset adverse environmental and social impacts.

ESMP requires that the eventual operator of the Project must have in place a comprehensive EMS prior to initiation of operations. It is expected that this will ensure that the issues identified in the ESIA and the Addendum will be adequately addressed. Therefore, the emphasis in ESMP is on the management of impacts that may arise from the pre-construction and construction Phase of the Project.

The Project Company (PC) will be responsible for the overall implementation of the Project ESMP and will establish an Environmental and Social Department (ESD) for that purpose. The implementation of the ESMP is an obligation of the PC under the Common Terms Agreement (CTA) between the Project Company and the Lenders.

For the purpose of this document, Lenders include the Agence Française de Développement (AFD), the European Investment Bank (EIB), the Overseas Private Investment Corporation (OPIC), and the Promotion et Participation pour la Coopération économique (PROPARCO).

### **1.2 Environmental and Social Management Plan Part 2 (ESMP Part 2)**

The Environmental and Social Management Plan Part 2 (ESMP 2) addresses the mitigation, monitoring, and institutional measures to be taken during construction and operation of the project to eliminate, reduce or offset adverse environmental and social impacts that are beyond the control of the PC.

The overall implementation of the Project ESMP 2 will be the responsibility of MWI. The implementation of ESMP Part 2 is an obligation under the sovereign loans from EIB and AFD to the Government of Jordan (GOJ).

## 2 WATER RESOURCES

### 2.1 Background

#### 2.1.1 Current Status of Renewable Water Resources in the Amman Area

The Disi project will supply an additional 100 MCM per year of water to Amman. At present Amman relies on water from the Jordan Valley and wells drilled into the Upper Cretaceous limestone aquifer of the Amman-Zarqa basin that underlies the city and the quarternary limestone aquifer of the Azraq basin near the Azraq oasis to the east.

Data on abstractions in 2002 and estimated safe yields from the two groundwater basins are given below.

**Table 2.1 : Abstractions and Safe Yields in the Amman-Zarqa and Azraq Basins**

Basin	Abstraction (MCM/year)			Estimated Safe Yield (MCM/year)	Deficit (MCM/year)
	Municipal	Irrigation	Total		
Amman-Zarqa	84	54	137	65	-72
Azraq	23	35	58	32	-26

Source: National Water Master Plan, Groundwater Resources, 2004

The abstractions for municipal supplies are primarily for Amman and Zarqa.

As may be seen from the table, both aquifers are overdrawn, with abstractions approximately double the estimated safe yield. This is reflected in falling water levels and declining water quality. Of particular concern in the Azraq basin is the virtual drying out of the Azraq Oasis. This unique wetland area in the desert is a Ramsar site and was a major stopover and wintering ground for hundreds of thousands of migratory birds. However, in the 1980s and 1990s, over abstraction of water from the underlying aquifers resulted in drying up the springs, which fed the oasis, leading to a catastrophic reduction in the wetland area and significant adverse environmental impacts. Recent attempts to re-establish the oasis have had limited success.

Groundwater is used locally for irrigation. According to the National Water Master Plan, 2004, all licensed wells have a permitted free abstraction of 150,000 m<sup>3</sup>/year. This figure was established in 2004 and it generally increased the legal abstraction from each well. However, it is thought that previous limits were widely disregarded and in effect adherence to the current free abstraction limit would result in an overall reduction in water abstraction of about 70 MCM/year. Well owners are entitled to abstract more than the free limit, but must pay a charge of 0.005 JOD/m<sup>3</sup> (or 5.0 fils/m<sup>3</sup>). The level of the charge for water is unlikely to discourage abstraction. There are also thought to be large numbers of unlicensed wells.

### **2.1.2 The Water Strategy**

The Government of Jordan has published its Water Strategy – ‘Water for Life’, which aims at redressing the imbalance between available renewable resources and the use of water. The exploitation of non-renewable resources, such as the Disi aquifer, is an integral part of this strategy, which will enable reductions in abstractions for municipal supplies from over exploited aquifers with renewable resources. The ESMP includes a short section on monitoring the impact of the Disi project on overdrawn renewable groundwater supplies (Section 5.4.3). It proposes that Disi Project Advisory Committee (DPAC) produce a baseline survey of conditions at the completion of the Disi project and the impact of the additional water from Amman is then assessed through the Government monitoring programme.

The Water Strategy also emphasises:

- Conservation of water; including encouraging more efficient use of water and restricting the consumption of water in the home through building regulations.
- Use of treated wastewater for irrigation.
- Improved management of resources, including closing illegal wells and limiting licensed abstractions to levels that are sustainable.
- Abolition of the free abstraction from wells.

The Water Strategy includes its visions for the future and 93 actions to achieve those visions.

### **2.1.3 Future Water Requirements**

The present and projected future water requirements for Amman and Zarqa governorates from the National Water Master Plan are given in the table below.

**Table 2.2 : Water Demand Forecast from National Master Plan (MCM/year)**

Governorate/demand category	2005	2020	Growth
<b>Amman Governorate</b>			
- Gross Municipal demand plus tourism	150.3	199.2	48.9
- Gross Industrial demand	1.2	2.3	1.1
- Sub-total	151.5	201.5	50.0
- Gross Irrigation Requirements	74.5	72.1	-2.4
<b>Zarqa Governorate</b>			
- Gross Municipal demand plus tourism	60.5	78.7	18.2
- Gross Industrial demand	7.8	13.0	5.2
- Sub-total	68.3	91.7	23.4
- Gross Irrigation Requirements	133.3	122.1	-11.2

The National Water Master Plan forecasts an increase in gross municipal and industrial demand in the two governorates of 73.4 MCM/year from 2005 to 2020, which will be partially offset by a small decrease in irrigation water use of 13.6 MCM/year, leaving a net increase in water demand in the two governorates of about 60 MCM/year. The savings in irrigation requirements are derived from assumed increases in irrigation efficiency. No reduction in the irrigated area is assumed. The projections for municipal demand for 2020 assume an increase in per capita consumption in the Greater Amman area to 150 l/d, and a large reduction in physical losses from the municipal water supply networks, amounting to 28.3 MCM per year for the two governorates. If the reduction in leakage represents a loss of return water to the Amman-Zarqa aquifer, the net increase in demands on the local resource will be nearly 90 MCM/year by 2020 (rather than the 60 MCM increase in gross demands). It is clear that, whilst the provision of an additional 100 MCM/year from implementation of the Disi project will facilitate an immediate reduction in the over abstraction of water from the Amman-Zarqa and Azraq basins, the improvements will be steadily eroded over time by increasing demands, and are likely to be completely lost by the early 2020s unless other measures are taken to manage demands or develop new resources.

Despite the above projections for increasing demand, Jordan's Water Supply Strategy is committed to reducing, and eventually eliminating, the current over abstraction of renewable resources.

Most water supplied for municipal, tourist and industrial use is returned as wastewater. Assuming 80% of the water supplied for municipal, tourist and industrial use is returned as wastewater, the projected increase in consumptive use in Amman and Zarqa governorates by 2020 is only 18.4 MCM/year. One means of minimising the impact of increasing municipal and industrial demand on the aquifers is to use the wastewater, after appropriate treatment, to replace groundwater for irrigation of fodder and tree crops.

The water abstracted from the Azraq basin for Amman is used outside the basin, so that any leakage from the distribution system in Amman is not returned to the aquifer from which it was taken. Also any treated wastewater from Amman will not be readily available for irrigation use within the Azraq basin. The National Water Master Plan shows no potential site for irrigation with treated wastewater in the Azraq basin. Therefore, it is important that the current abstractions for Amman reduce when the Disi scheme is operational.

## **2.2 Water Resources Management during the Operation of the Disi Scheme**

### **2.2.1 Actions to be Implemented by the Government of Jordan**

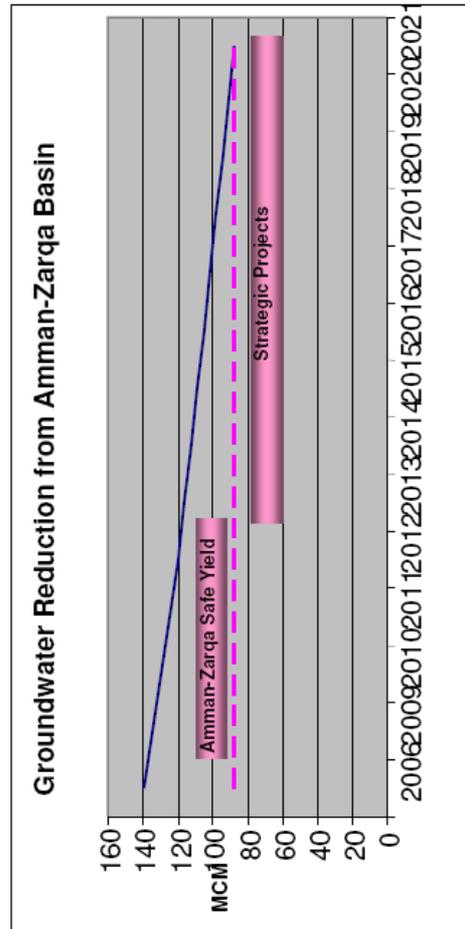
The additional 100 MCM/year of water provided from the Disi project will enable measures to be taken that will help to correct imbalances in the groundwater basins of Northern Jordan. The supply from Disi is approximately equal to the current deficit in the Amman-Zarqa and Azraq basins.

The Government of Jordan, through the MWI, produced in February 2009 a Groundwater Reduction Plan for Amman-Zarqa & Azraq Basins (see Appendix A). The plan outlines MWI's proposed actions for reducing over abstraction from the Amman-Zarqa Basin and the Azraq Basin. This plan has been approved by MWI/ under Decision No. 80 dated 15 February 2009.

In accordance with Scenario 2 of the Groundwater Reduction Plan for Amman-Zarqa & Azraq Basin, MWI will carry out the necessary actions outlined in the plan to ensure the following reductions in abstraction.

**Table 2.3 Reduction Plan of Groundwater Abstraction from Amman-Zarqa Basin (Scenario 2)**

	Expected Reduction Per Year (MCM)	Ground-water Abstraction (MCM)														
		2006	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Amman-Zarqa GW Basin		139.4	139.1	138.8	138.5	138.2	133.1	128.1	123.0	117.9	112.9	107.8	102.7	97.6	92.6	87.5
Reduction from Decrease free amount from 150,000 to 100,000 Tariff	0.3	139.4	138.5	137.6	136.7	135.8	131.0	126.1	121.3	116.5	111.7	106.8	102.0	97.2	92.3	87.5
Reduction from Increase in Tariff	0.9	139.4	138.4	137.4	136.4	135.4	130.6	125.8	121.0	116.2	111.5	106.7	101.9	97.1	92.3	87.5
Reduction from Renting Wells	1	139.4	136.4	133.4	130.4	127.4	123.4	119.4	115.4	111.4	107.5	103.5	99.5	95.5	91.5	87.5
Reduction from Buying Wells	3	139.4	134.2	129.0	123.8	118.6	115.5	112.4	109.3	106.2	103.1	99.9	96.8	93.7	90.6	87.5
TOTAL	5.2	139.4	134.2	129.0	123.8	118.6	115.5	112.4	109.3	106.2	103.1	99.9	96.8	93.7	90.6	87.5





outlined in Appendix A, to reduce the over abstraction from the aquifers in the Amman- Zarqa and Azraq basins. In addition MWI will ensure that the following is carried out in relation to the water supply to Amman:

- Once the Disi scheme is operational, all abstractions from the Azraq basin for Amman and Zarqa will cease. The wells used to supply Amman may be kept on standby as an emergency source, but shall not be used to supply other municipal or agricultural consumers.
- The Disi scheme will also enable immediate reductions in the abstractions from the Amman-Zarqa aquifer. However, other measures will need to be implemented if the reductions are to be maintained as demand grows.

The following actions, which are already included in ‘Jordan’s Water Strategy 2008-2022’ will ensure that the environmental benefits of reducing abstractions for Amman are maintained and in due course enable the supply from the aquifers with renewable resources to be brought back into balance with the recharge to the aquifer:

- Revise by-law 85/2002 to introduce stringent controls on groundwater use, including abolition of free abstraction.
- Establish a strict monitoring system to prevent illegal abstractions or over-exploitation of water wells; rigorously enforce by-law 85/2002 and close down all illegal water wells.
- Promote the use of treated wastewater for irrigation of tree and fodder crops, replacing irrigation from renewable groundwater resources.
- Adopt and enforce draft building and plumbing codes that set maximum flow limits for plumbing fixtures.

### **2.2.2 Timescale for Actions**

The actions described above are to be undertaken within the times given in the table below.

**Table 2.5 : Timetable for Completion of Actions**

<b>Action</b>	<b>Completion</b>
Preparation of management plans for the Amman-Zarqa and Azraq basins	Completed (see Appendix A)
Termination of abstractions for Amman from the Azraq basin	On commissioning of the Disi scheme
Termination of abstractions for Amman from the Amman-Zarqa basin	On commissioning of the Disi scheme
Reduction of abstractions from the Amman-Zarqa basin	In accordance with Table 2.3
Reduction of abstractions from the Azraq basin	In accordance with Table 2.4

### 2.2.3 Monitoring and Reporting

#### Monitoring

The Government, through MWI and WAJ, will monitor the impact of the Disi scheme as follows:

- (a) Baseline conditions will be established by DPAC as required in Section 5.4.3 of Part 1 of the ESMP. These data will be used as the basis of assessing the impact of the Disi scheme on conditions in the aquifers of the Amman-Zarqa and Azraq basins.
- (b) The supply of water to, and consumption within, Amman and Zarqa will be measured and recorded as follows:
  - Abstractions from the Amman-Zarqa basin.
  - Abstractions from the Azraq basin.
  - Supply from the Jordan Valley (raw water abstraction and treated water output).
  - Supply from Disi.
  - Measured billed consumption and hence calculated non-revenue water for Amman and Zarqa.
- (c) Abstractions from the Amman-Zarqa and Azraq basins for irrigation will be recorded.
- (d) The extent of the Azraq oasis and its fauna and flora will be recorded. The Royal Society for the Conservation of Nature (RSCN) has a mandate to monitor wildlife numbers in the reserves for which it is responsible and it should undertake this task.

#### Reporting

MWI is required to prepare a consolidated monitoring report containing details of items (a), (b), (c) and (d) and distribute it to WAJ, Project Company and the Lenders on an annual basis.

### **3 WATER QUALITY COMPLIANCE: MONITORING AND BLENDING**

#### **3.1 Background**

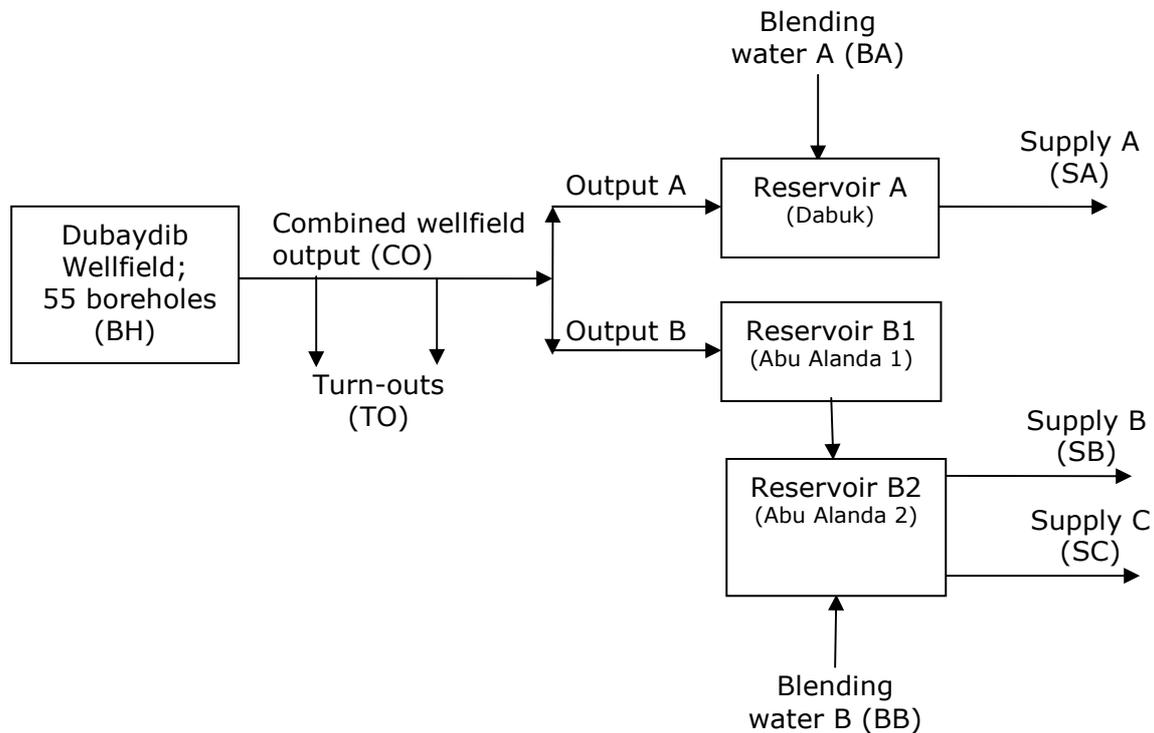
The aim of the Disi Project is to provide the population of Greater Amman with a reliable supply of drinking water that is compliant with the Jordanian Standard 286:2008 – 5<sup>th</sup> edition (JS 286). The Project Company will construct the Project Facilities, extract water and pump it to Amman. Throughout the construction and operations periods, the Project Company will be responsible for measuring water quality in accordance with the Technical Requirements set out in the Project Agreement in order to ensure that the water meets agreed standards. The measurement, control and mitigation of natural radioactivity in the Disi Water are under the responsibility of the MWI. This section sets out the specific responsibility of MWI in relation to natural radioactivity.

It is understood that the radioactivity in the Disi aquifer is naturally occurring and that the predominant radioactive isotopes are radium 226 (Ra-226) and Radium 228 (Ra-228) indicating that the radioactivity emanates from the natural Uranium decay series and the natural Thorium decay series. As such, other products of the Uranium and Thorium decay series may also be present in groundwater. The third main decay series observed in nature is the actinium decay series.

#### **3.2 Monitoring Proposals**

The required monitoring regime under this ESMP Part 2, for the Disi Project is generally based on the principles of the Jordanian Drinking Water Standards 286:2008 – 5<sup>th</sup> Edition, the WHO Guidelines for Drinking-Water Quality, and information provided by MWI to Lenders prior to commencement of the project.

A simplistic schematic of the Disi–Mudawarra to Amman Conveyance System is presented below:



The combined output of the wellfield will be pumped through a common pipeline and will be delivered to reservoirs A, B1 and B2. At reservoirs A and B2, blending water will be mixed with Disi water to reduce the concentration of radioactivity in Supply A, Supply B and Supply C to an acceptable level.

Sampling points are identified as:

- BH: 55 borehole well head sampling points with each borehole treated as a separate source
- CO: combined output of the wellfield, sampled at the wellfield collector tank
- TO: Turn-outs (if and when used), sampled after blending and prior to supply
- BA: blending water A, sampled at the inlet of Reservoir A
- BB: blending water B, sampled at the inlet of Reservoir B2
- SA: supply A, sampled at the outlet of Reservoir A
- SB: supply B, sampled at the outlet of Reservoir B2
- SC: supply C, sampled at the outlet of Reservoir B2

The screening procedure for gross alpha activity and gross beta activity of the output from each borehole should commence as soon as abstraction begins.

### **3.2.1 Construction Phase**

As a minimum during the construction phase, MWI is required to:

- During the completion and acceptance test for each borehole drilled by the Project Company, MWI shall sample the borehole and test for radioactivity parameters including the following:
  - Total alpha and total beta activity
  - Activities for radionuclides including radium (Ra-226 and Ra-228), radon (Rn-222), lead (Pb-210).
- Undertake repeat sampling and testing every two months for the above parameters for a maximum of 12 months on all boreholes in regular use for construction water by the Project Company and/or its EPC contractor.
- Undertake at least one repeat sampling and testing round for the above parameters at each borehole during the functional or commissioning tests carried out by Project Company and/or its EPC contractor.
- In addition to testing water for natural occurring radioactivity, MWI will also be responsible for testing the sand extracted from the drilling of the wells for naturally occurring radioactivity. Should the extracted sand be found to have radioactivity levels above the 10.8 nCi/kg proposed threshold limit<sup>1</sup> on hazardous waste, MWI will be responsible for the appropriate disposal of the extracted sand.
- Provide a report on a quarterly basis to the Lenders and the Project Company including results of water quality sampling and testing of each borehole drilled, used by the Project Company and/or its EPC Contractor, and on sand extracted from the drilling of the wells.
- During the first year of construction MWI should carry out quarterly samples to determine the level of radioactivity in the blending water (BA and BB). No later than 14 months prior after commencement of the construction phase, provide a report to the Lenders and Project Company containing a review of, and supporting data for, the effective radioactive dose and flow available for blending from water proposed for blending with the Disi water. The report must confirm whether the level of radioactivity in the blending water is sufficiently low to provide the dilution required to meet the requirements of JS 286 during the life of the project.
- No later than 12 months prior to the Commercial Operation Date, provide a report to the Lenders and Project Company containing a review of the occurrence and significance of radon in water from the boreholes and proposals for removal if required by JS 286.
- No later than 12 months prior to the Commercial Operation Date, MWI is required to confirm its programme for long term monitoring of water

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<sup>1</sup> The proposed threshold limit on hazardous waste is 10.8 nCi/kg, in accordance with International Atomic Energy Agency (IAEA) guidelines, that is expected to be transferred into Jordanian law in 2009.

quality to ensure compliance with this ESMP 2 and that water supplies conform with JS 286.

### **3.2.2 Operational Phase**

MWI is required to prepare a consolidated report on water quality (for radioactivity and other related parameters) on a semi-annual basis. The report shall be submitted to the Lenders and the Project Company.

As a minimum during commercial operation, MWI is required to undertake and report on the following sampling regime and activities:

- Sample all operating boreholes (BH) and the blending water (BA and BB) at a minimum frequency of every 3 months for the first 12 months of operation, and every two years thereafter, to determine the blending requirements for providing drinking water according to JS 286, and to assess any seasonal variations in radionuclide concentrations. Sampling must include the following:
  - Total alpha and total beta activity
  - Activities for radionuclides including radium (Ra-226 and Ra-228)
- Sample the combined flow (CO) and the blended water (SA, SB and SC), supplied to the distribution network at a minimum frequency of every month for the first two years of operation and quarterly thereafter except as otherwise agreed between MWI and the Lenders, to determine compliance with JS 286. Sampling must include the following:
  - Total alpha and total beta activity
  - Activities for radionuclides including radium (Ra-226 and Ra-228)
- Sample the combined flow (CO), at a minimum frequency of every quarter during the first year of operation and annually thereafter for the following parameters:
  - Activities for radon (Rn-222) and lead (Pb-210) radionuclides
- For emergency turn-outs (TO) that might be operated on a temporary basis after informing Lenders MWI must ensure that appropriate blending or other type of treatment is implemented at each turn-out so that water supplied conforms with the requirements of JS 286. MWI must sample TO, at a minimum frequency of every month for the first two years of operation and quarterly thereafter except as otherwise agreed between MWI and the Lenders, and to determine compliance with JS 286. Sampling must include the following:
  - Total alpha and total beta activity
  - Activities for radionuclides including radium (Ra-226 and Ra-228)
- Undertake continuous flow measurement of the blending water (BA and BB), and the blended water (SB) and (SC). Undertake continuous flow measurement at emergency turn-outs (TO) for the duration of use.
- MWI will be responsible for semi-annually testing of sand deposits in the facilities, resulting from the operation of the project, for naturally

occurring radioactivity. Should the sand be found to have radioactivity levels above the 10.8 nCi/kg proposed threshold limit on hazardous waste, MWI will be responsible for its appropriate disposal.

- Disposal of well pumps and equipment contaminated as a result of fouling/scaling with naturally occurring radioactive material (NORM) will need to be assessed and, if necessary, disposed of by MWI during the life of the project.
- MWI is required to provide a report on a semi-annual basis to the Lenders and the Project Company including results of sampling and testing of water quality, results of sampling and testing of sand deposits around the facilities, and results of flow measurements at BA, BB, SB, SC and TO. The semi-annual report must also include details of the assessment and disposal of any contaminated equipment, assessed upon replacement.
- If under any circumstances and during the sampling regimes outlined above, gross alpha activity is in excess of 0.5 Bq/litre or gross beta activity is in excess of 1 Bq/litre, then the specific radionuclides producing this activity should be identified and their individual activity concentrations should be measured (ref. JS 286 paragraphs 5.2.1.5 and 5.2.2.5, and WHO Guidelines paragraph 9.4.2).
- MWI is required to immediately notify (Red Flag notification), the Lenders and the Project Company in the event that the projected blended water output (SA, SB or SC) exceeds the equivalent effective dose per year of 0.45 mSv/y. No later than three months after notification is issued to Lenders, MWI must carry out progressive sampling of the operational boreholes (BH) to identify and mitigate the problem, and provide a monthly report (Red Flag report) to the Lenders and the Project Company with the proposed measures to ensure that the blended water output (SA, SB or SC) does not exceed the threshold of 0.5 mSv/y and progress relating to their implementation. Sampling of BH must include the following:
  - Total alpha and total beta activity
  - Activities for radionuclides including radium (Ra-226 and Ra-228)
- If the effective dose per year of blended water exceeds 0.5 mSv/y, MWI is required to implement remedial measures within a maximum of 18 months and shall immediately commence sampling of operating boreholes (BH) at a rate of every 2 months (ref. JS 286 paragraph 5.2.1.5). Sampling and testing shall continue until the effective dose per year reduces to below 0.45 mSv/y. Progress and radioactivity sampling results must be reported in the monthly Red Flag report to Lenders and the Project Company.
- The effective dose per year of blended water may never exceed 1 mSv/y. If the total exposure is exceeds this threshold, MWI must ensure that the supply to the distribution network stops immediately (ref. JS 286 paragraph 5.2.2.5), and only recommences once remedial actions are implemented. Progress or remediation measures and radioactivity

sampling results must be reported in the monthly Red Flag report to Lenders and the Project Company.

### 3.2.3 Summary of Radioactivity Sampling and Reporting Requirements

**Table 3.1 Summary of Radioactivity Sampling and Reporting Responsibilities of MWI**

Sampling Location	MWI Responsibility	Timescale / Frequency	ACTIONS				
			MWI	Project Company	Lenders	Operator	
<b>CONSTRUCTION PHASE</b>							
<b>SAMPLING</b>							
At Wellfield (BH)	Sample and test for radioactivity water from all boreholes in regular use for construction water (total alpha, total beta, Ra-226 and Ra-228, Rn-222, Pb-210)	Every 2 months for a maximum of 12 months	E	N	R	N	
At Wellfield (BH)	Sample and test for radioactivity from all boreholes (total alpha, total beta, Ra-226 and Ra-228, Rn-222, Pb-210)	Twice. Once during the completion and acceptance test and once during the functional or commissioning test	E	N	R	N	
At Wellfield (BH)	Sample and test sand extracted from the drilling of each borehole	Once during the drilling of the borehole	E	N	R	N	
Blending Water (BA and BB)	Sample to determine the level of radioactivity in the blending water (BA and BB)	Quarterly during the first year of the construction phase	E	N	R	N	
<b>REPORTING</b>							
	Report on the results of sampling and testing of each borehole drilled, used by the Project Company and/or its EPC Contractor, and on sand extracted from the drilling of the wells	Quarterly for the duration of the drilling	E	N	R	N	
	Report on the level of radioactivity in the blending water (BA and BB), and confirmation of available flow for blending	No later than 14 months after commencement of the construction phase	E	N	R	N	

Sampling Location	MWI Responsibility	Timescale / Frequency	ACTIONS			
			MWI	Project Company	Lenders	Operator
	Review the occurrence of radon in water from the boreholes and provide a proposal for removal if required by JS 286	No later than 12 months prior to Commercial Operation Date	E	N	R	N
	Confirm the MWI programme for long term monitoring of water quality to ensure compliance with this ESMP 2 and JS 286	No later than 12 months prior to Commercial Operation Date	E	N	R	N
<b>OPERATIONAL PHASE</b>						
<b>SAMPLING</b>						
At Wellfield (BH)	Sample and test all operating boreholes for radioactivity levels (total alpha, total beta, Ra-226 and Ra-228)	Quarterly for the first 12 months. Every two years thereafter.	E	N	R	N
At Wellfield reservoir (CO)	Sample and test at the combined flow for radioactivity levels (total alpha, total beta, Ra-226 and Ra-228)	Monthly for the two years of operation and quarterly thereafter except as otherwise agreed between MWI and Lenders	E	N	R	N
At inflows to reservoirs (BA and BB)	Sample and test blending water for radioactivity levels (total alpha, total beta, Ra-226 and Ra-228)	Quarterly for the first 12 months. Every two years thereafter.	E	N	R	N
At reservoir outlet (SA, SB and SC)	Sample and test blended water for radioactivity levels (total alpha, total beta, Ra-226 and Ra-228)	Monthly for the first two year of operation and quarterly thereafter except as otherwise agreed between MWI and Lenders	E	N	R	N
At turn-outs (TO)	Sample and test treated water for radioactivity levels (total alpha, total beta, Ra-226 and Ra-228)	Monthly for the first two years of use and quarterly thereafter except as otherwise agreed between MWI and Lenders	E	N	R	N
At Wellfield reservoir	Sample and test combined flow for Rn-222 and Pb-210	Every quarter during the first year of operation and annually	E	N	R	N

Sampling Location	MWI Responsibility	Timescale / Frequency	ACTIONS			
			MWI	Project Company	Lenders	Operator
(CO)		thereafter				
At reservoir outlet (SA, SB and SC)	Sample and test blended water for Rn-222 and Pb-210	Every quarter during the first year of operation and annually thereafter	E	N	R	N
At selected locations	Sample and test sand deposits in the facilities	Semi-annually	E	N	R	N
At BA, BB, SB, SC and TO	Measure daily flow at BA, BB, SB, SC and TO	Continuous flow measurement	E	N	R	N
At selected locations	Sample and test replaced equipment for radioactivity	Upon replacement	E	N	R	N
At Wellfield (BH)	Progressively sample and test for radioactivity levels all operating boreholes (total alpha, total beta, Ra-226 and Ra-228)	Upon issue of a “Red Flag” notification. Once if effective dose exceeds 0.45 mSv/y and every two months if effective dose exceeds 0.5 mSv/y.	E	N	R	N
<b>REPORTING</b>						
	Report on results from the above sampling requirements with respect to the level of radioactivity in the water from the operating boreholes (BH), combined flow from the wellfield (CO), blending water (BA and BB), blended water (SA, SB and SC), and treated water at turn-outs (TO)	Semi-annually for the life of the project	E	N	R	N
	Report on flow measurements at BA, BB, SB, SC and TO	Semi-annually for the life of the project	E	N	R	N
	Report on level of radioactivity in sand deposits	Semi-annually for the life of the project	E	N	R	N
	Report on the radioactivity assessment and disposal of equipment replaced	Semi-annually for the life of the project	E	N	R	N

Sampling Location	MWI Responsibility	Timescale / Frequency	ACTIONS			
			MWI	Project Company	Lenders	Operator
	Red Flag notification and report	When the projected effective dose exceeds 0.45 mSv/y and monthly following a Red Flag notification	E	N	R	N

**Key:** R= Review/clear E= Execute S= Support N=Notified

## 4 COMPENSATION PLAN

### 4.1 ESMP and ESMP Part 2 Implementation Responsibilities

The roles and responsibilities for the implementation of separate phases and components of the project ESMP are outlined in ESMP Chapter 8, Table 8.1. Although the majority of the actions fall under the responsibility of the Project Company, the Compensation Plan (Actions 13 to 20 in the table) is primarily the responsibility of MWI. The part of Table 8.1 of ESMP that refers to the Compensation Plan has been included in ESMP Part 2 and the Actions that need to be addressed by MWI have been highlighted.

A timescale for the completion of the Actions has been identified and specific comments on the Actions incorporated.

**Table 4.1 Role of Project Parties in ESMP Implementation (part of Table 8.1 - ESMP)**

Action	Element in ESMP	RESPONSIBLE PARTY								Timescale	
		MWI	DPAC EC	PC ESD	EPCC EU	Operator	SG	MoE	Municipalities		Other
<b>Compensation Plan</b>											
13	Develop Valuation Guidelines for Committees	E		E					S	S	1
14	Confirmation of Entitlements Matrix	E			E		N				1
15	Compensation Inventory	E	N		E				S		2
16	Notification	E	N	N					S		2
17	Establish Valuation Committees and CRB	E		N					S		1
18	Valuation and Negotiation	E	N	N					S		2
19	Appeal Process	E	N	N					S		3
20	Completion – Payment and certification	E	N	N	N				N		3

**Key:** R= Review/clear E= Execute S= Support N=Notified

**Timescale Key:**

1. Required no later than 3 months after the effective date
2. Implemented over a number of years and on a when required basis ahead of the construction programme
3. To be complete before commencement of specific works on site

## **4.2 MWI Responsibilities under ESMP Part 2**

### **Develop Valuation Guidelines for Committees (Action 13)**

These must be tied to IFC Performance Standard 5 'Land Acquisition and involuntary Resettlement' and to an agreed and precisely mapped engineering baseline. In addition to compensation for land and property lost, compensation should also cover farm workers near Disi who may lose their employment<sup>2</sup> and businesses in Amman and other built up areas who either temporarily or permanently will suffer from reduced access.

### **Confirmation of Entitlements Matrix (Action 14)**

The Entitlements Matrix has been drawn up and appears as Table 4.2 in ESMP, April 2009. Triggers for confirmation of the entitlements matrix are provided in Table 4.3 in ESMP, April 2009 but it will be necessary for all parties involved in implementation of the project to agree on the final matrix and triggers to be applied.

### **Compensation Inventory (Action 15)**

Once the entitlements matrix is defined and the design review is complete an inventory of properties and assets is to be undertaken. Once these are defined, an affected persons census must be carried out and consultation undertaken in the form of community meetings.

### **Notification (Action 16)**

Once the affected assets are defined all individuals shall be notified and notifications placed in two National newspapers at each affected municipality.

### **Establish Valuation Committees and Compensation Review Board (CRB) (Action 17)**

Land Valuation Committee and Business Valuation Committee are to be established and guided by a pre-established valuation framework established for the project.

### **Valuation and Negotiation (Action 18)**

Once it has been established whether impacts cannot be resolved without payment of compensation, PAPs will be contacted with date of a valuation visit and given 14 days notice of this visit. After visit valuation prepared and delivered to PAP who will have 28 days to appeal and a period of 60 days for negotiation after initial valuation.

### **Appeal Process (Action 19)**

This may involve 'No Appeal', 'Appeal lodged' or 'No Response' from the PAP after 60 days, in which case draft compensation is referred to the CRB. Options for a project specific process for appeals is outlined in the ESMP (p21) since there is no specific legal basis in Jordanian law for compensation as defined in the entitlements matrix.

### **Completion – Payment and certification (Action 20)**

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<sup>2</sup> As in Table 4.2 'Entitlements Matrix' in ESMP, August 2008, Entitlement for Loss of Employment is defined as: 'Compensate demonstrable loss income for a given period as a result of project activities in accordance with Jordanian Labour law. To apply to all employees irrespective of nationality'

Once agreement is reached payment should take place followed by a certificate of compensation. All payments must be tied to IFC Performance Standard 5 'Land Acquisition and involuntary Resettlement' and to an agreed and precisely mapped engineering baseline. In addition to compensation for land and property lost, compensation should also cover farm workers near Disi who may lose their employment and businesses in Amman and other built up areas who either temporarily or permanently will suffer from reduced access. In the case of no response to compensation offer from a PAP, funds should be placed in a bank account for a minimum period of 5 years to be claimed by PAP on proof of eligibility.

**Reporting**

MWI should produce quarterly reports providing feedback to Project Co and the Lenders of the progress in implementing the Compensation Plan.

## **Appendix A      Groundwater Reduction Plan for Amman-Zarqa & Azraq Basins**

# **GROUNDWATER REDUCTION PLAN FOR AMMAN-ZARQA & AZRAQ BASINS**

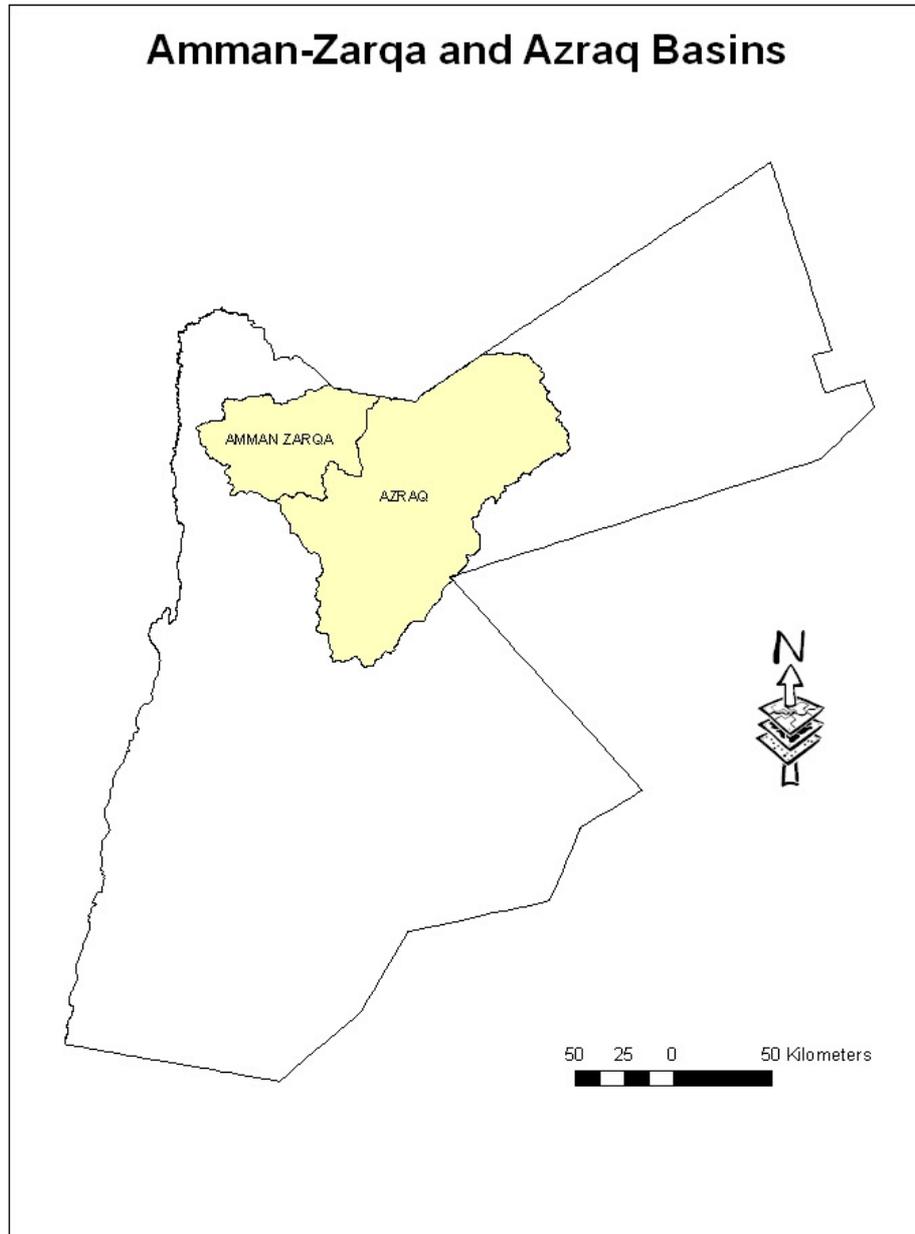
Prepared by the Ministry of Water and Irrigation /  
February 2009

# 1 Background

Amman-Zarqa Basin is the most important source of fresh ground water for domestic, agriculture and industrial sectors. The basin area is around 3590 km<sup>2</sup> and comprises mainly the city of Amman and Zarqa with 2.5 million inhabitants. Annual average rainfall ranges between 150 mm into the east and 500 mm to the east over the highlands. The basin's annual safe yield is estimated at 87.5 MCM. Abstraction from the basin in 2006 was 139 MCM and the number of active legally registered wells was 772 in the same year. There are few illegal wells in the basin. Over-exploitation, increased demand, and temporal and spatial variance of precipitation led to water-level decline (hydrographs below demonstrate an example of water-level drawdown).

Azraq basin is of regional importance. It is shared between Jordan and Syria. The total area of Azraq basin is about 12710 km<sup>2</sup>. Approximately 94% of the basin lies within Jordan and 6% within Syria. The basin is an important aquifer in the water supply of Jordan. Azraq Oasis is a unique oasis having important ecological, historical, and economic connections with Jordan and the world. It is located 85 km east-southeast of Amman and forms the ultimate collection point for the Azraq drainage basin. Two groups of springs exist at the border of the Oasis; the Drouze springs and Shihan springs. The discharge of these springs was about 15 MCM/a before 1981. With over-exploitation of the basin, the discharge of the springs was dramatically affected; Drouze springs and Shihan springs dried out completely. Annual average rainfall is 90 mm, and the basin's annual safe yield is estimated at 24 MCM. The basin supplies the city of Amman with 15-22 MCM/a since 1982. Large farming activities are taking place and consume considerable amounts of fresh ground water. Abstraction from the basin in 2006 was 59 MCM and the number of active legally registered wells was 596 in that year. There are many illegal wells in the basin. Over-exploitation for 20 years has produced excessive drawdown (hydrographs below), cessation of spring discharges and ecosystem degradation.

The location of both basins is shown in the map below.

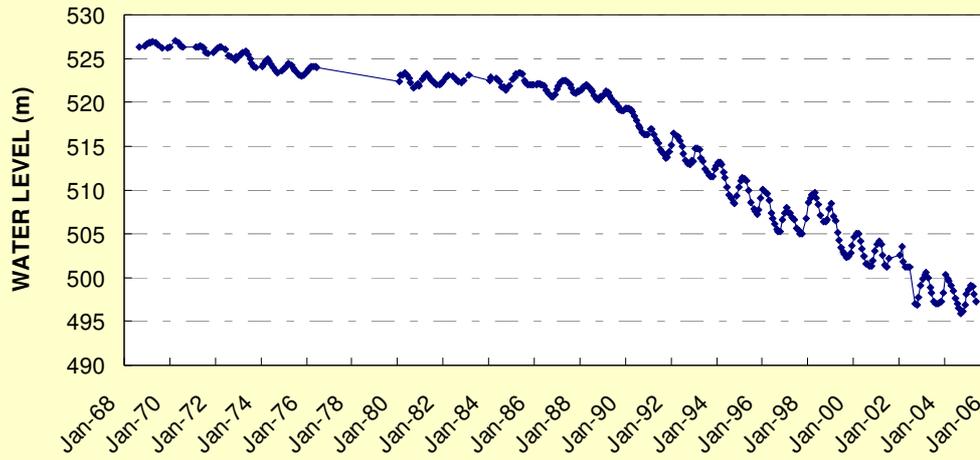


Map shows the location of Amman-Zarqa and Azraq Basins.

AMMAN\_ZARQA

## AL1041

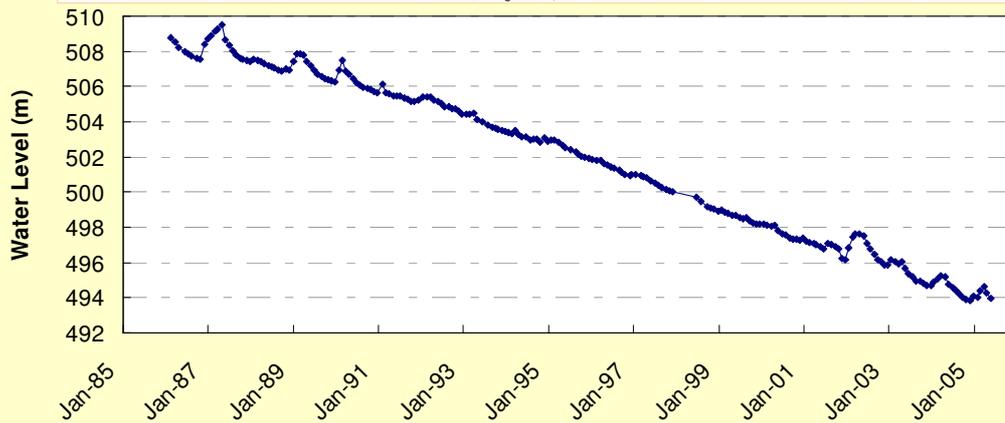
Well History: Name: TW6 / W. DHULEIL (PP 158) , Depth:155m, Measuring point:576.55m , Drilling Ended:15/05/1964, Aquifer:Amman/Wadi Sir (B2/A7)-Unconfined , WL at Drilling:526 , Recorder



AZRAQ

## F1043

Well History: Name: AZ 12 (PP 195), Depth:255 m, Measuring point: 517.2 m, Drilling Ended: 27-Nov-1963, Aquifer: Basalt-Unconfined, B4-Unconfined, WL at Drilling: 512.5, Recorder



Hydrographs demonstrate water-level decline in Amman-Zarqa and Azraq Basins

## 2 Groundwater Management Plan for Amman-Zarqa and Azraq Groundwater basins

### 2.1.1 Historical Trend of Groundwater Abstraction

The total amount of water produced by private irrigation wells in the years 2002-2006 for both basins (Amman-Zarqa & Azraq) is presented in table1 & table2. Different production categories were identified by the committee; Major water consumers are within the production category of greater than 100,000 m<sup>3</sup>/year. About 83% of water users in Amman Zarqa Basin and 61% in Azraq Basin are classified as major water consumers.

**Table 1: Water Production m<sup>3</sup> in Amman Zarqa Basin\_AL (Private Irrigation Wells)**

Production Categories	Production (m <sup>3</sup> )				
	2002	2003	2004	2005	2006
less than 100,000	9,973,572	10,368,756	8,977,548	9,472,200	9,672,276
less than 150,000	22,231,320	17,462,628	20,427,816	19,535,076	19,205,676
Between 100,000 & 150,000	12,857,748	7,093,872	11,450,268	10,212,876	9,533,400
greater than 100,000	41,720,505	42,130,452	48,563,724	48,909,876	47,380,464
greater than 200,000	17,313,636	23,546,940	25,050,036	25,964,148	25,777,860
<b>TOTAL Production</b>	<b>51,694,077</b>	<b>52,499,208</b>	<b>57,541,272</b>	<b>58,382,076</b>	<b>57,052,740</b>

**Table 2: Water Production m<sup>3</sup> in Azraq Basin\_F (Private Irrigation Wells)**

Production Categories	Production (m <sup>3</sup> )				
	2002	2003	2004	2005	2006
less than 100,000	13,505,076	13,689,888	12,914,208	12,765,624	13,538,784
less than 150,000	18,906,480	18,007,848	18,455,772	17,701,272	19,216,488
Between 100,000 & 150,000	5,851,404	4,767,960	5,991,564	5,685,648	6,727,704
greater than 100,000	20,287,608	19,752,096	20,972,256	21,522,480	22,055,844
greater than 200,000	8,237,136	9,918,480	9,284,172	9,970,752	9,742,236
<b>TOTAL Production</b>	<b>33,792,684</b>	<b>33,441,984</b>	<b>33,886,464</b>	<b>34,288,104</b>	<b>35,594,628</b>

### 2.1.2 Reduction Plan of GW Abstraction from Amman Zarqa and Azraq Basin

The committee suggested the following procedures to reduce the groundwater production for both basins until year the 2012. After 2012 the major strategic projects are expected to be in operation and there will be a dramatic decrease in the production from both basins until they reach the safe yield abstraction in the year 2022 (Safe Yield of Amman-Zarqa Basin= 87.5 MCM and for Azraq Basin = 24 MCM).

1- Revision of Groundwater Monitoring By-Law No. (85) of 2002:

**a-** Reduce the free of charges amounts of yearly Groundwater abstraction from 150,000 m<sup>3</sup> to 100,000 m<sup>3</sup> for irrigation use. **Target completion date: December 2009.**

For the calculations of this part, the amount of groundwater production that exceeds 100,000 m<sup>3</sup> for the categories between 100,000 m<sup>3</sup> and 150,000 m<sup>3</sup> were calculated for

each well in both basins then the results were aggregated per basin for the years 2002-2006. The average amounts are 2.1 MCM for Amman-Zarqa Basin and 1.3 MCM for Azraq Basin.

Three Scenarios were assumed depending on the percentage of the farmers that will decrease the amount of water abstracted see table 3. WAJ Experience and the survey The assumptions made for these scenarios are based on WAJ expert judgment and the results of a past USAID-WAJ collaboration on groundwater. In 2007, a survey<sup>1</sup> was conducted to assess the impact of By-law 85/2002 on water abstraction among a representative sample of 320 well owners. The survey showed that the By-law prompted 61% of users to reduce water consumption, an additional 22% knew about the By-law, but did not reduce consumption. A small number (17%) had never heard of the By-law.

**Table 3: Scenario (Decrease free amount from 150,000 m<sup>3</sup> to 100,000 m<sup>3</sup>)**

Basin	S1 (100%)	S2 (50%)	S3 (30%)
Amman Zarqa	2.1	1.0	0.6
Azraq	1.3	0.6	0.4

**b- Revise the groundwater tariff for irrigation use. Target completion date: October 2009.**

In this part all the amount that exceeds 150,000 m<sup>3</sup> was calculated for each well in both basins and then has been aggregated for each basin as shown below.

**Table 4: Scenario Increase in Tariff**

Basin	S1 (20%)	S2 (30%)	S3 (40%)
Amman Zarqa	1.3	2.7	4.0
Azraq	0.5	1.0	1.5

2- Enforcement of Article 29, item A 1 of the By-Law No.(85) of 2002 " ....The license for water extraction issued by the Secretary General or delegate containing the conditions that the licensee should comply with, including the following: 1- the maximum amount of water that may be extracted from the well within a fixed period of time" if the above mentioned point were not implemented."

This procedure would be another alternative for the first procedure if it didn't work, and it will almost reduce the same amount assumed in the previous. **Target completion date: December 2009.**

Illegal wells which have complied with well licensing and become legally pumping wells are constrained on the amount of water they can pump. Specified free quantities are per year and there are charges of 60 Fils per cubic meter after that. In the Amman-Zarqa Basin there are 19 wells and 94 wells in Azraq Basin with such specified free quantities. The table below shows the amount of water that can be saved annually for

<sup>1</sup> "By-law 85/2002 Impact Assessment" USAID/WAJ report Groundwater Management Enforcement Directorate, 2007

the years (2004 – 2007) if the farmers are restricted to the annual specified free quantities.

Basin Name	2004	2005	2006	2007
Amman-Zarqa	582,833	674,942	520,895	305,622
Azraq	3,156,300	3,435,600	2,481,708	1,415,528

Given that the grace period stated in the By-law for licensing illegal wells has passed, licensing should no longer be an option. All wells that have not been licensed should be identified and backfilled at the cost of the owner. Tackling illegal wells should be a high priority.

In fact, progress has been made. Under By-Law 85/2002, 320 illegal wells have been closed in Jordan, of which 51 wells are in Azraq Basin and 11 wells in the Amman-Zarqa Basin. In addition, 300 illegal wells have complied with the licensing conditions and become legal. There remain 400 illegal wells that have not complied with licensing conditions. These wells should be closed. In the interim, a high tariff is being imposed on water extracted as a temporarily measure until the issuing of the new water law.

**Scenario2** was chosen by the committee to formulate the final plan shown in the tables and graphs below.

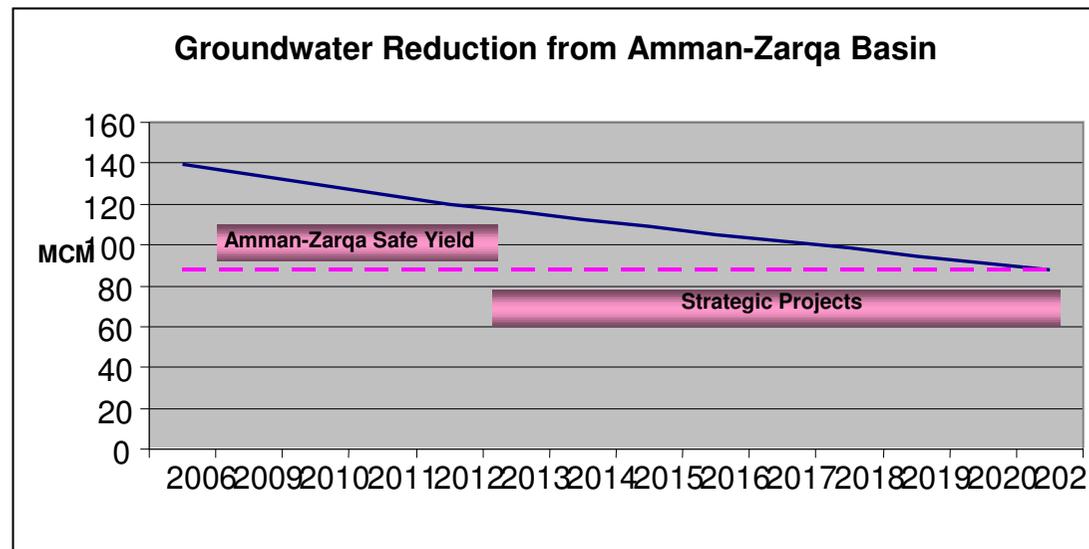
**3- Renting and buying the irrigation wells by the Water Authority of Jordan. Target initiation date: February 2009 with annual targets of 20 wells in Amman-Zarqa Basin and 5 wells in Azraq Basin rented or bought by WAJ.**

WAJ is already working in this direction. In 2008 16 wells were rented and contracts with two wells owners were signed in 2009. There are 16 wells under process all over the Kingdom. This was done through WAJ's efforts of sending official letters to all private well owners to check the owner's willingness to rent their wells to WAJ. As a last resort, WAJ could choose not to renew well pumping licenses when they come up for annual renewal. This would have an immediate and dramatic effect on the aquifer.

- The reduced amount of water from renting or buying wells was estimated at about 1MCM and 3 MCM per year respectively.
- The estimated budget for buying some wells to reduce the 3 MCM per year is equal to about 3 million JD per year. It should be noted that this cost is cheaper than some large capital intensive water supply activities.

**Table 5: Reduction Plan of GW Abstraction form Amman-Zarqa Basin (Scenario 2)**

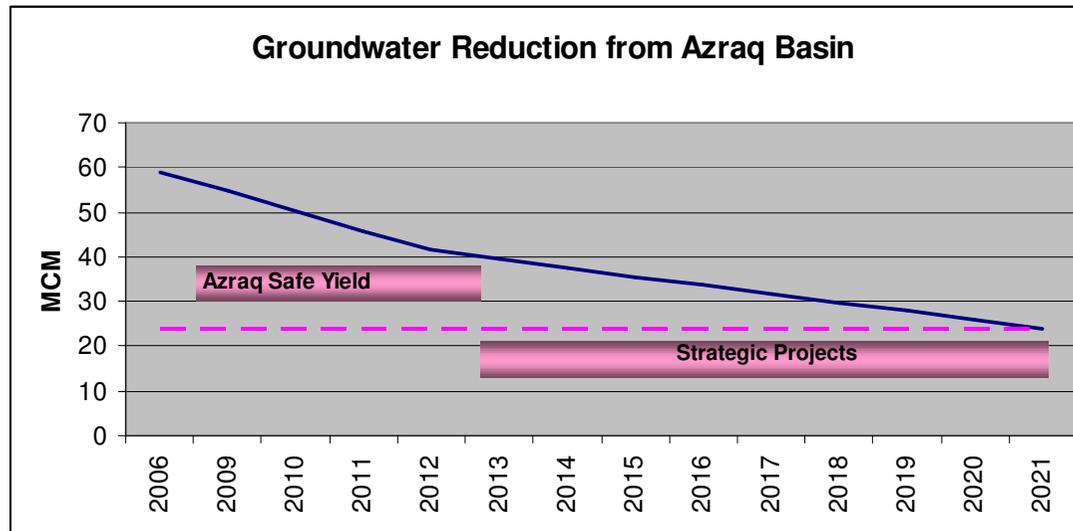
Amman-Zarqa GW Basin	Expected Reduction Per Year (MCM)	Ground-water Abstraction (MCM)														
		2006	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Reduction from Decrease free amount from 150,000 to 100,000	0.3	139.4	139.1	138.8	138.5	138.2	133.1	128.1	123.0	117.9	112.9	107.8	102.7	97.6	92.6	87.5
Reduction from Increase in Tariff	0.9	139.4	138.5	137.6	136.7	135.8	131.0	126.1	121.3	116.5	111.7	106.8	102.0	97.2	92.3	87.5
Reduction from Renting Wells	1	139.4	138.4	137.4	136.4	135.4	130.6	125.8	121.0	116.2	111.5	106.7	101.9	97.1	92.3	87.5
Reduction from Buying Wells	3	139.4	136.4	133.4	130.4	127.4	123.4	119.4	115.4	111.4	107.5	103.5	99.5	95.5	91.5	87.5
<b>TOTAL</b>	<b>5.2</b>	<b>139.4</b>	<b>134.2</b>	<b>129.0</b>	<b>123.8</b>	<b>118.6</b>	<b>115.5</b>	<b>112.4</b>	<b>109.3</b>	<b>106.2</b>	<b>103.1</b>	<b>99.9</b>	<b>96.8</b>	<b>93.7</b>	<b>90.6</b>	<b>87.5</b>



**Graph 1: Reduction Plan of GW Abstraction form Amman-Zarqa Basin (Scenario 2)**

**Table 6: Reduction Plan of GW Abstraction form Azraq Basin (Scenario 2)**

Azraq GW Basin	Expected Reduction Per Year (MCM)	Ground-water Abstraction (MCM)														
		2006	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Reduction from Decrease free amount from 150,000 to 100,000	0.2	59.0	58.8	58.6	58.4	58.2	54.8	51.4	47.9	44.5	41.1	37.7	34.3	30.8	27.4	24.0
Reduction from Increase in Tariff	0.3	59.0	58.7	58.4	58.1	57.8	54.4	51.0	47.7	44.3	40.9	37.5	34.1	30.8	27.4	24.0
Reduction from Renting Wells	1	59.0	58.0	57.0	56.0	55.0	51.9	48.8	45.7	42.6	39.5	36.4	33.3	30.2	27.1	24.0
Reduction from Buying Wells	3	59.0	56.0	53.0	50.0	47.0	44.7	42.4	40.1	37.8	35.5	33.2	30.9	28.6	26.3	24.0
<b>TOTAL</b>	<b>4.5</b>	<b>59.0</b>	<b>54.5</b>	<b>50.0</b>	<b>45.5</b>	<b>41.0</b>	<b>39.3</b>	<b>37.6</b>	<b>35.9</b>	<b>34.2</b>	<b>32.5</b>	<b>30.8</b>	<b>29.1</b>	<b>27.4</b>	<b>25.7</b>	<b>24.0</b>



**Graph 2: Reduction Plan of GW Abstraction form Azraq Basin (Scenario 2)**

4- A social component of the plan will be the formation or strengthening of groundwater basin users associations, one for each basin. Involving the users is one way to reduce potential conflict and gain buy-in from the community. WAJ should help organize the associations and monitor their operation to ensure equity and sound management. No extraction reductions have been estimated for this approach, however, it is felt that user associations can help successfully implement the other approaches defined above. **Target completion date: December 2009.**

## **Summary & Conclusion**

- Until the year 2012, the reduction of groundwater abstraction shall be mainly from private irrigation wells in both basins, thereafter, some of the strategic projects are expected to be in operation and therefore, the reduction will continue to increase from different uses until it reaches the safe yield in 2022 (as planned in the NWMP).
- Well(s) renting and/or buy-out has already begun and is making progress. It depends on the willingness of the well owners and WAJ's funding availability. WAJ has started to contact well owners to determine interest in relation to well rental and/or buy-out and is in the process of advertising in the newspaper and on the MWI website to attract interested well owners.
- Successful implementation of the groundwater reduction plans will be affected by, but is not dependent on the water-year conditions (Wet, Moderate, or Dry) and the implementation of the strategic projects. However water-year conditions and implementation of strategic projects should have no impact on the private wells buy-out program, which should move forward.
- The Ministry of Water and Irrigation will revise the plans on yearly basis.
- Quarterly reports on the abstraction from both basins for all uses will be submitted by GWBMD / Water Authority of Jordan. Annual reports will assess compliance with the targets and proposed measures outlined in this plan. Both quarterly and annual reports will be available to the public.

- The revision of Groundwater Monitoring By-Law No. (85) of 2002, as stated in 2.1.2.1. of this report, will be done after official issuance of the new water law. Additional points may be considered when drafting the new water law:
  - The Government of Jordan may take over wells and close them. This could be synced with payment of fees to renew pumping licenses. First wells for consideration should be those that have operated long enough for the owners to have recovered investment costs and to have gained reasonable profits from the wells. Also to be considered should be sources of income for farmers impacted. Those dependent on use of the wells for farming, and such farming is the major source of family income should be low priority for well closures. Farmers not dependent on agriculture income from the wells should be high priority for closure. This group is likely to include many of the large extractors who do not live in the local community and will have the largest positive impact on extraction reduction.
  - Groundwater user associations should be formed in each of Jordan's water basins with initial support from the government to help define structures and functions.