THE HASHEMITE KINGDOM OF JORDAN
MINISTRY OF WATER AND IRRIGATION (MWI)
WATER AUTHORITY OF JORDAN (WAJ)
YARMOUK WATER COMPANY (YWC)

PREPARATORY SURVEY REPORT
ON
THE PROGRAMME FOR URGENT IMPROVEMENT OF WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIAN REFUGEES IN NORTHERN GOVERNORATES
IN
THE HASHEMITE KINGDOM OF JORDAN

December 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

TEC INTERNATIONAL CO., LTD.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on the The Programme for Urgent Improvement of Water Sector for the Host Communities of Syrian Refugees in Northern Governorates and entrust the survey to TEC INTERNATIONAL Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of the Hashemite Kingdom of Jordan, and conducted a field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Hashemite Kingdom of Jordan for their close cooperation extended to the survey team.

December, 2014

Masami Fuwa
Director General,
Global Environment Department
Japan International Cooperation Agency

SUMMARY

1. Overview of the Country

The Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan") has a population of 6.38 million people (as of 2012) and land area of 89,316 km^2. It is surrounded by Israel (West Bank, Palestinian Interim Self-Government Authority) in the west, Syria in the north, Iraq in the east, and Saudi Arabia in the southeast. Western area of the Kingdom has a narrow valley, known as Jordan Valley, which spreads from Jordan River through the Dead Sea (which is 400 m below sea level) and to the Gulf of Aqaba in the Red Sea. The east side of Jordan Valley is a plateau area of 600 ~ 1,500 m above sea level, and on the east of the plateau area is a desert area which covers around 75% of the national land. Most of the rainfall occurs during winter. The amount of rainfall varies, reaching an average of up to around 660 mm in the northeast plateau and only around 120 mm in the desert area.
The per capita GNI of Jordan is 4950 US dollars (2013). The percentages of GDP by industry are as follows: tertiary industry including tourism industry is maximum and accounts for 67% of the total, with secondary industry coming next and accounts for 30%, followed by the primary industry at 3% (2013). The economic growth presently is sluggish (2.8%: 2013) having been impacted by the global financial crisis in 2008. Furthermore, the economy is plagued by structural issues such as difference in income levels in the urban and regional areas, poverty and unemployment rates changing at high levels, and chronic financial gap. It is vulnerable and likely to be swayed by trends such as financial aid from abroad as in the past, security situation in the area, and short-term inflow of capital from abroad.
The population of Jordan is 6.39 million (2012), and the country has still maintained the high population growth rate (2.2%:2012). After 2011, the inflow of refugees from neighboring Syria has increased steeply. According to the Office of the United Nations High Commissioner for Refugees (UNHCR), this population has reached to about 600,000 as of the end of May 2014, and accounts for 10% of the population of Jordan.

2. Background of the Project

With the inflow of a large number of Syrian refugees into Jordan after the Syrian crisis in 2011, the water issue in Jordan has worsened considerably. According to UNHCR statistics, as of May 2014, the registered number (including persons on the waiting list) of refugees that entered Jordan is about 590,000. Out of this number, 390,000 refugees have entered the four northern governorates, while 240,000 persons have entered the Irbid governorate. About half of the refugees have entered the Irbid governorate. The areas where these Syrian refugees have migrated to reside in large numbers are called "host communities." The population of Irbid governorate in 2012 was 1.13 million but this number has increased to 1.31 million including the population of Syrian refugees in 2014. Syrian refugees account for about 20% of the population. The result was that the water supply situation worsened in the host communities because limited water resource was being shared with a larger population. It seems that in some areas friction arose between the Syrian refugees and native Jordanians.
97% of the population in the four northern governorates of Jordan has been making use of the water supply services through pipelines. All water sources are underground water sources. The water source volume assigned to the four northern governorates is limited. The demand for water from water sources is much greater than the volume of water sources because of the steep increase in the refugee population. Regardless of the issues of inherent inadequate capacity, deterioration from aging and water leakage, the water supply facilities are being subjected to excessive loads as they continue to operate beyond their capacity due to the steep increase in population.
In view of this background, Jordan recognized the effects of the inflow of Syrian refugees into the four northern governorates on the water supply and sewerage services, conducted a comprehensive study on the status of the water supply and sewerage services in the host communities, and requested Japan for technical cooperation through development plan study with the aim of adopting measures to resolve the problems sustainably.
The technical cooperation project based on development plan study consists of three components:

conceptual design of priority project (Component A), formulation of development plan for water supply and sewerage services (Component B), and pilot activities (Component C). This study aims to carry out the conceptual design because the priority projects will be implemented under Japan's grant aid cooperation program.
The priority projects to be implemented under the grant aid cooperation program will be selected from the sub-project candidates listed below, prepared by YWC and submitted with the approval of WAJ.

Sub-projects
Sub-project 1　Distribution facilities and equipment ・Priority 1B　Irbid main distribution pipeline stage 1 project ・Priority 1C　Hofa -Bait Ras area distribution main facilities project ・Priority 1D　Project for provision of main transmissio n pipeline between Aqeb-Za'atary pumping stations
Sub-project 2　Hawwara area water supply pipeline network rehabilitation project
Sub-project 3　Irbid City sewer network provision project
Sub-project 4　Sarieh area water supply network rehabilitation project
Sub-project 5　Mafraq City pumping station rehabilitation project
Sub-project 6　Ramtha City sewer network provision project

3. Overall Goal

Jordan formulated the National Agenda, a comprehensive national strategy that specifies issues the country should tackle and guidelines to resolve them. Issues in the water sector include deficient renewable water resources, depletion of groundwater, inefficient distribution of water, inappropriate setting of water tariff, inadequate sewage treatment capacity and so on. Concepts to resolve these issues are as given below.

- Reduce operating cost and non-revenue water by improving efficiency of the distribution pipeline network
- Review water tariff and reduce auxiliary costs stepwise
- Develop (and improve) wastewater treatment facilities by using advanced technologies and use of treated water for agricultural and industrial purposes
- Contribute further to the private sector for creating an environment conducive to investments and developments of the water sector

"Water for Life: Jordan's Water Strategy 2008 – 2022" was formulated as a core strategy of the Jordanian water sector based on national agenda – a high-ranked policy. The following common pledges can be listed in this water strategy:

① Supply adequately safe and secure drinking water
② Deepen understanding of groundwater and surface water; promote effective management
③ Create sound freshwater ecosystem
④ Use water resources sustainably
⑤ Set water tariff that is fair, reasonable and suitable considering cost
⑥ Take immediate measures for the entire water sector and for economic development to cope with the increase in population that will use water.

4. Current Situation and Problems of the Sector

About 75% of the Hashemite Kingdom of Jordan (hereafter "Jordan") is desert area, and the annual precipitation is less than 200 mm. The per capita annual renewable water resource is extremely low at about 145 m^3 compared to the global average of 7,700 m^3 suggesting that the deficiency in water resource is extremely severe.
For this reason, there is a chronic water supply restriction with the capital city Amman receiving water supply two days a week on an average, and Irbid City, the study area of this project, receiving water supply once a week on an average.

In addition to the deficiency in water resource, the sudden inflow of refugees from Syria has further added to the severity of the water supply condition within Jordan, especially in the four northern governorates (Irbid, Mafraq, Jerash, and Ajloun) adjacent to Syria. Water shortage has become more pronounced after the inflow of refugees, and friction between the host community and refugees has increased.

The water problem has always been an important topic in Jordan. The basic policy has been "how to make effective and fair use of the limited water resources." In view of this policy, reducing non-revenue water has become an urgent need.

Existing facilities such as transmission and distribution pipes and pumps have deteriorated; moreover, steps towards strengthening and expanding transmission and distribution facilities to cope with the increase in population and sudden expansion of metropolitan areas have been inadequate, therefore, the transmission and distribution system is inefficient. Terrain with excessive level difference has worsened this issue. On the other hand, development of water resources is being continued to cope with the water shortage.

The water supply works in Jordan have been managed and operated by the Water Authority of Jordan (WAJ) under the supervision of the Ministry of Water and Irrigation (MWI). However, the separation of the distribution system from WAJ and formation of public agencies were recommended so as to improve the efficiency and sustainability of the water supply works. Firstly, the Miyahuna Water Company (initially called the Rima Company) was established in the Amman governorate, then the Aqaba Water Company was established in the Aqaba governorate, and finally the Yarmouk Water Company (YWC) was established in the four northern governorates. YWC management was entrusted to private party by contract in 2011, and it aimed for improved business; however, the contract was canceled in 2013, and YWC is presently operating independently.

5. Overview of the Study Results and Contents of the Project

(1) Project component

The project component will be the No. 1 and No. 2 projects in the order of priority below, from the sub-projects requested by the Jordanian side.

- Priority No. 1: Installation of new distribution pipeline between Hofa reservoir and Bait Ras area in Irbid governorate
- Priority No. 2: Rehabilitation and renewal of distribution pipeline network in Hawwara area in Irbid governorate (including strengthening of distribution pipeline and setting of distribution zones)

This survey was undertaken from January to June, 2014.

(2) Project Objective

The objective of the project are: 1) to increase the volume of water supplied to the area where water demand has tightened (because of the inflow of Syrian refugees into the host communities) by using the source water volume that has increased because of rehabilitation of well field in the eastern part of the four northern governorates and because of development of DISI fossil groundwater; and (2) to reduce the water leakage by rehabilitating the distribution pipeline network of Hawwara area.

(3) Design Policy

This Grant Aid Project aims to rehabilitating the distribution pipeline network in order to contribute to the Programme for Urgent Improvement of Water Sector for the Host Communities of Syrian Refugees in Northern Governorates which is targeting to increase the volume of water supplied to the area and reduce the water leakage. This project is planned based on the policies below.

① The target year of the project shall be 2017.
② The total population of the planned facilities is taken as the population of permanent residents of Jordan and the Syrian refugee population in 2017.
③ A flow of 30,000 m^3/day will be newly allocated in 2017 to Irbid City and Bait Ras and Hawwara areas from the Disi groundwater and water sources in the eastern part to the Hofa reservoir through distribution pipelines between Hofa and Bait Ras.
④ The design policies for the facilities are as follows.
- Expansion of gravity distribution area (Irbid city and Bait Ras area)
- Reduction of pump distribution area (Irbid city and Bait Ras area)
- Equalization of water pressure of boundary between Zebdat gravity distribution area and Hofa gravity distribution area (Irbid city)
- Equality of water supply by establishment of distribution zone and reduction of water leakage (Hawwara area)

The table below shows the outline of project facility planned based on the above policies.

Facility	Area and Items	
Distribution pipeline	Distribution pipeline between Hofa reservoir and Bait Ras area	DIP 400mm x 5,200m DIP 500mm x 1,380m DIP 600mm x 12,030m Pressure-reducing valve：5 Places
	Rehabilitation of Hawwara area distribution pipeline network	HDPE 63mm x 4,266m DIP 100mm x 8,798m DIP 150mm x 3,203m DIP 200mm x 776m DIP 300mm x 627m House connection 350 Places Pressure-reducing valve：2 Places

6. Construction Period and Estimated Project Cost

For the project, approx. 3 months for tendering, and approx. 17 months for construction are estimated. The estimated cost to be borne by WAJ required for the implementation of the Project is 20,000 JD.

7. Project Evaluation

(1) Validity

① Population benefitted

The population estimated to be benefitted when water is supplied according to the design plan for laying distribution pipelines between the Hofa reservoir and Bait Ras is 473,000 (the estimated served population by the Hawwara area distribution network rehabilitation plan is included in the served population mentioned here).

② Project targets and BHN

The targets of the project are: 1) to increase the volume of water supplied to the area where water demand has tightened (because of the inflow of Syrian refugees into the host communities) by using the source water volume that has increased because of rehabilitation of well field in the eastern part of the four northern governorates and because of development of DISI fossil groundwater; and (2) to reduce the water leakage by rehabilitating the distribution pipeline network of Hawwara area, and aims to satisfy basic human needs (BHN).

③ Improving lifestyle of the residents and stabilizing their livelihood

The project will contribute to improving the water supply services and thereby improving the lifestyle of the residents. It will also contribute to improving the welfare program for the northern part of Jordan where a large number of Syrian refugees have taken shelter, contribute to harmony between Syrian refugees and host community, and stabilize the livelihood in the country.

④ Contributing to realization of targets of medium and long-term development plans

The "National Water Strategy" which is Jordan's medium to long-term plan has the policy of effectively using limited water sources to the maximum extent. This project will contribute to realizing the targets of the medium to long-term plan through reduction in water leakage and non-revenue water.

⑤ Matching Japan's aid policy and guidelines

Japan has announced aid equivalent to 60 million dollars at the 68th UN General Assembly meeting in September 2013 as humanitarian aid to Syria. The implementation of rehabilitation and provision of water sector facilities will contribute to lightening the load on the host communities that have accepted the Syrian refugees and matches the above mentioned guidelines; therefore it is highly valid.

(2) Effectiveness

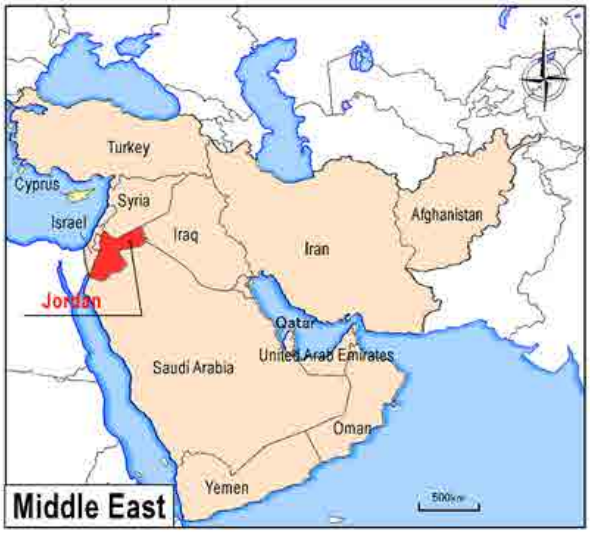
① Quantitative effects

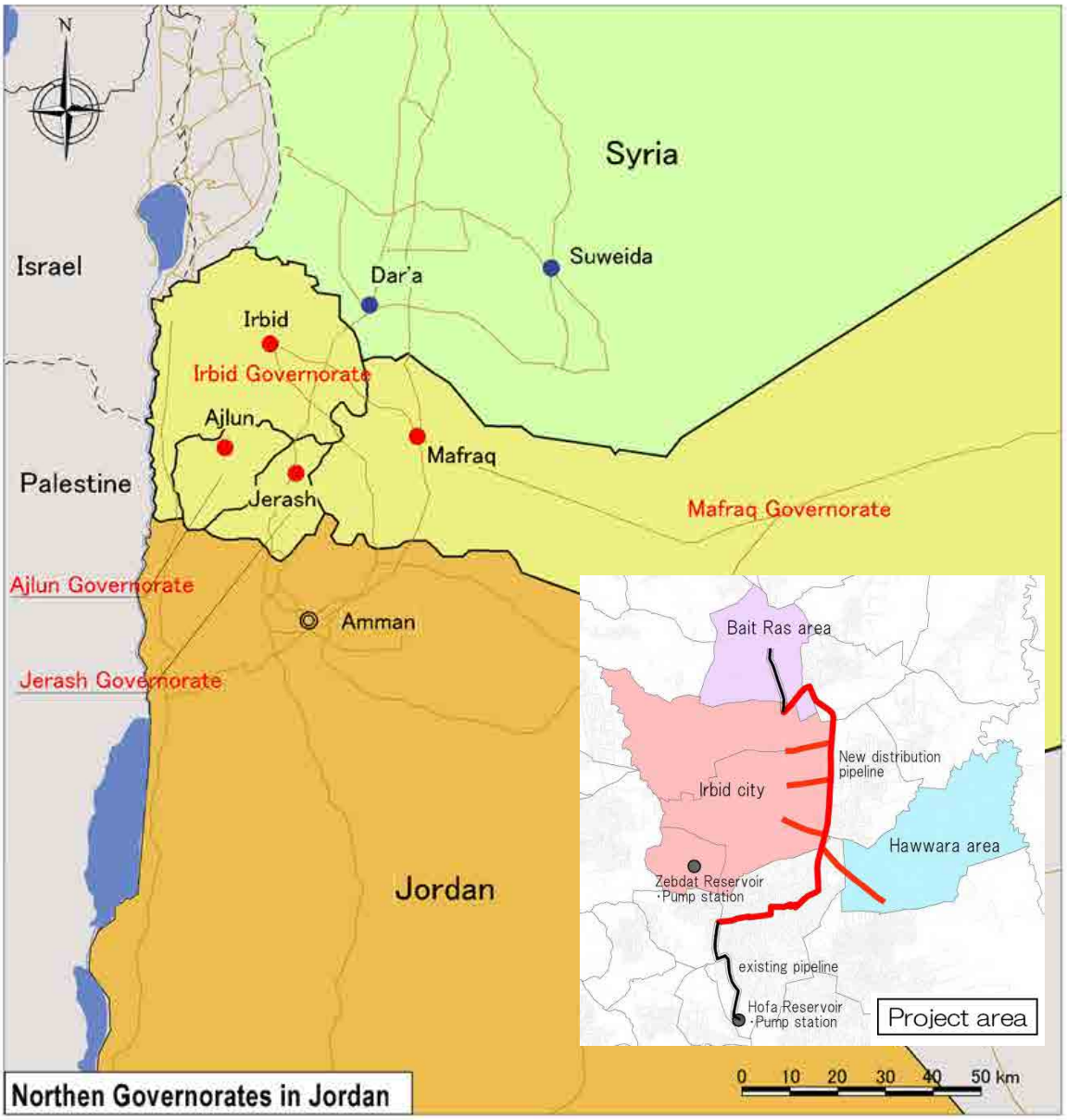
- A flow of 30,000 m^3/day will be newly allocated to Irbid City and Bait Ras and Hawwara areas from the Disi groundwater and water sources in the eastern part to the Hofa reservoir through distribution pipelines between the Hofa reservoir and the Bait Ras.

② Qualitative effects

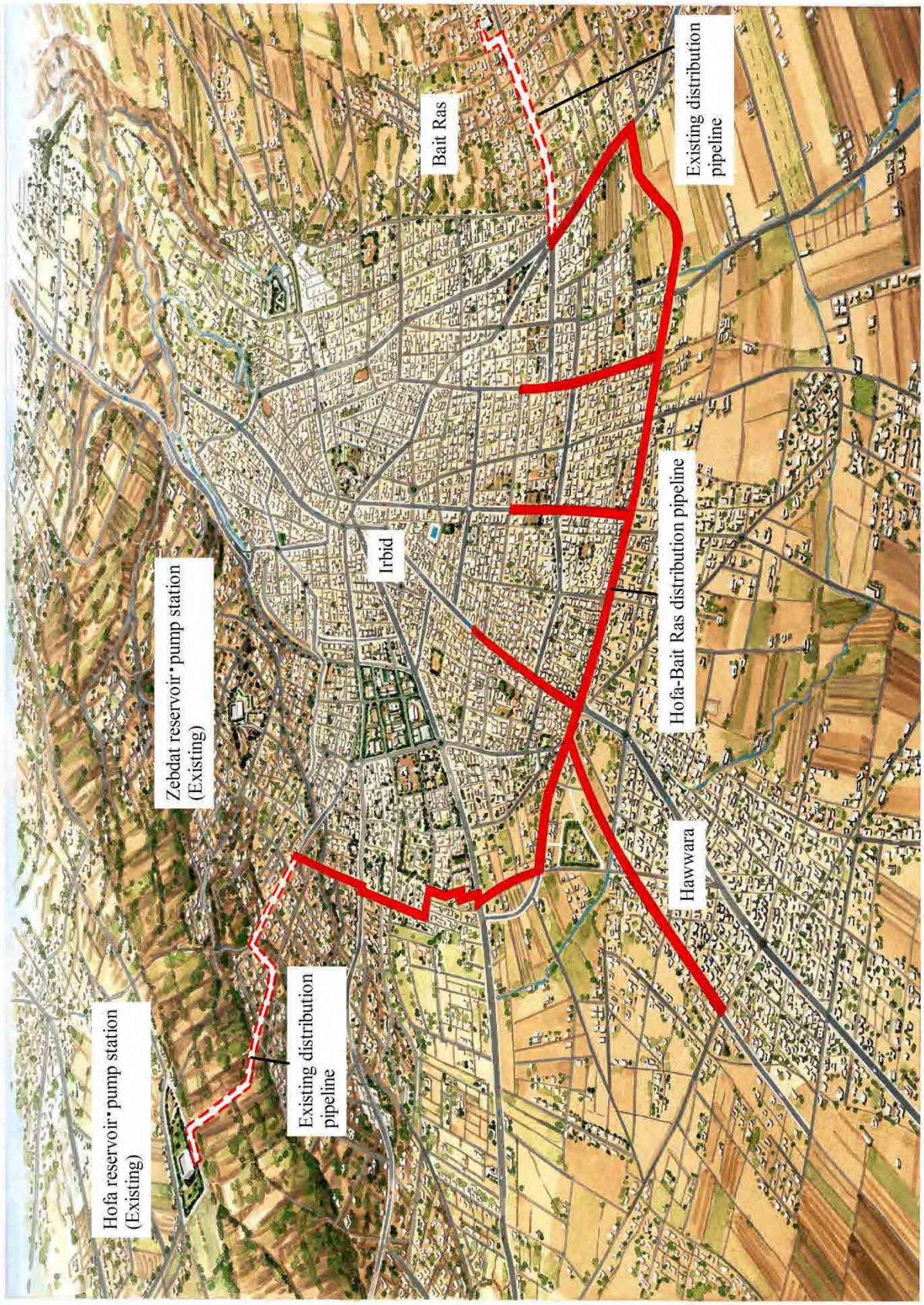
- Water is being supplied generally once a week; however, the supply time will be increased with the increase in supply volume. The annually distributed volume of water from the Zebdat reservoir to Irbid City and Bait Ras area is about 12 MCM. However, at the completion of this project, the annual volume will increase by 11 MCM so that the total volume will become approximately 23 MCM/year. Consequently, the supply time may be expected to double and will become twice a week in 2017 when the project starts.
- The per capita water supply volume will increase with the increase in the supply time and the allocated (supplied) volume, and the unsatisfactory water supply area will also decrease.
- The non-revenue water will decrease with the setting of distribution zones in Hawwara area, rehabilitation of the distribution pipeline network and regulation of distribution pressure.

Based on the content above, this project will contribute to improving the living environment of residents of Irbid City, Irbid governorate, Bait Ras area and the Hawwara Area in Jordan. Effects as mentioned above are anticipated; therefore, the implementation of grant aid cooperation is highly significant and is expected to be very effective.





Location Map



Perspective

Preface
Summary
Location Map
Perspective
Table of Contents
Abbreviation

TABLE OF CONTENTS

CHAPTER 1 BACKGROUND AND HISTORY OF PROJECT 1-1

1.1 Background, Transition and Overview of Grant Aid Cooperation 1-1
1.2 Natural Conditions 1-1
1.3 Environmental and Social Considerations 1-5

CHAPTER 2 CONCEPTUAL DESIGN OF PROJECT 2-1

2.1 Project Overview 2-1
2.1.1 Overall Goal and Project Target 2-1
2.1.2 Project Overview 2-1
2.2 Conceptual Design of Project 2-8
2.2.1 Design Policy of the Project 2-8
2.2.2 Basic Plan 2-18
2.2.3 Outline Design Drawing 2-44
2.2.4 Implementation Plan 2-45
2.2.5 Operational Guidance Plan 2-51
2.3 Obligation of Recipient Country 2-51
2.4 Project Operation Plan and Maintenance Plan 2-52
2.4.1 Basic Principle of Operation and Maintenance 2-52
2.4.2 Organization of Operation and Maintenance 2-52
2.5 Project Cost Estimation 2-53
2.5.1 Initial Cost Estimation 2-53
2.5.2 Operation and Maintenance Cost 2-54
2.5.3 Other Relevant Issues 2-54

CHAPTER 3 PROJECT EVALUATION 3-1

3.1 Pre-requisites for Project Implementation 3-1
3.2 Investment Items of Counterpart (to be borne) Necessary for Realizing Overall Project Plan 3-1
3.3 External Conditions 3-1
3.4 Project Evaluation 3-1
3.4.1 Validity 3-1
3.4.2 Effectiveness 3-2
3.4.3 Conclusion 3-3

APPENDICES

Appendix I: Member List of the Study Team I-1
Appendix II: Study Schedule II-1
Appendix III: List of Parties Concerned in the Recipient Country III-1
Appendix IV: Minutes of Discussions IV-1
Appendix V: Other Relevant Data V-1

Appendix -1 Monitoring Form
Appendix -2 Environmental Check List
Appendix -3 Expected Water Demand and Production
Appendix -4 Result of Network Analysis
Appendix -5 Amount of Well Production in Northern Governorates in 2011 to 2013
Appendix -6 Outline design drawing
Appendix -7 Inflow to Hofa reservoir
Appendix -8 Environmental and Social Considerations
Appendix -9 Result of Test Pit

LIST OF TABLES

Table 1.1 Geological Formation 1-3
Table 1.2 Main Aquifers 1-3
Table 1.3 Outline of Project 1-8
Table 1.4 Scoping Plan and Result of Examination 1-9
Table 1.5 Monitoring Plan 1-10
Table 2.1 Requested Sub-Projects and Agreed Priority 2-3
Table 2.2 Comparison of Contents of Request and Facilities for This Project (Plan Proposal) 2-5
Table 2.3 Future Population of Irbid Governorate and Population of Syrian Refugees 2-12
Table 2.4 Populations of Syrian Refugees and Permanent Residents in Northern Governorates 2-13
Table 2.5 Status Values and Target Values due to the Project in the Study Area 2-19
Table 2.6 Population of Permanent Residents of Jordan, Syrian Refugees and Demand 2-20
Table 2.7 Planned Water Use per Capita per day 2-21
Table 2.8 Planned Non-revenue Water Ratio and Planned Leakage Ratio of Irbid City 2-21
Table 2.9 Plan Conditions for Water Supply Volume in Study Area 2-22
Table 2.10 Water Supply Pressure Used in This Project 2-22
Table 2.11 Comparison of Distribution Pipeline Routes 2-30
Table 2.12 Distribution Pipeline Plan (at maximum of 2,226 m^3/h) 2-34
Table 2.13 Distribution Pipeline Plan (at daily maximum of 1,484 m^3/h) 2-36
Table 2.14 Pressure-reducing Valve Plan 2-38
Table 2.15 No Dig (Trenchless) Work Plan 2-39
Table 2.16 Estimated Population in the Project Area 2-40
Table 2.17 Distribution of Effective Head in the Distribution Zone 2-42
Table 2.18 Pressure-reducing Valve Plan of the Hawwara 2-42
Table 2.19 Demarcation of Construction Works of Facilities between the Two Countries 2-46
Table 2.20 Japanese Supervision Organization in the Site 2-48
Table 2.21 Contractor's Work Control System 2-48
Table 2.22 Quality Control Plan 2-49
Table 2.23 Procurement Plan for Main Materials and Equipment 2-50
Table 2.24 Implementation Schedule 2-51
Table 2.25 Obligation of Recipient Country 2-52
Table 2.26 Major Facility and Monitoring Equipment 2-53
Table 2.27 Periodical Inspection Items for Transmission and Distribution Pipes 2-53
Table 2.28 Periodical Inspection Items for Pressure Reducing Valve 2-53
Table 2.29 Summary of Estimated Costs to be Covered by Jordanian Side 2-53
Table 3.1 Quantitative Effects of the Project 3-3

LIST OF FIGURES

Figure 1.1 Geology of Northern Governorate in Jordan 1-4
Figure 1.2 Monthly Average Temperatures in Irbid (Average of Past 30 Years) 1-4
Figure 1.3 Monthly Average Precipitation in Irbid (Average of Past 30 Years) 1-5
Figure 1.4 Flow of EIA Procedures 1-6
Figure 1.5 Organization of MOE and EIA Approval Organization 1-7
Figure 1.6 Location of Project (Existing Land Use) 1-8
Figure 2.1 Project Area (Irbid City, Bait Ras area, Hawwara area) 2-2
Figure 2.2 Planned Distribution Pipeline between Hofa and Bait Ras (Priority No. 1) 2-6
Figure 2.3 Rehabilitation Plan of Hawwara Distribution Pipeline Network (Priority No. 2) 2-7
Figure 2.4 Transmission Line up to the Hofa Reservoir 2-9
Figure 2.5 Project Facilities and Areas 2-11
Figure 2.6 Population Trend and Estimated Future Population of Irbid Governorate 2-12
Figure 2.7 Summary of Issues in Water Supply to the Study Area 2-15
Figure 2.8 Water Transmission in Northern Governorates 2-23
Figure 2.9 Water Balance near Irbid City (2017 average base, MCM/y) 2-24
Figure 2.10 Conceptual Sketch of Distribution of Water Before and After Implementing the Project in the Study Area 2-26
Figure 2.11 Conceptual Sketch of Distribution of Water Before and After Implementing the Project in the Study Area (Level Differences) 2-27
Figure 2.12 Water Pressure before and after Converting Existing Transmission Mains from Zebdat to Hofa Reservoir to Distribution Mains 2-29
Figure 2.13 Alternative Proposals for Distribution Pipeline Route 2-30
Figure 2.14 Water Distribution Pipeline Route between Hofa and Bait Ras (Including Connecting Pipelines, Branch-off points, and Locations of PRV Installation) 2-32
Figure 2.15 Hydraulic Grade Line of Distribution Pipeline from Hofa to Bait Ras (at daily maximum) 2-35
Figure 2.16 Hydraulic Grade Line of Distribution Pipeline from Hofa to Bait Ras (at daily maximum flow) 2-37
Figure 2.17 Effects of Proposed Distribution Pipeline 2-39
Figure 2.18 Locations of Distribution Pipeline Work using Trenchless Construction Method 2-40
Figure 2.19 Hofa Reservoir-Hawwara Distribution System (Gravity Flow) 2-41
Figure 2.20 Distribution Zones of the Hawwara 2-42
Figure 2.21 Network Plan and Pressure Distribution (Hourly Maximum) 2-43
Figure 2.22 Scope of Hawwara Area Plan 2-44

ABBREVIATION

DCIP	Ductile Cast Iron Pipe
DOS	Department of Statistics
E/N	Exchange of Notes
EIA	Environmental Impact Assessment
EIB	European Investment Bank
G/A	Grant Agreement
GDP	Gross Domestic Product
GNI	Gross National Income
GRDP	Gross Regional Domestic Product
HCSP	Host Community Support Platform
HDPE	High Density Polyethylene Pipe
JICA	Japan International Cooperation Agency
JD	Jordan Dinar
KfW	Kreditanstalt für Wiederaufbau
Lpcd	Liters per capita and day (L/capita/day)
MCM	Million cubic meter
MCM/y	Million cubic meter per/year
MOE	Ministry of Environment
MPWH	Ministry of Public Works and Hosing
MOTA	Ministry of Tourism and Antiquities
MWI	Ministry of Water and Irrigation
O & M	Operation & Maintenance
PMU	Performance Management Unit of WAJ
PRV	Pressure Reducing Valve
RSCN	Royal Society for the Conservation of Nature
TOR	Terms of Reference
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development
WAJ	Water Authority of Jordan
WASH	Water, Sanitation & Hygiene
WLRP	Water Loss Reduction Program
WWTP	Wastewater Treatment Plant
YWC	Yarmouk Water Company

CHAPTER 1 BACKGROUND AND HISTORY OF PROJECT

1.1 Background, Transition and Overview of Grant Aid Cooperation

With the inflow of a large number of Syrian refugees into Jordan after the Syrian crisis in 2011, the water issue in Jordan has worsened considerably. According to UNHCR statistics, as of May 2014, the registered number (including persons on the waiting list) of refugees that entered Jordan is about 590,000. Out of this number, 390,000 refugees have entered the four northern governorates, while 240,000 persons have entered the Irbid governorate. About half the refugees have entered the Irbid governorate. The areas where these Syrian refugees have migrated to reside in large numbers are called "host communities." The population of Irbid governorate in 2012 was 1.13 million but this number has increased to 1.31 million including the population of Syrian refugees in 2014. Syrian refugees account for about 20% of the population. The result was that the water supply situation worsened in the host communities because limited water resource was being shared with a larger population. It seems that in some areas friction arose between the Syrian refugees and native Jordanians.
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Sub-project 4 Sarieh area water supply network rehabilitation project
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Sub-project 6 Ramtha City sewer network provision project

1.2 Natural Conditions

(1) Topography
Irbid City, Hawwara and Bait Ras, which form the project study area, are located on a plateau with projecting elevations of 400-700 m. A catchment boundary lies at the center and slightly to the east of Irbid urban area, while the river basin of Wadi Arab, the tributary of the Jordan river lies on the western side. The river basin of Wadi Shallalah, the tributary of the Yarmouk river lies on the eastern side.

The Hofa reservoir, which is the distribution base is situated at an elevation of 780 m, while the Zebdat reservoir is at an elevation of 625 m. The Zebdat reservoir is located within the city, so distribution of water to the city is convenient. The Hofa reservoir is situated at the highest elevation in the project area; it is at an elevation suitable for distributing water by gravity flow to Irbid City and Hawwara. Since there is a level difference in the study area, the plan for distribution facilities should consider elevation aspects appropriately.

(2) Geology

The geology of surface layers in the project area consists mainly of a distribution of Paleogene strata from the Cretaceous upper strata, and consists of limestone, Dolomite type limestone, and chalk. According to test boring study results, the pipe laying route has gravel mixed with limestone (silt and sand) and limestone ground (soft rock). From the geological status, the ground has adequate bearing capacity to resist structures, and generally, no foundation work is required.

(3) Hydrogeology

Figure 1.1 shows the hydrogeological unit distribution of Jordan, while Table 1.1 shows the hydrogeological unit stratigraphic table. Table 1.2 shows the major aquifer layers that form the intake for production wells in the four northern governorates. The wells in the four northern governorates mainly take in water from the B2/A7 aquifers (Barqa group, Wadi Amman formation/ Ajloun group, Wadi Sir formation: Paleogene- Palaeocene period/ upper part of the Cretaceous Period).

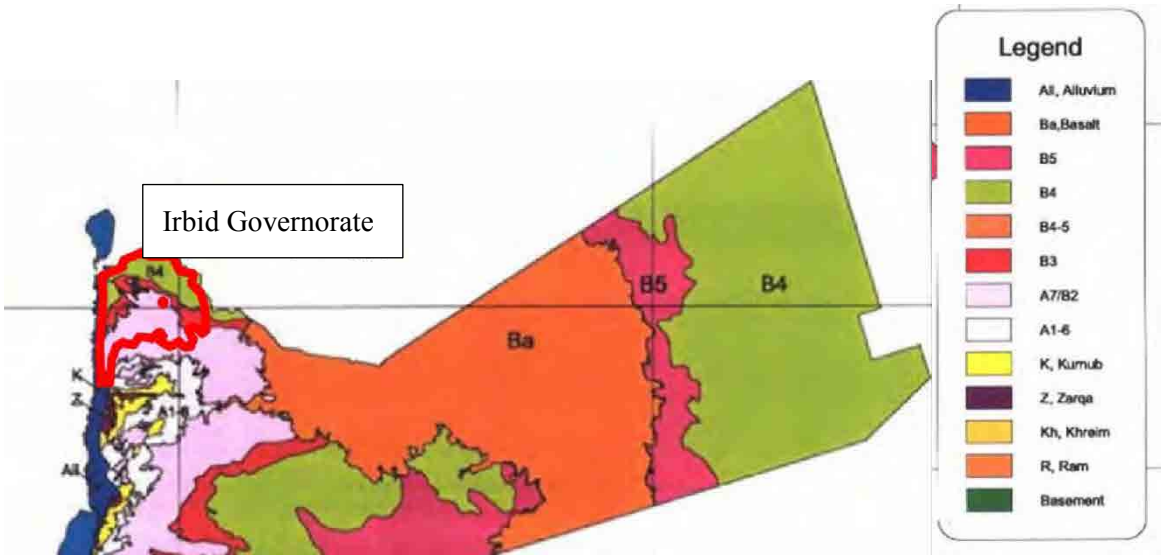
Table 1.1 Geological Formation

ERA	PERIOD		EPOCH	Group	Formation	Symbol	Lithology	Aquifer Characteristics	Aquifer Cond. (m/s)
CENOZOIC	Quarter -nary		Holocene	Alluvium	Fuviatile	Rc	Soil, sand, and gravel	Poor to Good (Aquifer)	Not Available
			Pleistocene	Diluvium	Lacst and Eolian				
	Tertiary	Neogene	Pliocene	J. Valley	Jafer – Azraq	Ja-Az	Marl, clay, and evaporites conglomerate with siliceous sand, gravel, and basalt	Poor Fair	Not Available
			Miocene	Volcanics	Basalts	Ba	Basalt	Good (Aquifer)	4.0 E -04 *
			Oligocene	Volcanics	Basalts	Ba	Basalt		
		Paleogene	Eocene	Balqa	Wadi Shallah	B5	Limestone, chalk, and marl	Good (Aquifer)	5.0 E -05 *
					Rijam	B4	Chert, limestone, chalk, and marl	Good (Aquifer)	5.0 E -05 *
			Paleocene		Muwaqqar	B3	Marly limestone, and shale	Poor (Aquifer)	1.0 E -09 **
					Amman	B2	Chert, limestone, and phosphate	Good (Aquifer)	2.0 E -05 *
MESOZOIC	Cretaceous	Upper	Meastrichtian Campanian Santonian		Wadi Ghudran	B1	Chalk, marl, and marly limestone	Poor (Aquifer)	Not Available
			Taronian ?????	Ajlun	Wadi Sir	A7	Limestone, dolomite, and chert	Very Good (Aquifer)	2.0 E -05 *
					Shueib	A5, A6	Limestone, and marly limestone	Poor (Aquitard)	1.0 E -09 **
			Cenomanian		Hummar	A4	Dolomite, and dolomitic limestone	Fair to Good	2.0 E -05 *
					Fuheis	A3	Marl, and marly limestone	(Aquifer)	1.0 E -09 **
					Naur	A1, A2	Limestone, and dolomitic limestone	Poor (Aquitard) Good (Aquifer)	1.0 E -05 **
			Albian	Kurnub	Subeihi	K2	Sand and shale	Fair to Good	3.0 E -05 *
		Lowe-	Aptian				Clay and sandy limestone	(Aquifer)	
			Neocomian						
			Berriasian		Aarda	K1	Sandstone, marl and shale		
	Jurassic	Malm	Tithomian						
			Kimmeridgian						
			Oxfordian						

(Source; Northern Governorates Water Transmission System Feasibility Study Final Report CDM International Inc. 2005, Modified from JICA 2001 and BGR 2001)

Table 1.2 Main Aquifers

Symbol	Layer	Type of rock	Layer thickness (m)	Transmissivity (m/s)	Volume to be pumped (m^3/h/m)
BS	Basalt	Basalt	10->500	4.0E-04	0.01
B5/B4	Shallala/Rijam	Limestone, tuffite	0-850	5.0E-05	0.05
B2/A7	Amman/Wadi as Sir	Limestone	80-650	2.0E-05	0.05
A4	Hummar	Limestone	30-100	2.0E-05	0.01
A1.2	Naur	Tuffite, limestone	90-220	1.0E-05	0.01
K	Kurnub	Sandstone	120-350	3.0E-05	0.025

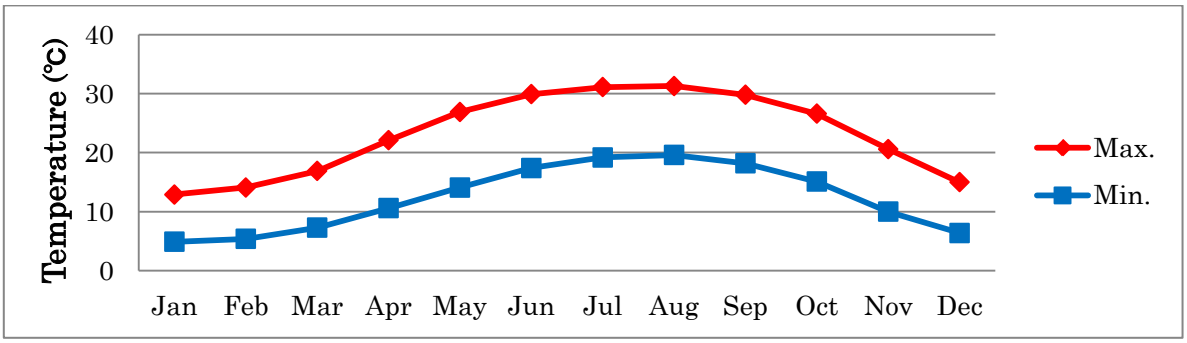


Source: Northern Governorates Water Transmission System Feasibility Study Final Report CDM International Inc. 2005, Modified from JICA, 2001 and BGR 2001

Figure 1.1 Geology of Northern Governorate in Jordan

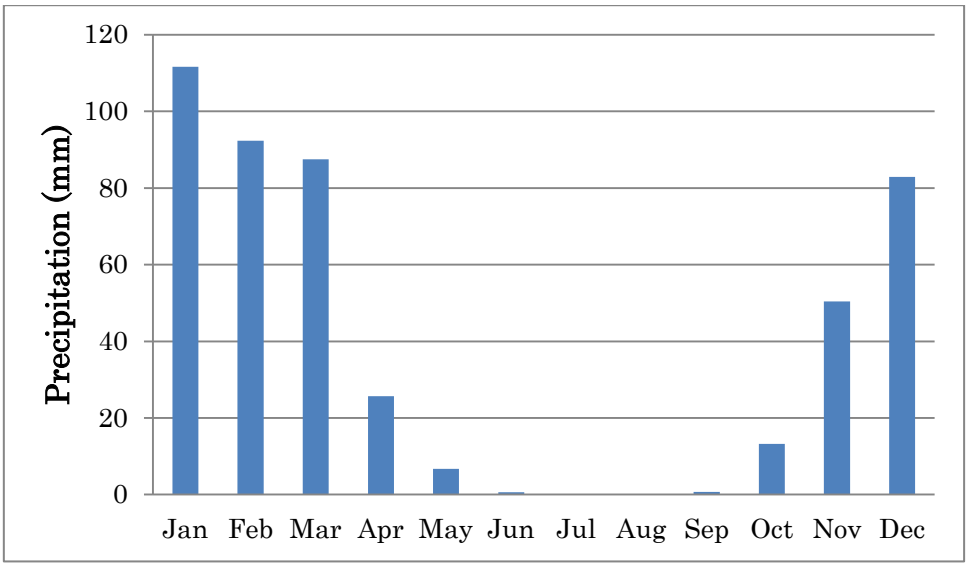
(4) Weather

The weather in Irbid is dry-summer subtropical or Mediterranean climate (Koppen's classification of climate: Csa), with hot summer and cold winter. The annual average maximum temperature is 23.1 ºC, the annual average minimum temperature is 12.4 ºC, and the annual average precipitation is 470 mm. During summer, the temperature may reach close to 40 ºC on some days, hot and dry with harsh climate. On the other hand, when winter approaches, the temperature may fall below freezing point, and snow has also been observed. Since it is dry and hot in summer, water demand increases; "No water" complaints increase, and YWC has to deal with the complaints time and again.



Source: World Weather Information Service, Web site

Figure 1.2 Monthly Average Temperatures in Irbid (Average of Past 30 Years)



Source: World Weather Information Service, Web site

Figure 1.3 Monthly Average Precipitation in Irbid (Average of Past 30 Years)

1.3 Environmental and Social Considerations

(1) Laws or Regulation and organization related to Environmental and Social Considerations

1) Laws or Regulation related to Environmental and Social Considerations

The Environmental Impact Assessment (EIA) is mainly enforced by the following Laws and Regulation in Jordan.

- Environmental Impact Assessment Regulations No. 37 of 2005,
- Environmental Protection Law No. 52 of 2006,

EIA is enforced by the following procedures in Jordan. Flow of EIA procedures is shown in Figure 1.4.

i) Project implementation organization submits the project overview document for examination to Directorate of Licensing & Guidance in MOE.

ii) MOE calls the meeting of central license committee. If necessary the committee will examine to confirm the construction site. Based on the review by the committee, it will decide to implement the Comprehensive EIA (Holding of Public Hearings), Preliminary EIA (No Holding of Public Hearings) or not to implement. The result is notified by the MOE to the Project implementation organization within 45 days of submission of document.

iii) Based on the result of decision from committee, if needed, Project implementation organization implements EIA and submits the result to MOE. The committee meeting is held and the authorization or modified instructions is given as applicable.

iv) After approval of EIA (for the Projects that require EIA), construction or project is permitted.

v) MOE implements the monitoring for checking the parameters included in EIA during the construction period

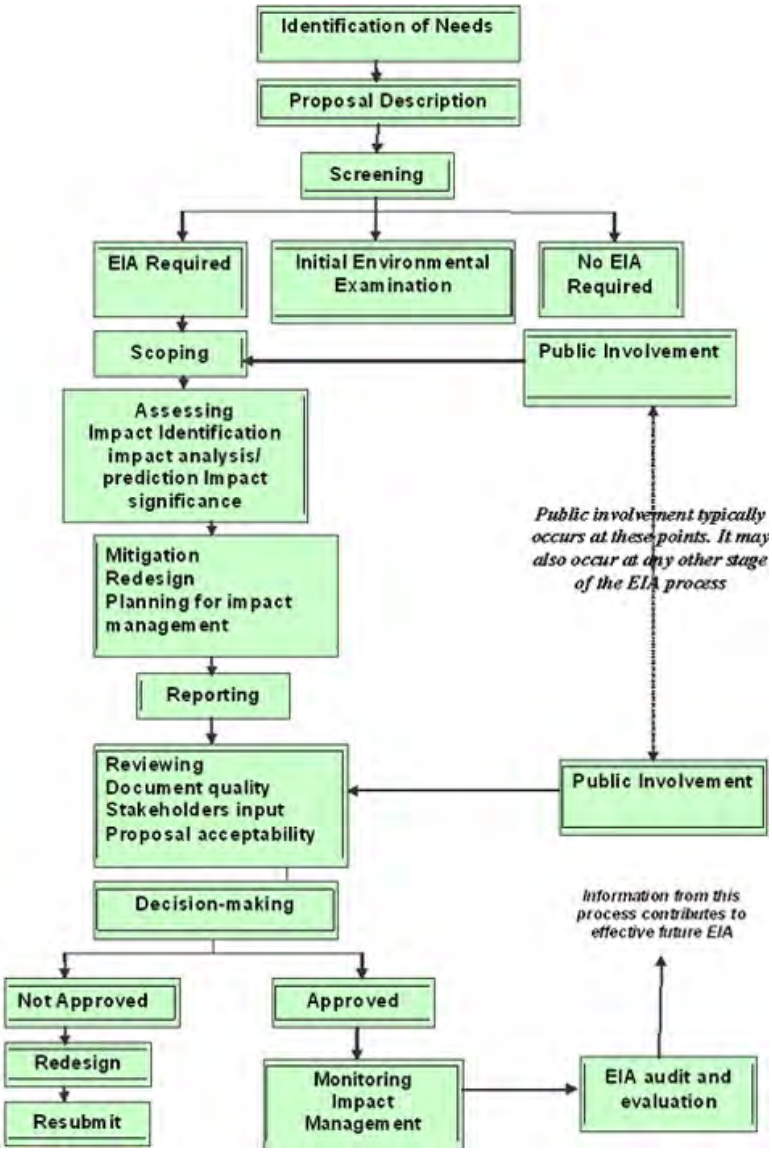


Figure 1.4 Flow of EIA Procedures

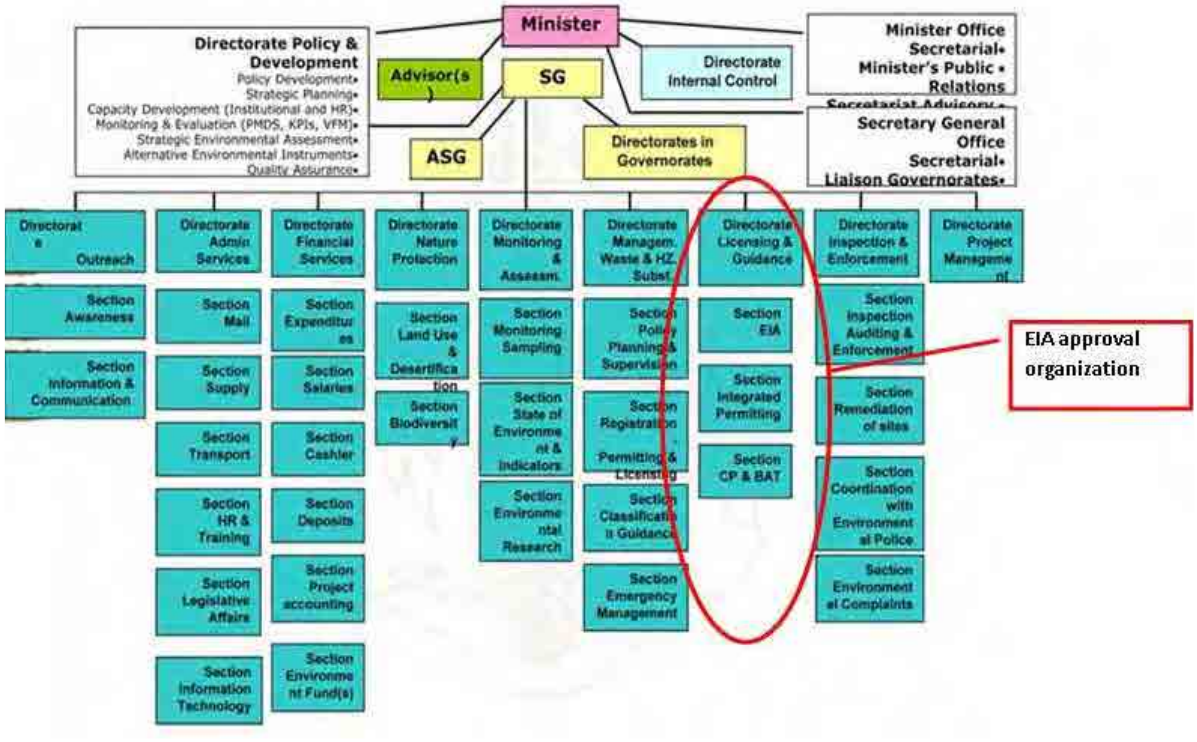
Regarding the contents of Project documents to be submitted for the examination, Directorate of Licensing & Guidance in MOE and WAJ (Water Authority of Jordan) in charge of environment explained that there is no standard form and explained to submit project outline, planning and drawing for confirmation of project site, specifications and catalog of main installation equipment, document for Environmental evaluation.

For the Component A of Project, Project document for examination has been prepared and submitted to MOE through WAJ upon confirmation of Hawwara distribution network. Based on the review of submitted Project document, MOE will decide and instruct the EIA type.

2) Relevant organization

a) MOE

Organization chart of MOE is shown in Figure 1.5. The department responsible for supervision and EIA approval is Directorate of Licensing & Guidance under MOE.



Source: MOE document

Figure 1.5 Organization of MOE and EIA Approval Organization

b) WAJ

The division responsible for EIA management in WAJ is PMU: Project Management Unit. For this purpose, in PMU there is technical monitoring, Department of inspection, and Environmental and Social expert.

(2) Environmental and Social Considerations in this project

Environmental and Social Considerations in this project is shown below. The detail is shown in Appendix-8.

1) Outline of the project

The Project for which Environmental and Social Considerations are carried out are a) Hofa－Bait Ras distribution pipeline and b) Hawwara network rehabilitation and restructuring. Outline of the project is shown in Table 1.3. The site of each Project is shown in Figure 1.6.

Table 1.3 Outline of Project

Priority	Sub Project	Outline	Remarks
1	Hofa－Bait Ras distribution pipeline	Hofa-Bait Ras distribution pipeline, 600 mm DCIP: 12.0 km, 500 mm DCIP: 1.3 km, 400 mm DCIP: 5.2 km	To distribute the increased volume of expected water to eastern Irbid, Bait Ras, and Hawwara brought from the eastern transmission pipeline
2	Hawwara distribution network	Hawwara distribution network: 300 mm DCIP: 0.6 km, 200 mm DCIP: 0.7 km, 150 mm DCIP: 3.2km, 100 mm DCIP: 8.7 km and House connection	Hawwara population: 16,000 (2012), Water network installed in 1970's

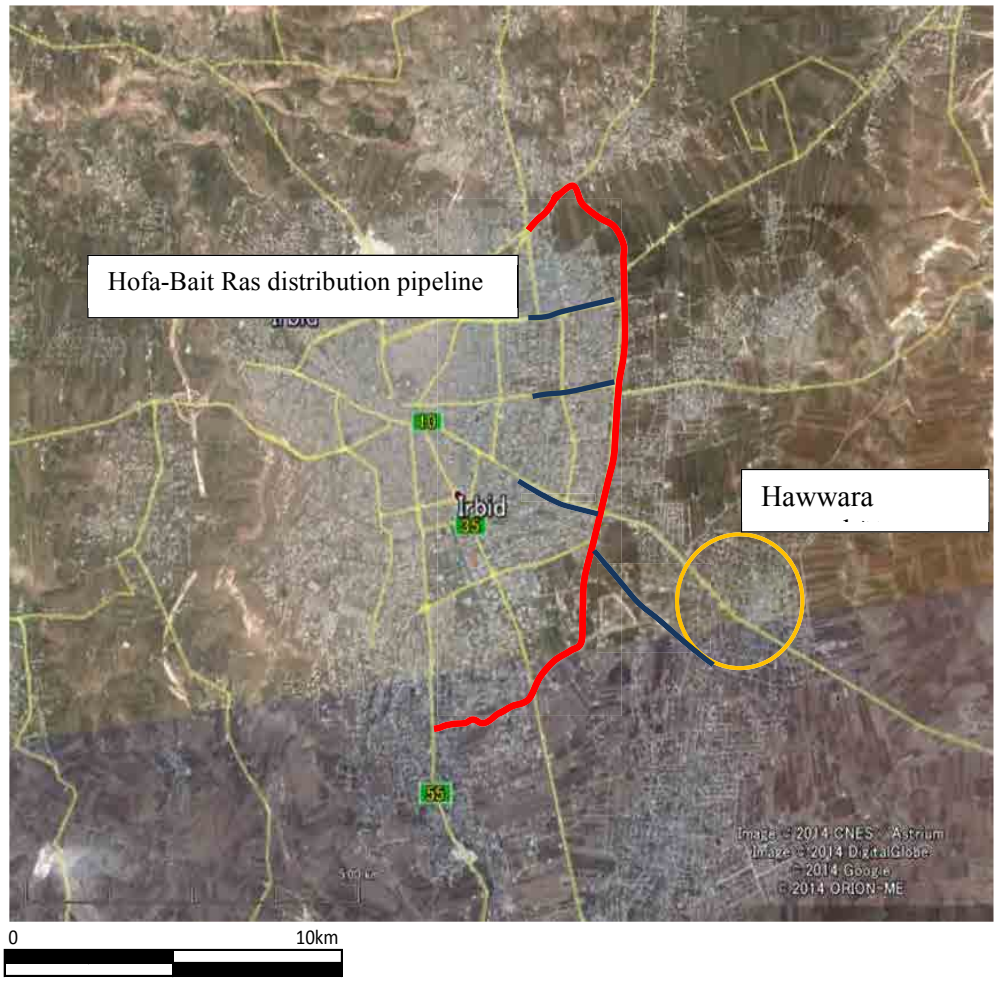


Figure 1.6 Location of Project (Existing Land Use)

2) Procedure of Environmental and Social Considerations

1. Basic Environment and Social situation
2. Consideration of alternative solution
3. Scoping
4. TOR of Examination of Environmental and Social Considerations
5. Examination of Environmental and Social Considerations
6. Evaluation of Impacts
7. Mitigation Measures and Cost
8. Monitoring plan
9. Stakeholder Consultation

3) Evaluation of Impacts

Based on Result of examination of Environmental and Social Considerations, Result of Evaluation of impacts is shown in Table 1.4 Scoping plan and result of examination.

Component A of the Project includes Hofa－Bait Ras distribution main and rehabilitation/ restructuring of Hawwara water network. Environmental impact of the project activities is expected only during construction works as described below. During operation of project components, negative impacts are not expected.

a. Development of water source and construction or rehabilitation of water treatment plant is not included in this Project.
b. There is no negative environmental impact during operation of facilities because distribution main and distribution network are located under the ground.
c. Resettlement and land acquisition is not expected because pipelines are to be laid under the ground.

Table 1.4 Scoping Plan and Result of Examination

Category	No.	Environmental Item	Scoping Evaluation of Impact in Scoping		Evaluation of Impact based on examination result		Reason of evaluation
			Before and under construction	Operation	Before and under construction	Operation	
Pollution Control	1	Air Quality	B-	D	B-	N/A	Air pollution occurs by dust from digging, and due to exhaust gas from construction machines and vehicles during construction.
	2	Water Quality	B-	D	N/A	N/A	Water source in this Project is mainly deep aquifer, and groundwater pollution is not expected due to drainage resulting from sprinkling, or car washing during construction.
	3	Wastes	D	D	N/A	N/A	Wastes do not occur.
	4	Soil pollution	B-	D	B-	N/A	Soil pollution is expected due to leakage of small amount of oil from construction machines, vehicles during construction.
	5	Noise and Vibration	B-	D	B-	N/A	Noise and Vibration is expected to occur from construction machine and vehicles during construction.
	6	Subsidence	D	D	N/A	N/A	Subsidence is not expected.
	7	Offensive odor	D	D	N/A	N/A	Occurrence of offensive odor is not expected.
	8	Substratum	D	D	N/A	N/A	Project activity is not expected to have any impact on Substratum.
Natural Environment	9	Reserve Area	D	D	N/A	N/A	Natural Reserve Area is located far from Project areas (about 10 km or more). Therefore, ne negative impact is expected.
	10	Ecosystem	D	D	N/A	N/A	Project area does not include any protected animals and plants.
	11	Hydrology	D	D	N/A	N/A	Alteration of Hydrology is not expected due to project.
	12	Topography, geological feature	D	D	N/A	N/A	Alteration of Topography, geological feature is not expected.
Social Environment	13	Resettlement	D	D	N/A	N/A	Resettlement is not expected to occur due to Project.
	14	Poor classes	D	D	N/A	N/A	Project activities are not expected to cause any negative impact on Poor classes.
	15	Ethnic Minorities and Indigenous Peoples	D	D	N/A	N/A	Project area does not include Ethnic Minorities and Indigenous Peoples.
	16	Refugee	D	B+	N/A	B+	Project activities will not have any

Category	No.	Environmental Item	Scoping Evaluation of Impact in Scoping		Evaluation of Impact based on examination result		Reason of evaluation
			Before and under construction	Operation	Before and under construction	Operation	
							discrimination against Refugee; rather water supply is expected to improve for all.
	17	Livelihood	B-	D	B-	N/A	During construction, Traffic may be regulated and traffic interruption may be caused, and approach to commercial facilities is expected to be limited.
	18	Cultural Heritage	B-	D	B-	N/A	There is possibility to find remains and relic during excavation work.
	19	Landscape	D	D	N/A	N/A	No negative impact on Landscape is expected to occur.
	29	Gender	D	D	N/A	N/A	Negative impact on Gender is not expected due to Project activities.
	21	Work Environment	B-	D	B-	N/A	Construction activities are expected to have some negative impact on working environment of Labor in terms of air quality, noise, and vibration due to operation of construction machines.
Others	22	Accident	B-	D	B-	N/A	During construction, there is possibility of occurrence of traffic jam and traffic accident due to regulated and interrupted traffic.
	23	Influence of the border violation, climate change	D	D	N/A	N/A	No influence on the border violation, climate change is expected.

Note) Evaluation A+/-: Significant positive / negative impact is expected.
Evaluation B+/-: Positive / negative impact is expected to some extent.
Evaluation C+/-: Positive / Negative impact is not clear.(Further examination is necessary, and level of impact becomes clear by the progress of the examination.)
Evaluation D: No impact is expected

4) Monitoring plan

Monitoring plan, which is mainly required for construction stage, is shown in Table 1.5.

Table 1.5 Monitoring Plan

Environmental Item	Item	Place	Frequency	Responsible institution
Air Quality	TSP, CO, NO_2, SO_2	Neighborhood of Construction site	1 time /month	Contractor YWC, WAJ
Soil pollution	Checking of oil leakage from construction machines and vehicles, and status of repairing Situation of locations where soil is affected by oil leakage	Construction site, construction machinery, Vehicle storage place	1 time /month	Contractor YWC, WAJ
Noise and Vibration	Noise and Vibration	Neighborhood of Construction site	1 time /month	Contractor YWC, WAJ
Livelihood	Condition of blocking, limited approach of commercial facilities	Surrounding Construction site	1 time /week	Contractor YWC, WAJ
Cultural Heritage	Existence of remains and relic	Construction site	MOTA coordination	Contractor MOTA
Work Environment	Situation of wearing working clothes, safe shoes, masks, and other safety related accessories of Workers. Enforcement situation of the safety measures of neighboring inhabitants	Construction site Surrounding Construction site	1 time /week	Contractor YWC, WAJ
Accident	Enforcement situation of traffic safety measures. Traffic man work situation	Surrounding Construction site	1 time /week	Contractor YWC, WAJ

5) Stakeholder Consultation

For Component A of the Project, document on Project outline has been prepared and submitted to MOE through WAJ upon the confirmation of Hawwara distribution network. Based on review of submitted document, MOE will decide the EIA type required for requested project and instruct WAJ accordingly. Based on instruction from MOE, if necessary, stakeholder Consultation for Component A of the Project shall be organized.

(3) Land Acquisition and Resettlement

Land acquisition and resettlement is not expected to occur in implementation of this Project.

(4) Others

1) Monitoring Form (Draft)

Monitoring Form (Draft) is shown in Appendix 1.

2) Environmental check list

Environmental check list is shown in Appendix 2.

CHAPTER 2 CONCEPTUAL DESIGN OF PROJECT

2.1 Project Overview

2.1.1 Overall Goal and Project Target

Jordan formulated the "National Agenda 2005-2015," a comprehensive national strategy that specifies issues the country should tackle and guidelines to resolve them. Issues in the water sector include deficient renewable water resources, depletion of groundwater, inefficient distribution of water, inappropriate setting of water tariff, inadequate sewage treatment capacity, and so on. One of the guidelines to resolve such issues is "to make operation and maintenance of facilities efficient and to reduce non-revenue water." Furthermore, the Jordanian government has issued comprehensive guidelines in the "Water for life: Water strategy of Jordan 2008-2011." This national strategy called the "National Agenda" and the "Water Strategy" are overall plans of this project. The present project will contribute to the realization of the targets below from the guidelines and targets indicated in the overall plans.

- Reduce operating cost and non-revenue water by improving efficiency of the distribution pipeline network
- Supply adequately safe and secure drinking water
- Take immediate measures for the entire water sector and for economic development to cope with the increase in population that will use water.

Furthermore, this is a part of the project for making use of the Disi groundwater and water sources in the eastern part of the four northern governorates under the "water allocation strategy 2010." This project will contribute to mitigating the friction between host community and refugees and lessen the impact of inflow of Syrian refugees by meeting the demands of water supply systems and sewerage of the host community under the "National Resilience Plan."

Based on the overall goal, the targets of the project are: 1) to increase the volume of water supplied to the area where water demand has tightened (because of the inflow of Syrian refugees into the host communities) by using the source water volume that has increased because of rehabilitation of well field in the eastern part of the four northern governorates and because of development of DISI fossil groundwater; and (2) to reduce the water leakage by rehabilitating the distribution pipeline network of Hawwara area.

The project for formulating urgent water supply plans for Syrian refugees and host communities in Jordan consist of three components. These are Component A (conceptual design of priority project), Component B (formulation of master plan for water supply and sewerage) and Component C (pilot activities). The present project relates to Component A.

2.1.2 Project Overview

The activities listed below will be implemented for constructing distribution pipelines (between Hofa reservoir and Bait Ras area) for Irbid City and for reconstructing the distribution system and renewing the distribution pipeline network of Hawwara area, in order to realize the goals of the project mentioned above.

(1) Japanese cooperation projects

Installation of new distribution pipelines and rehabilitation of aged, deteriorated distribution pipelines (including connections to existing distribution pipelines, installation of sluice valves, drain valves, pressure-reducing valves, etc., and setting of distribution zones). Project area is shown in Figure 2.1.

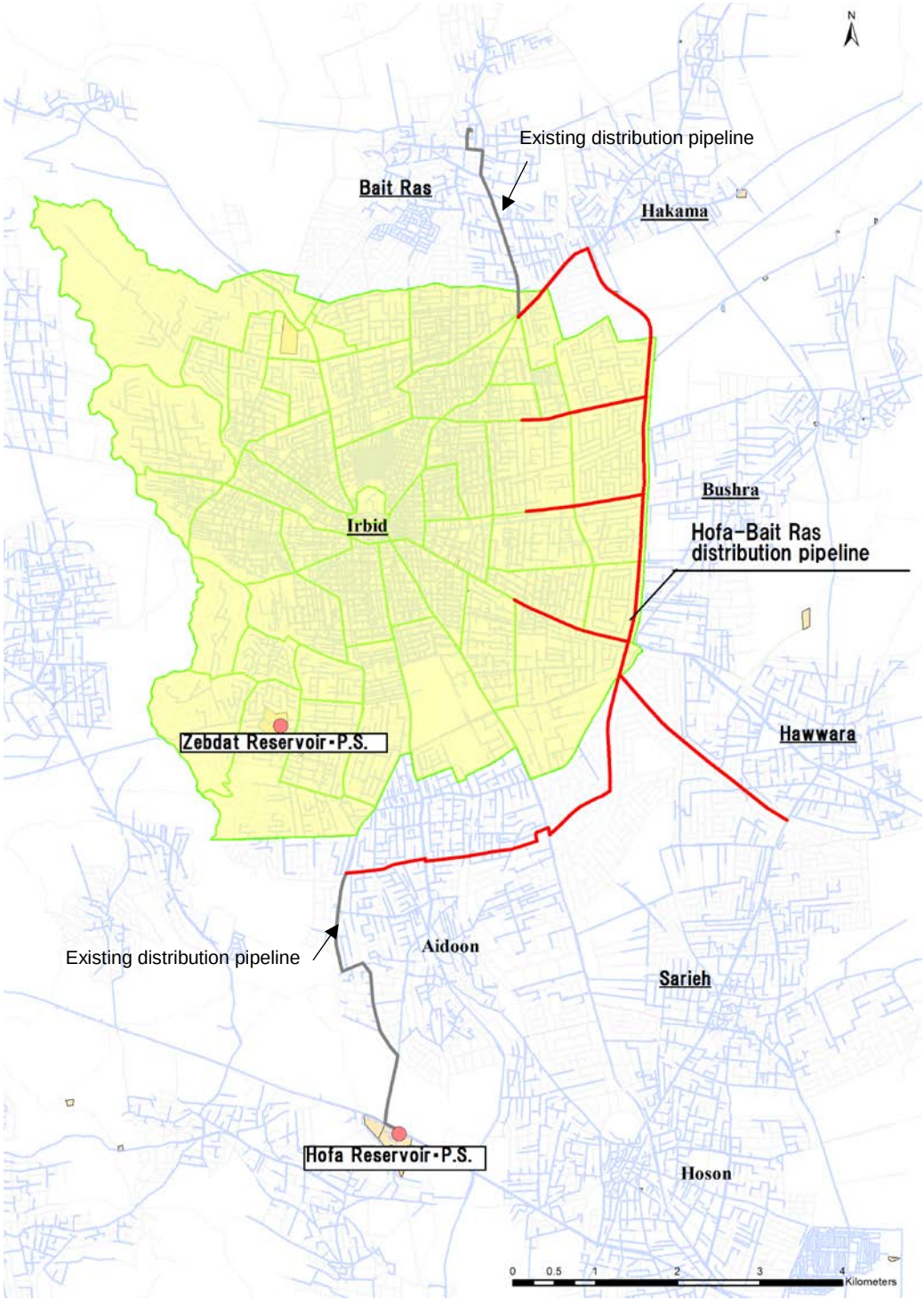


Figure 2.1 Project Area (Irbid City, Bait Ras area, Hawwara area)

(2) Projects implemented in Jordan
None

(3) Application and plan contents
This project was selected as a sub-project with high priority from the sub-projects requested by Jordan. Based on the content of the sub-project and four selection criteria namely, urgency, technical validity, effectiveness and necessity, the order of priority of the sub-projects was decided and agreed upon after discussions with WAJ. Table 2.1 shows the order of priority.
The approximate amounts of the sub-projects with high order of priority estimated were compared with

the donor amounts mentioned in the exchange of notes signed in March 2014. It was observed that funding of projects having priority lower than 4 were difficult. The results of study on the costs for three cases—one case with order of priority 1 and two cases with order of priority 2 led to the removal of rehabilitation of distribution pipeline network from the Sarieh area (order of priority 2) and a part of the Hawwara area from this plan.

Table 2.1 Requested Sub-Projects and Agreed Priority

Order of priority	Sub-project	Urgency	Technical validity	Effectiveness	Necessity
1	1B: Distribution pipeline between Hofa and Bait Ras area	◎ Water supply volume per resident has decreased due to the large inflow of refugees, and the living environment has deteriorated.	△ Validation of demand-supply balance in the four northern governorates and study of road conditions for mains as well as hydraulic analysis are necessary for deciding pipe route and pipe diameter.	◎ Served population estimated at 260,000. Rehabilitation of Disi groundwater and eastern part water sources has enabled their use. Water reaching Hofa reservoir is expected to be effectively used. Extension of water supply time and increase in per capita water supply anticipated.	○ Rehabilitation of Disi groundwater and eastern part water sources has enabled their use. Water reaching Hofa reservoir can be supplied.
2	2: Rehabilitation of Hawwara area distribution pipeline network	○ Water supply volume per resident has decreased due to the large inflow of refugees, and the living environment has deteriorated.	○ Pumped distribution from the Zebdat reservoir can be changed over to gravity flow system from the Hofa reservoir in the Hawwara area. Hydraulic analysis is necessary for deciding pipe route and pipe diameter.	○ Served population estimated at 16,000. Water leakage reduces by rehabilitation of distribution pipelines that have deteriorated due to aging and are leaking considerably.	○ Rehabilitation of Disi groundwater and eastern part water sources has enabled their use and effective use of water may be anticipated. Water leakage reduces.
2	4: Rehabilitation of Sarieh area distribution pipeline network	○ Same as above	○ Hydraulic analysis is necessary for deciding pipe route and pipe diameter.	○ Served population estimated at 24,000. Water leakage reduces by rehabilitation of distribution pipelines that have deteriorated due to aging and are leaking considerably.	○ Same as above
4	Supply of O&M equipment and materials	—	—	—	—
5	6: Provision of	△	○	○	△

Order of priority	Sub-project	Urgency	Technical validity	Effectiveness	Necessity
	Ramtha area sewer network	Population density is low; urgency is low.	Although Terms of Reference for implementation of this project exist, no planning documents for spread of sewerage system and population presented. Even if influent sewage increases due to provision of sewer network, Ramtha sewage treatment plant has excess treatment capacity.	Sewered population estimated at 6,000 to 7,800 persons. Independent houses are many in the study area; empty spaces are also abundant.	Although sanitation facilities (improved pits) are used, sludge drawing will not be required if sewerage system is provided, and the living environment improves.
6	5: Rehabilitation of Mafraq pumping station	○ Reduction in the maintenance of pumps with frequent breakdowns and reduction in replacement of parts anticipated.	○ Galvanized steel pipes laid 40 years ago; leakage rate in pipes estimated as 38%. Distribution pump distributing water to a different village each day; water pressure is not correct. Merely replacing pump will not do; entire water supply system must be reviewed.	△ Served population estimated at 8,700 persons. O&M becomes easier if new pumps including spare pumps are installed.	△ Breakdown of distribution pump is frequent; O&M becomes inconvenient.
7	1A: Irbid main distribution pipeline stage 1 (Zebdat pumping station-Alia)	△ Although leakage reduces and chances of pipe burst reduce, urgency is low.	△ Formulation of MP of Irbid urban area and implementing part of network reconstruction are recommended.	○ Served population estimated at 20,000. O&M becomes easy if new pipes are laid.	○ Distribution pipelines pass below residential area (500 m). Buried depth in part is 4 m, so O&M is inconvenient. Leakage has occurred thrice in two years.
8	3: Provision of Irbid sewer network	△ Although linked to improvements in the living environment of the study area, the increase in sewered population is small and urgency is low.	○ Plan view and vertical section view of sewer network plan available. Sewer mains and trunk sewers connecting to planned sewer network already provided.	△ Sewered population estimated at 2,000.	△ Although sanitation facilities (improved pits) are used, sludge drawing will not be required if sewerage system is provided, and living environment improves.

Table 2.2 shows the comparison of facilities planned in the conceptual design and requested contents. Figure 2.2 and Figure 2.3 show the planned distribution pipelines between Hofa reservoir and Bait Ras area, and the distribution pipeline network rehabilitation plan of the Hawwara area respectively.

Table 2.2 Comparison of Contents of Request and Facilities for This Project (Plan Proposal)

Order of priority	Area	Facility items		Unit	Quantity	
					Request	This plan
No. 1	Distribution pipeline between Hofa reservoir and Bait Ras area	Water pipe	400 mm DI	m	4,413	5,200
			500 mm DI	m	0	1,380
			600 mm DI	m	2,665	12,030
			800 mm DI	m	16,691	0
			Total	m	23,769	18,610
		Pressure-reducing valve		Location	0	5
No. 2	Rehabilitation of Hawwara area distribution pipeline network	Water pipe	63 mm HDPE	m	No quantity	4,266
			100 mm DI	m		8,798
			150 mm DI	m		3,203
			200 mm DI	m		776
			300 mm DI	m		627
			Total	m		17,670
		Water supply pipe		Location	No quantity	350
		Pressure-reducing valve		Location	0	2
Total		Water pipe	63 mm HDPE	m	No quantity	4,266
			100 mm DI	m		8,798
			150 mm DI	m		3,203
			200 mm DI	m		776
			300 mm DI	m		627
			400 mm DI	m	4,413	5,200
			500 mm DI	m	0	1,380
			600 mm DI	m	2,665	12,030
			800 mm DI	m	16,691	0
			Total	m	23,769	36,280
		Water supply pipe		Location	No quantity	350
		Pressure-reducing valve		Location	0	7

Note: The quantity of pipes and pressure-reducing valves differ in the contents of request and plan.

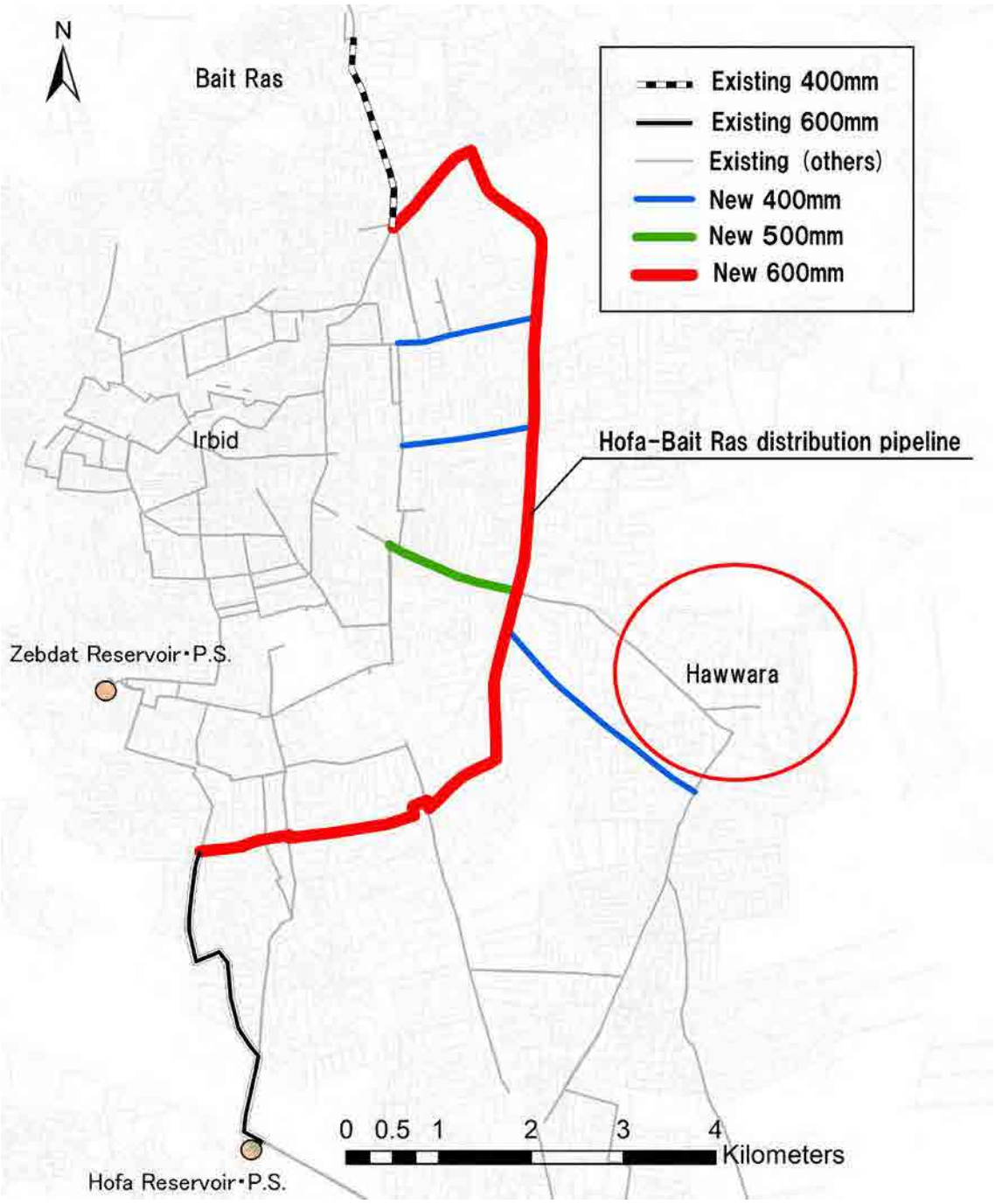


Figure 2.2 Planned Distribution Pipeline between Hofa and Bait Ras (Priority No. 1)

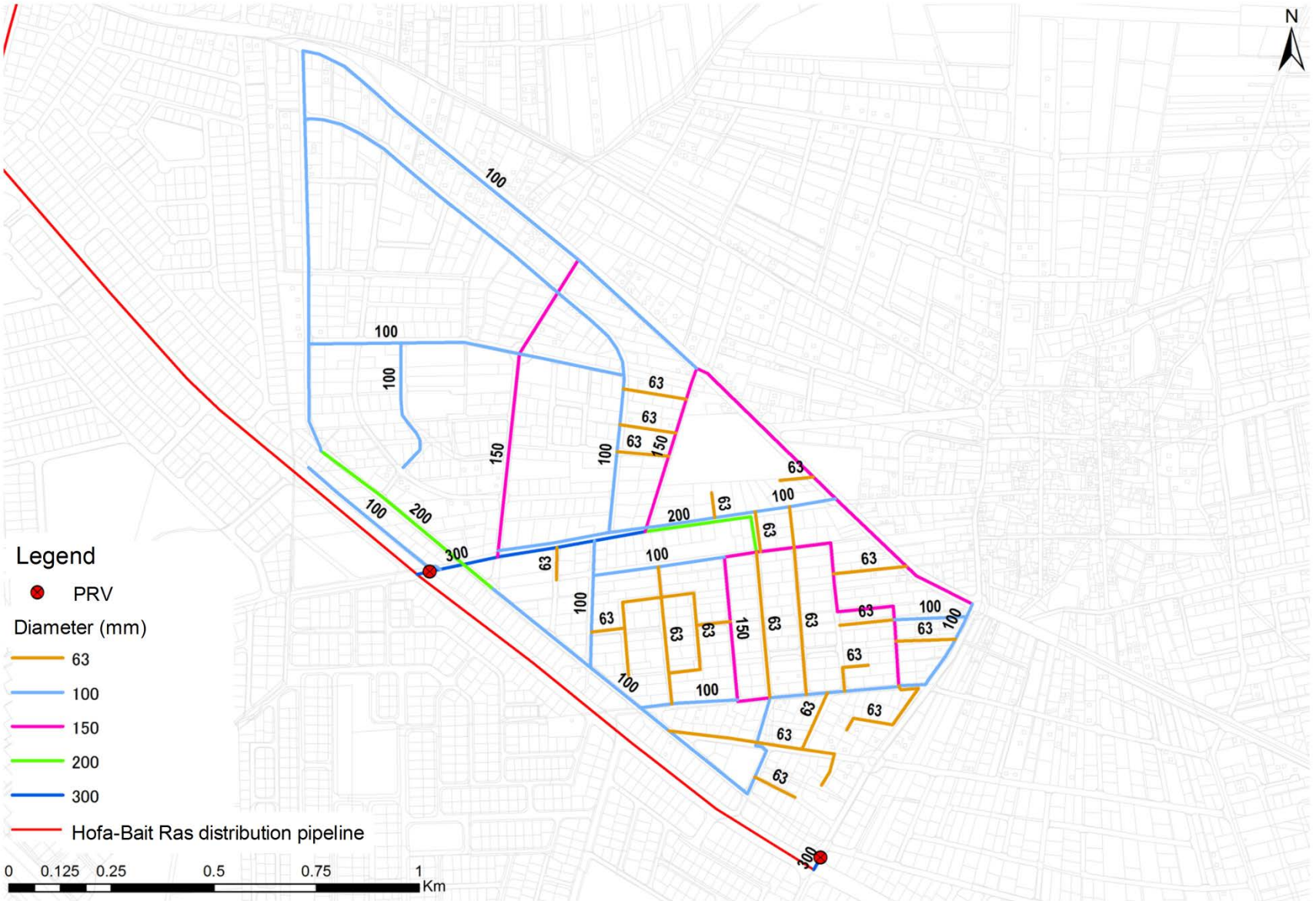


Figure 2.3 Rehabilitation Plan of Hawwara Distribution Pipeline Network (Priority No. 2)

2.2 Conceptual Design of Project

2.2.1 Design Policy of the Project

(1) Pre-requisites

To resolve the water supply-demand gap in Jordan, Disi fossil groundwater was developed in the southern part of Jordan, and water was transmitted to Amman from 2013. This enabled the well field in the eastern part of the four northern governorates, used for transmitting water to Amman in the past, to being used now within the four northern governorates. Additionally, a part of the Disi fossil groundwater was allocated to the four northern governorates. The increases in these water volumes including the well water sources in the area results in a total allocated volume in the four northern governorates of 91 MCM/year. Supplemental projects to construct transmission lines have been developed to make use of these water source volumes in the four northern governorates (see Figure 2.4). The present project has the pre-requisite that upon completion of the projects below that are currently being implemented, the transmitted volume of water to the study area of the project will increase. The increase in water volume will be transmitted to the Hofa reservoir from the transmission line in the eastern part. As a result, the volume of water transmitted from the transmission line in the western part will decrease, and the transmission of water from the Zebdat reservoir to the Hofa reservoir will be stopped.

1. Rehabilitation of water resources in the well field of the eastern part

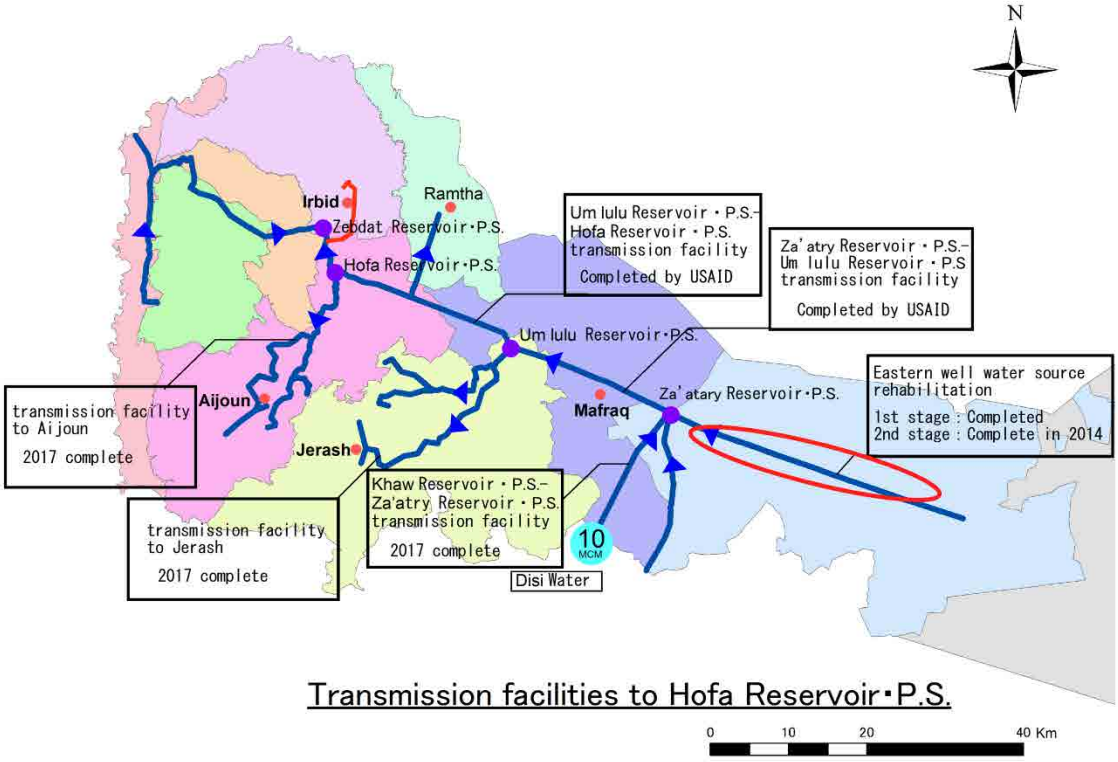
Rehabilitation and development of water sources in the well field of the eastern part are being implemented with German aid aiming for an increase in the source water volume. The first term has already been completed in the first half of 2014, and the second term is scheduled for completion in 2014.

2. Water source volume from the Disi fossil groundwater development project

Projects to reinforce the two areas below are underway aiming for completion in 2017. Branching off water from these facilities for supply to Jerash and Ajloun governorates is being planned with assistance from Saudi Arabia.

- Reinforce the transmission pipeline between the Abu Alanda distribution reservoir in Amman governorate and the Khaw distribution reservoir in Zarqa governorate with French assistance
- Reinforce the transmission facilities from the Khaw distribution reservoir to the Za'atary pumping station well field in the eastern part of Mafraq governorate with German assistance.

Transmission facilities between the well field in the eastern part and the Hofa reservoir have already been reinforced with USAID assistance. An inflow of at least 13 MCM/year to the Hofa reservoir is expected by the completion of these facilities in 2017.



Source: Prepared by the Study Team based on various data

Figure 2.4 Transmission Line up to the Hofa Reservoir

(2) Basic policy

1) Scope of cooperation

The scope of cooperation to be studied will be the No. 1 and No. 2 projects in the order of priority below, from the sub-projects specified by the Jordanian side.

- Order of priority No. 1: Installation of new distribution pipeline between Hofa reservoir and Bait Ras area in Irbid governorate
- Order of priority No. 2: Rehabilitation and renewal of distribution pipeline network in Hawwara area in Irbid governorate (including rehabilitation of distribution pipeline and setting of distribution zones)

However, in case of Priority No. 2 project, the volume of project is big, so area is to be selected according to the project budget. The selection will be made by the priority of distribution zone.

2) Targets of the project

The targets of the project are: 1) to increase the volume of water supplied to the area where water demand has tightened (because of the inflow of Syrian refugees into the host communities) by using the source water volume that has increased because of rehabilitation of well field in the eastern part of the four northern governorates and because of development of DISI fossil groundwater; and (2) to reduce the water leakage by rehabilitating the distribution pipeline network of Hawwara area.

3) Study area

The study areas of this project include Irbid City, which is the capital of Irbid governorate, the adjacent Bait Ras area and the Hawwara area (see Figure 2.5).

4) Target year

Construction of transmission pipeline is to be completed in 2017—this is the pre-requisite of this project. The target year of this project is 2017 in order to enable water to be supplied to the study area at the same time as this facility is commissioned, and because of the high urgency of this project.

5) Planned population

a. Concept of planned population

The total population of the planned facilities is taken as the population of permanent residents of Jordan and the Syrian refugee population in 2017. Since the future change in refugees cannot be predicted, the population of refugees in 2017 is taken as constant and equivalent to the population of refugees in 2013. In case if all the refugees return to their own country, the planned population will be the population of permanent residents of Jordan in 2026. Accordingly, this project will consider provision of facilities for the population of permanent residents in 2026 assuming that all refugees return to their own country. Since even the Jordanian side and international organizations cannot predict the change in the number of refugees, the number of refugees in this plan was taken as the existing refugee population based on the discussions with WAJ.

Data of the entire Irbid governorate, which are concrete, were analyzed to estimate the years corresponding to the planned population if the refugees return. The future populations of Irbid City (estimates of the Department of Statistics) are shown in Table 2.3 and Figure 2.6. Table 2.3 shows the total population which includes the future population of Irbid City plus the population of refugees (240,000, Ministry of the Interior) as of July 2013. The future population in 2017 is 1,498,000 persons; this figure is approximately equivalent to the population of permanent residents of Jordan in 2026.

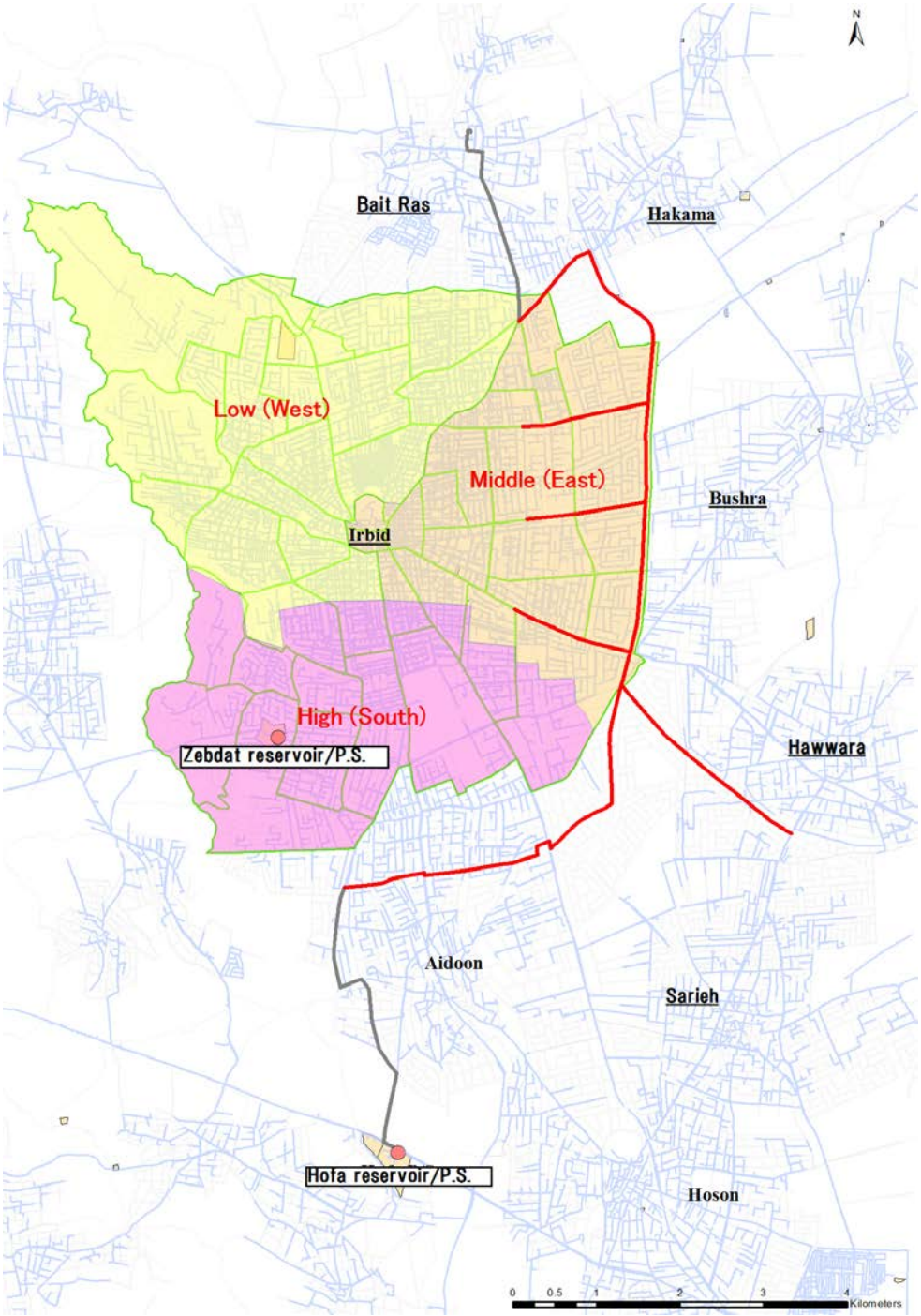


Figure 2.5 Project Facilities and Areas

Table 2.3 Future Population of Irbid Governorate and Population of Syrian Refugees

(Unit: 1000 persons)

Year	Future population Population of permanent residents of Jordan (Department of Statistics)	No. of refugees (July 2013, Ministry of the Interior)	Total population	Remarks
2013	1,160	240	1,400	
2014	1,184	240	1,424	
2015	1,207	240	1,447	
2016	1,233	240	1,473	
2017	1,258	240	1,498	Plan
2020	1,334	240	1,574	
2022	1,391	240	1,631	
2023	1,419	240	1,659	
2024	1,447	240	1,687	
2025	1,475	240	1,715	
2026	1,506	240	1,746	
2027	1,537	240	1,777	
2028	1,568	240	1,808	
2029	1,599	240	1,839	
2030	1,630	240	1,870	
2035	1,801	240	2,041	

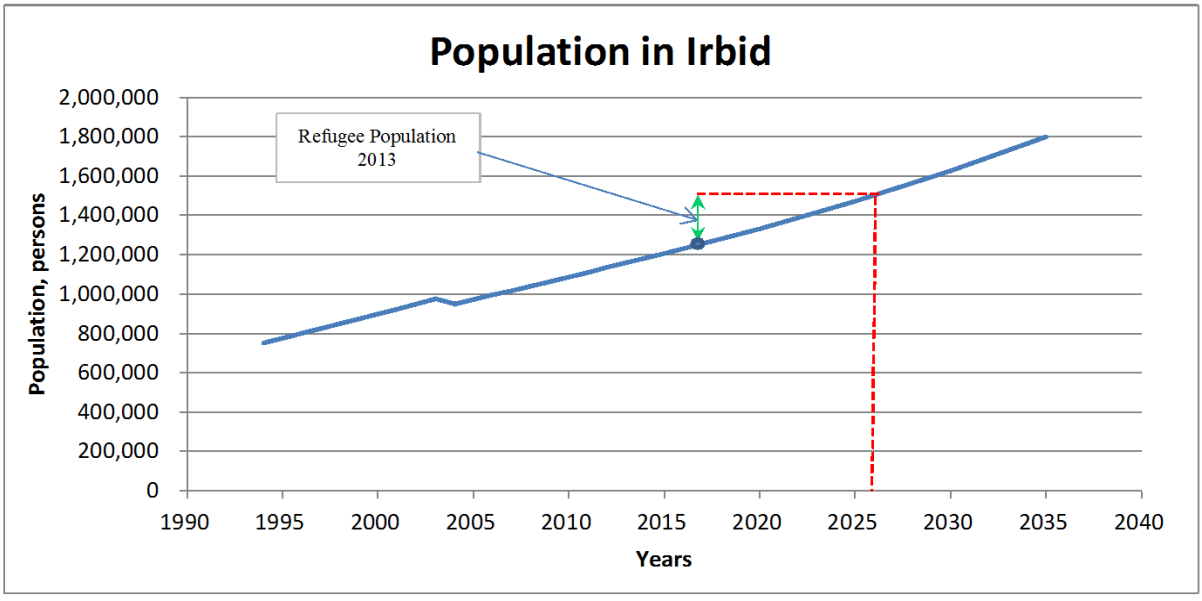


Figure 2.6 Population Trend and Estimated Future Population of Irbid Governorate

Table 2.4 shows the Syrian refugee population (2013) and population of permanent residents in the northern governorates. The population of Syrian refugees in Irbid governorate as of July 2013 was 240,000 persons. The refugee population is about 20% of the population of permanent residents.

Table 2.4 Populations of Syrian Refugees and Permanent Residents in Northern Governorates

Governorate	Population of Syrian refugees (July 2013)	Population of permanent residents of Jordan (2012)	Total
Irbid	239,750	1,137,100	1,376,850
Mafraq	134,900	300,300	435,200
Jerash	10,218	191,700	201,918
Ajloun	9,066	146,900	155,966
Total	393,934	1,776,000	2,169,934

6) Issues to be resolved

a. Main issues

Figure 2.7 summarizes the issues in water supply in the study area. The main issue to be resolved is the issue of "No water." About 20,000 complaints of unsatisfactory water supply were registered in one year in Irbid City. Next in the order was water leakage at 5,000 complaints; other issues were comparatively minor. Although water leakage does not directly affect the lifestyle of the residents, it is linked to the complaint "No water" because of the reduction in available water supply due to leakage.

b. Water supply services

i. Shortage in per capita water supply amount

The actual water supply per capita per day (not including refugee demand and water leakage volume) is estimated at 61-71 L/capita/day (pcd) served by the facilities in the study area including Hofa reservoir and the Zebdat reservoir. This value is lower than the planned national average (116 L/capita/day) and the estimated value (80-90 L/capita/day) for the four northern governorates.

ii. Inadequate water supply pressure

The water supply pressure measured in the distribution pipeline network is 0.2 Mpa maximum, and 0.1 Mpa on average. Because of this, numerous "No water" complaints are received. This complaint has occurred from all locations in the study area and not from specific locations.

iii. Water supply restriction

To equitably distribute the meager volume at water sources, water supply rationing have been practiced in each area. The average water supply time in the study area is between 6 hours to 24 hours per week. However, the time for which water is actually supplied at the users end (customer) is less. Water supply rationing have many demerits; they accelerate corrosion in pipelines, lead to mixing of contaminants, and make leakage detection difficult.

c. Main causes of "No water"

Five main causes of "No water" are listed below.

1. Shortage of water at source (shortage in supply volume)
2. Increase in water demand due to steep increase in the inflow of Syrian refugees
3. Improper arrangement and inadequate capacity of the distribution pipeline network
4. Inadequate distribution management skills of YWC
5. Water leakage because of deteriorated (aged) pipeline network, galvanized pipes (GI) and inadequate O&M

i. Shortage of water at source (shortage in supply volume)

Water supply services in the four northern governorates including Irbid governorate are in a very poor condition. The main cause for this lies in the shortage of absolute volume of water sources and the transmission of water from sources developed in the four northern governorates to Amman. The supply volume is limited for the demand in Irbid City, Hawwara and Bait Ras areas. If the demand corresponding to the Syrian refugees is included, the water demand becomes tighter.

ii. Increase in water demand due to steep increase in the inflow of Syrian refugees

The increase in Syrian refugees in the host communities of the four northern governorates started in 2011. The population of Syrian refugees in Irbid governorate as of July 2013 is 240,000 compared to the population of permanent residents in Jordan of about 1,137,000. The usable water volume per capita has decreased because of this increase in population, which has also become the main cause of the increase in complaints of water supply services.

iii. Improper arrangement and inadequate capacity of the distribution pipeline network

Water supply rationing is practiced for equitable water supply; however, the maximum number of complaints is still "No water" and this complaint has increased in recent years. The major reason for the complaint is the increase in water demand due to the increase in Syrian refugees as mentioned above. The improper arrangement and inadequate capacity of the distribution pipeline network is an additional cause as given below. This is because even if water is pumped at a high pressure of 2 MPa from the Zebdat pumping station (low water level 625 m), the water supply pressure (below 0.2 MPa) is low in areas with altitude lower than that of the pumping station (Bait Ras area with altitude of 550-600 m), a part of the Hawwara area (altitude 520-580 m) and the eastern part of Irbid City. If the distribution pipeline network had been arranged with pipelines of appropriate diameter, water could have been distributed by gravity flow from this distribution reservoir.

- Low capacity of distribution facilities (diameter smaller than required)
- Distribution pipeline network is unsuitable for population increase and expansion of urban area. Accordingly, the use of high lift pumps is unavoidable in areas where demand is high.
- Transmission pipelines, distribution mains, and branch and service pipelines are not systematically and properly arranged
- Distribution zones have not been divided considering the difference in levels

For these reasons, even if the volume of water sources increases in 2017 (which is a pre-requisite), the increased volume of water cannot be distributed to the study area.

iv. Inadequate distribution management skills

Distribution management is performed by several valve operators who open and close valves manually at about 100 locations. Issues in distribution management such as valve operations being performed based on the experience of the operators, operators forgetting to open or close the valve, and so on, have been confirmed. Such issues are considered to increase the "No water" complaints. To distribute scarce water more rationally and equitably, high level distribution management must be implemented, such as by hydraulic analysis of pipeline network and accurately understanding the hydraulic conditions.

v. Water leakage because of deteriorated (aged) pipeline network, galvanized pipes (GI) and inadequate O&M

Water leakage has been occurring all over the study area. The causes of water leakage are as below.

- Corrosion of GI used in service pipes and small diameter pipes
- Damaged steel pipes
- Inappropriate and low-quality pipe connections
- Inadequate repairs for water leakage
- Damage due to construction work
- High distribution pressure.

Especially, the distribution pipeline network of the Hawwara area consists of galvanized steel pipes laid in the seventies. The deterioration of these pipes is severe and water leakage is likely to occur easily.

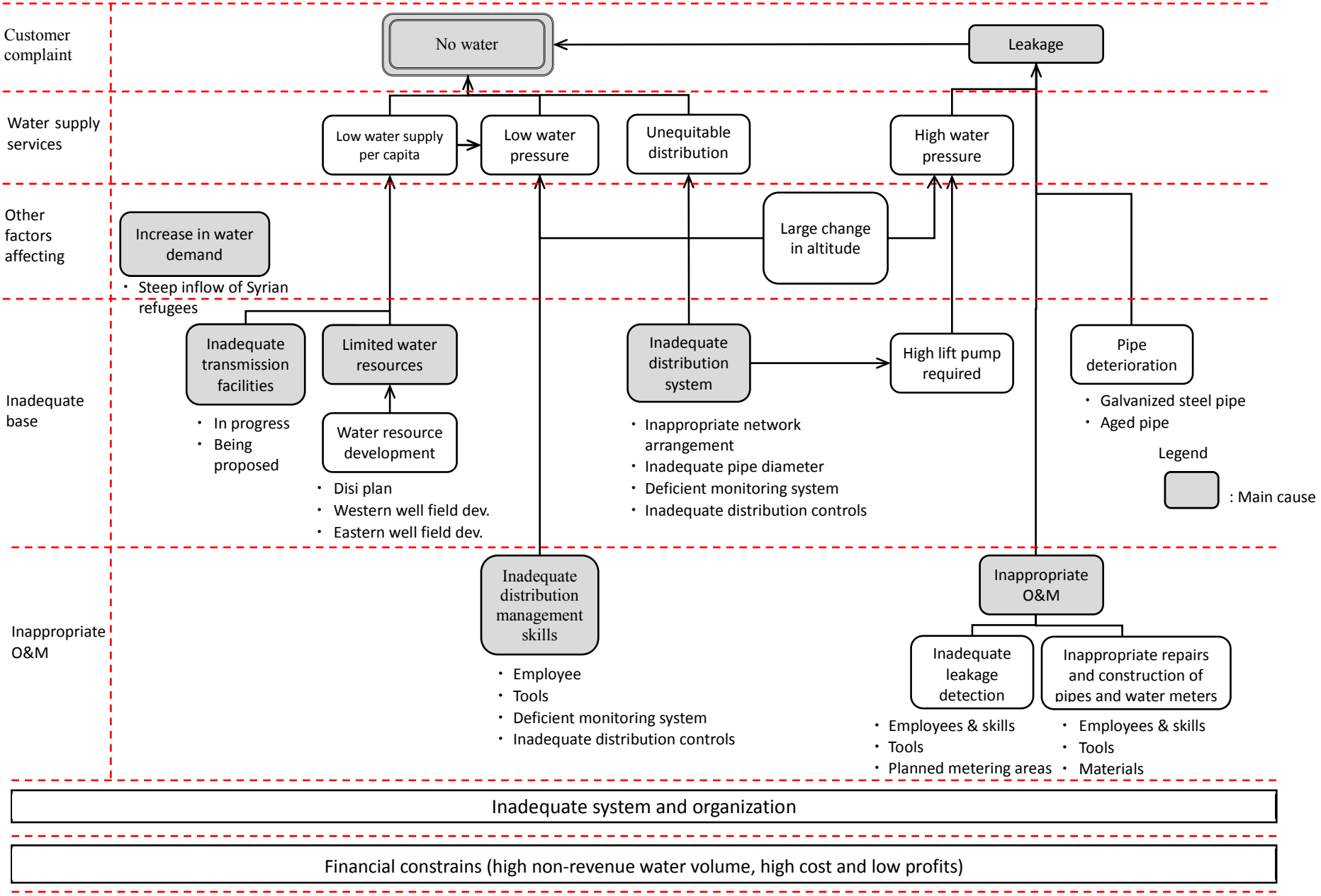


Figure 2.7 Summary of Issues in Water Supply to the Study Area

7) Measures for issues in this project

To improve water supply services and resolve the issues mentioned above, the project will be planned with the following policy:

i. Increase in water demand due to shortage of water at source (shortage in supply volume) and steep increase in the inflow of Syrian refugees

Increase in volume of water sources of the study area is according to the pre-requisites, and will be tackled by implementing other projects and not this project. Since the change in the number of refugees in the future cannot be predicted, the refugee population presently (2013) is fixed, and facilities will be planned to suit the demand of population consisting of permanent residents of Jordan and Syrian refugee in 2017.

ii. Improper arrangement and inadequate capacity of the distribution pipeline network

- Construction of new distribution lines

The increase in volume of water will be transmitted to the Hofa reservoir in 2017. New distribution lines will be installed to equitably distribute the increase in volume of water at the appropriate pressure by gravity to all parts of the study area from the Hofa reservoir.

- Expansion of distribution area served by gravity flow system and abolition of high lift pumps

High lift pumps currently being used to distribute water to Bait Ras and a part of eastern Irbid City will be abolished, and water will be taken from the Hofa reservoir by gravity flow and distributed to the relevant areas. Reduction in O&M (power cost) and bursting of distribution pipes in the high water pressure areas near the pumping station, and as a result, reduced water leakage may be anticipated.

- Installation of pressure-reducing valves

Pressure-reducing valves will be installed in distribution lines and its branches to contain the distribution water pressure within a fixed range with the aim of reducing leakage ratio and ensuring equitable supply of water.

iii. Inadequate distribution management skills

No measures for inadequate distribution management skills will be adopted in this project. However, valves will be installed at six locations in the branch lines of the distribution lines. These valves will enable water to be distributed to the relevant areas easily; therefore, distribution management will become easier than before.

iv. Water leakage because of deteriorated (aged) pipeline network, galvanized pipes (GI) and inadequate O&M

- Renewal of aged pipes in Hawwara and optimization of distribution pressure

Aged GI pipes in Hawwara will be renewed with HDPE pipes to reduce the leakage ratio. When renewing the aged pipes, the diameter of the new pipes will be selected so that the pipes can distribute water properly in the planned years as well. Improvements to repair skills of YWC for water leakage will be implemented in Component C of this technical cooperation project.

8) Guidelines related to renewal of old distribution pipeline network in Hawwara

Since the scale of the renewal work of aged distribution pipeline network in Hawwara is huge, the scale should be made such that it suits the project budget. The scale can be narrowed by assigning priority to the distribution zones.

9) Effective use of existing facilities

In principle, all existing facilities will be used effectively. The changes in existing facilities due to the present plan are as follows:

- Use of existing Hofa reservoir

  The use of the distribution reservoir will be allowed temporarily even if its capacity is inadequate.

The Wadi Arab water source is being developed as the next source of water after Disi fossil groundwater. The water from this source will be transmitted to the Zebdat reservoir from the western transmission line. The volume of water flowing into the Hofa reservoir from the eastern part transmission line is planned to be reduced. Even if the capacity of the Hofa reservoir increases in this project, when the water reaches the western part water source in the future, the increased capacity may become redundant.

- Reducing the frequency of use of pumps in the Zebdat pumping station
  The pumped water distributed from the Zebdat pumping station will be replaced by gravity flow water distributed from the Hofa reservoir in two areas. Water transmission from the Zebdat pumping station to the Hofa reservoir will also become redundant. As a consequence, the usage frequency of pumps in the Zebdat pumping station will reduce.
- Transmission pipelines from the Zebdat pumping station to the Hofa reservoir
  Steel pipes of diameter 600 mm laid in 1992 are being used as transmission pipelines carrying water from the Zebdat pumping station to the Hofa reservoir. With the increase in water supply volume from the eastern water sources to the Hofa reservoir, this transmission pipeline will become redundant. Consequently, a part of the 600 mm steel pipeline will be used as a part of the distribution pipeline in this project. According to YWC, no accidents have occurred to this steel pipeline. (Refer to 2.2.2(6)2))

(3) Considering water distribution to areas connected by distribution pipelines from Irbid City

The distribution pipeline network of Irbid City is connected to the Bani Kinana District to the north of Irbid City. Since development of regional water sources is restricted, water must be transmitted in the direction of Irbid City so as to meet the increasing demand in the future in these areas. Accordingly the capacity of the distribution pipelines in this project will be planned to include the transmitted volume to these areas.

(4) Considerations for water source development in the future

For future water sources, an increase in the Disi fossil groundwater and eastern part water sources likely to be implemented in the present study stage are being contemplated in this project. On the other hand, WAJ, which is pressed for water source development at an early stage because of the inflow of Syrian refugees, is planning to develop water sources in the western part of Irbid (Wadi Arab). The volume and timing at which water will be supplied after development of the water source is not clear at the present stage. Accordingly, the Irbid City internal distribution system was planned such that good use will be made of the water regardless of whether it is transmitted from the eastern or the western water sources.

(5) Policy on natural conditions

- Care is necessary especially when placing concrete in summer when daytime temperatures are close to 40ºC; quality controls must be properly implemented.
- The geology of the study area shows gravel mixed with limestone (silt and sand) and limestone ground (soft rock). The ground shows adequate bearing capacity based on geological conditions. According to test boring study results, soft rock exists in all sections of the pipe laying route. However, sections at shallow locations (3 m below ground surface) account for about 20% of the water pipe sections, while locations 3 m above the ground surface account for the remaining 80% of the sections. Accordingly, 20% along the pipeline length is soft rock, while the rest may be treated as ordinary soil. Retaining wall structures is not necessary for water pipe excavations.

(6) Policy on socioeconomic conditions

- Water supply rationing are routinely implemented in the study area because of shortage of water sources. Although the supply time varies by area, it is generally one day per week on an average. Water demand has grown because of the inflow of refugees; however, the volume at the water source has not increased, therefore the supply time has not changed. Accordingly, the per capita volume has decreased, and phenomena such as the following have appeared: unsatisfactory water supply has increased to larger areas, and supply time has decreased for the user. The present

project aims to increase the water supply volume, reduce the areas where water supply is deficient, and increase the water supply time.
- Construction work methods in commercial areas and dense residential areas will be implemented such that hindrance to normal living and industrial activities is minimized. At the same time, construction work methods at roads where traffic is dense will consider the effects of the work on through traffic and safety.
- Benefits for the residents in the study area such as employment in construction work and so on, will be considered.

(7) Policy related to procurement
- Materials and equipment that can be procured in Jordan will be procured in Jordan. Materials and equipment that cannot be procured in Jordan or for which adequate quality cannot be ensured, will be procured from a third country or from Japan. Laborers and materials and equipment will be procured locally as far as possible so as to contribute to the local economy in the study area.

(8) Policies related to construction methods and construction periods
- Conditions of the host communities that are deteriorating because of the inflow of refugees must be improved as early as possible; therefore, plans will be made to shorten the construction period. Since most of the work is pipeline work, simultaneous work in parallel is possible at different work sections. The number of working teams will be increased, the construction period will be set at 1.5 years, and 2017 will be taken as the target year for start of usage of the facilities. Transmission facilities for Disi groundwater are anticipated to be completed in the same year.
- Even if the work on the Disi groundwater transmission facilities becomes prolonged, the increase in water volume enabled by rehabilitation of the eastern water sources expected to be completed in 2014 can be conveyed to the Hofa reservoir using the transmission facilities already in use in the four northern governorates. Thus, immediately after this project is completed, although the increase in volume of water will be partial, it can be used.
- The work plan for excavation for laying pipes will be formulated considering how to minimize traffic hindrance. Moreover, work safety measures will be devised.
- Excavation work for pipeline crossings in trunk roads under the jurisdiction of the Ministry of Public Works and Housing (MPWH) is not permitted. Accordingly, trenchless method will be used.

(9) Policy on management, operation and maintenance skills of the implementing organization
- WAJ will be the organization in charge of design and work supervision. YWC will be responsible for the routine O&M of the distribution facilities after the work is completed.
- The facility plan will be formulated to create simple facilities with easy O&M. It will also be such that the materials and equipment for O&M owned by YWC can be utilized for O&M.

2.2.2 Basic Plan

(1) Setting project target values

The present water supply service index values and the target values for effects of implementation of this project are set in the table below. The measurement year is taken as 2017, the year of completion of the project. Explanation on target values is given after this section. Target values are used as given below.
- Effect index: Value that measures the effect of the project
- Target value: Value related to the project taken as target for improvement by YWC
- Reference value: Reference value for unknown estimation values such as status values

Table 2.5 Status Values and Target Values due to the Project in the Study Area

Item		Unit	Status value	Target value (2017)	Use of target value
Number of "No water" complaints (Fair water supply index)		Number	20,801 (Irbid City, 2013)	8,000 (Average of past 8 years)	Target
Water supply pressure		MPa	Less than 0 - 0.75	0.25 – 0.75	Target
Distribution pipeline flow between Hofa reservoir and Bait Ras		m^3/day	0	30,000	Effect index
Supply value /pcd (Estimated)	Jordanians	Lpcd	82	125	Reference
	Including refugees	Lpcd	68	106	Reference
Water use per capita per day (Estimated)	Jordanians	Lpcd	65	100	Reference
	Including refugees	Lpcd	54	85	Reference
Leakage ratio (assumed)		%	20% (Estimated)	15 %	Target
Leakage complaints	Number	Number	4,439 (Irbid City)	3,000	Target
Served population	Jordanians	Persons	344,724	368,827	Reference
	Including refugees	Persons	104,507	104,507	Reference
	Including refugees	Persons	449,231	473,334	Reference

Note: Project study area taken as Irbid City, Bait Ras and Hawwara.

(2) Plan conditions

1) Planned population

The population of permanent residents of Jordan, population of Syrian refugees and demand are summarized in the table below. The population of Syrian refugees in each zone was estimated by proportional division based on the ratio of population of permanent residents and population of Syrian refugees in Irbid governorate, and the population of permanent residents in each zone was estimated by the ratio of permanent residents in Irbid governorate. The served population ratio is almost 100%, and the served population is taken as the administrative population. The estimation of water demand quantity is discussed in the next section.

The populations of permanent residents of Jordan in 2017 in the study area, that is, Irbid City, Bait Ras and Hawwara are 323,289, 26,914 and 18,624 respectively, with the total at 368,827 persons. If the estimated population of Syrian refugees – 104,507 is added to this figure, then the total population benefitted by this project works out to 473,334 persons.

Table 2.6 Population of Permanent Residents of Jordan, Syrian Refugees and Demand

Population of permanent residents of Jordan

	2012	2017
Population		
Irbid City (urban)	307,024	323,289
Bait Ras (rural)	22,078	26,914
Hawwara (rural)	15,622	18,624
Total	344,724	368,827
Water use per capita per day		
Urban area	145	145
Rural area	110	110
Demand (MCM/y)		
Irbid City (Urban)	16.25	17.11
Bait Ras (rural)	0.89	1.08
Hawwara (rural)	0.63	0.75
Total	17.76	18.94
Demand (m^3/day)		
Irbid City (Urban)	44,518	46,877
Bait Ras (rural)	2,429	2,961
Hawwara (rural)	1,718	2,049
Total	48,665	51,886

Estimated population of Syrian refugees

	2012	2017
Irbid City (Urban)	93,078	93,078
Bait Ras (rural)	6,693	6,693
Hawwara (rural)	4,736	4,736
Total	104,507	104,507
Water use per capita per day		
Urban area	145	145
Rural area	110	110
Demand (MCM/y)		
Irbid City (Urban)	4.93	4.93
Bait Ras (rural)	0.27	0.27
Hawwara (rural)	0.19	0.19
Total	5.39	5.39
Demand (m^3/day)		
Irbid City (Urban)	13,496	13,496
Bait Ras (rural)	736.23	736.23
Hawwara (rural)	520.96	520.96
Total	14,754	14,754

Total populations of permanent residents and refugees

	2012	2017
Irbid City (Urban)	400,102	416,367
Bait Ras (rural)	28,771	33,607
Hawwara (rural)	20,358	23,360
Total	449,231	473,334
Demand (MCM/y)		
Irbid City (Urban)	21.18	22.04
Bait Ras (rural)	1.16	1.35
Hawwara (rural)	0.82	0.94
Total	23.15	24.32
Demand (m^3/day)		
Irbid City (Urban)	58,015	60,373
Bait Ras (rural)	3,165	3,697
Hawwara (rural)	2,239	2,570
Total	63,419	66,640

2) Planned water use per capita per day

Planning conditions for the four northern governorates are considered to clarify the allotment of distributed water to the project study area in 2) and 3).
Planned water use per capita per day is as given below, based on the planned values in the "Water Reallocation Strategy 2010) of MWI. WAJ has been using 1.5 to 2.0 as the time coefficient, although this figure varies depending on the project; for this project, 1.5 will be used as the minimum required limit.

Table 2.7 Planned Water Use per Capita per day

S.N.	Item	Urban area (Irbid)	Rural area (Bait Ras, Hawwara)
1	Domestic water (Lpcd)	100	80
2	For commercial use	3% of water for domestic use	3% of water for domestic use
3	For industrial use	5% of water for domestic use	2% of water for domestic use
4	For tourism use	3% of water for domestic use	-
5	For emergency use	5% of water for domestic use	5% of water for domestic use
6	**Daily average water use (Lpcd)**	116	88
7	Seasonal variation coefficient	17% more than water for domestic use	17% more than water for domestic use
8	**Daily maximum water use**	135	103
9	**Time coefficient**	50% more than daily maximum water use	50% more than daily maximum water use

3) Planned non-revenue water ratio and planned leakage ratio

Table 2.8 shows the planned non-revenue water ratio and planned leakage ratio. The non-revenue water ratio for Irbid City in 2012 was 45%. The non-revenue water ratio for the planned year did not vary from the present ratio. The non-revenue water ratio for 2017 was taken as 40% to suit Component B of the technical cooperation project in the water supply Master Plan. The leakage ratio for the same year was taken as 20% using half the planned non-revenue water ratio, which is frequently used in Jordan. The non-revenue water ratio of this project is the target value in "Jordan's Water Strategy 2008-2022" and the planned leakage ratio is the target value in "Water Reallocation Strategy 2010." Although it is true that the non-revenue water ratio and the leakage ratio cannot be improved easily, the target values of the government stated in the "National Agenda 2006-2015" were used in this project.
However, even if the water demand is estimated based on an optimistic reduction in leakage ratio reflecting this, the volume at the water source visualized later in (3)-5) will be exceeded; therefore this demand cannot be satisfied. Accordingly, although the water demand has been calculated in this project, it is merely a reference value for fair distribution of the restricted volume in the water sources to various areas.

Table 2.8 Planned Non-revenue Water Ratio and Planned Leakage Ratio of Irbid City

Index	2012	2017	Remarks
Non-revenue water ratio (%)	45	40	Non-revenue water ratio and Leakage ratio of 2017 of Water supply Master Plan used
Leakage ratio (%)	20	20	

Note: The non-revenue water ratio for Irbid City in 2012 was 45.2%.

4) Planned water supply volume

The planned water supply volume is given in the table below using the planned leakage ratio and planned water use per capita per day.

Table 2.9 Plan Conditions for Water Supply Volume in Study Area

Item	2012 (Actual value)	2017	
		Urban area	Rural Area
A. Planned water use per capita per day (Lpcd)	87	116	88
B. Planned average water supply volume per capita per day (Lpcd)	－	145	110
C. Planned maximum water supply volume per capita per day (Lpcd)	－	166	120

5) Planned water supply pressure

The water supply pressure [1] for this project is taken as minimum 0.25 to 0.29 MPa and maximum 0.78 to 0.98 MPa[2] in principle, assuming water with direct connection to a four-storey building. The design policy for water pressure was set considering the following items:

- Water is distributed by gravity flow system to the study area. If the water pressure in the planned distribution pipelines in some areas between the Hofa reservoir and Bait Ras is taken as less than 0.78 to 0.98 MPa, water cannot be distributed by the gravity flow system to Bait Ras (since the minimum water supply pressure cannot be ensured); therefore, the maximum supply pressure was set at the value mentioned above. Water will not be supplied directly from this area to each household.
- Pressure-reducing valves are planned to be installed at two locations in the planned distribution pipeline and at connections (three locations) in the already installed pipelines for pressure regulation.
- If the pressure-reducing valve breaks down, static water pressure (maximum of about 2.45 MPa) may act from the Hofa reservoir. Therefore, the pipe selected was ductile cast iron pipe that can withstand internal pressure of 2.94 MPa, which includes the water hammer pressure of 0.49 MPa, on the maximum static pressure.

Table 2.10 Water Supply Pressure Used in This Project

Minimum water supply pressure	Maximum water supply pressure
0.25-0.29 MPa (Water can be supplied to a four-storey building)	0.78-0.98 MPa assumed in principle.

(3) Allocation of transmission volumes in the future to the study area

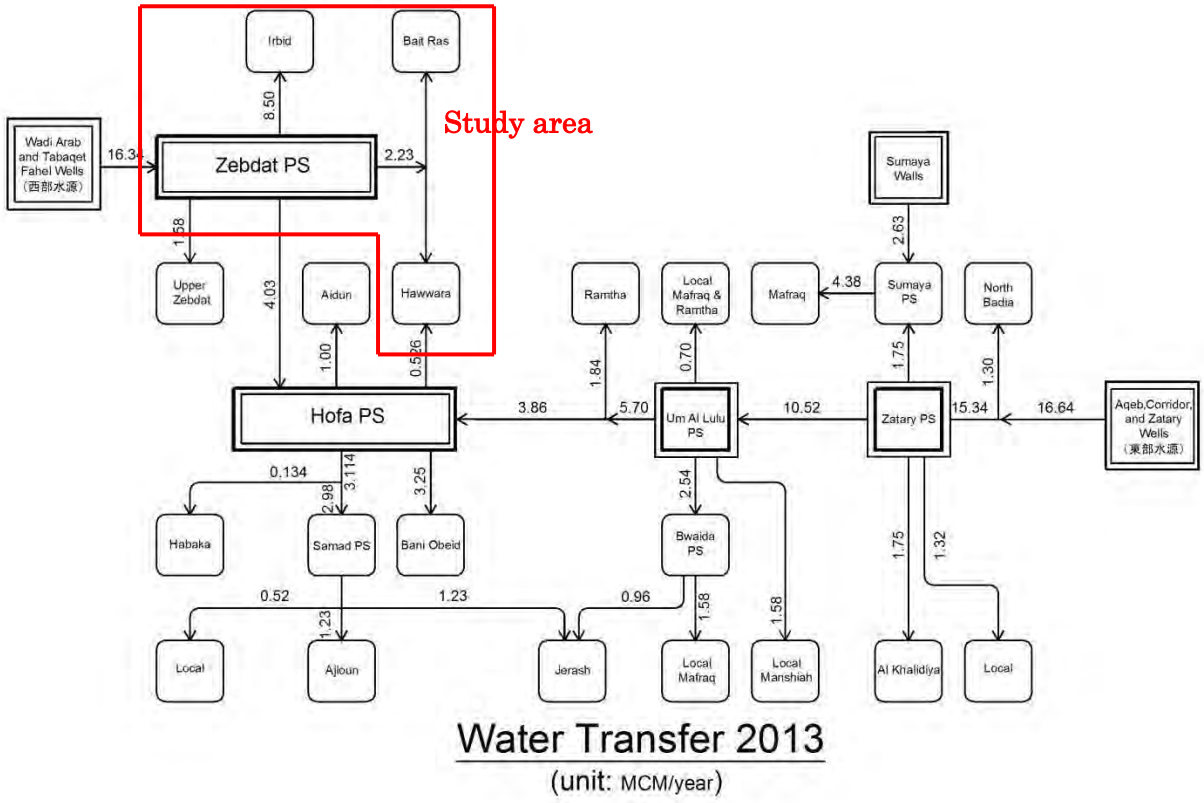
To propose the distribution pipeline plan for the pipelines between Hofa reservoir and Bait Ras in the study area of this project, the inflow to the Hofa reservoir in the future is estimated. For details, refer to the Appendix-7.

1) Water allocation status

Figure 2.8 shows the transmission status of water as of 2013.

[1]Not a documented WAJ guideline. WAJ will specify design conditions through study/design in the specifications or consultant will propose the conditions and WAJ will approve them if the project is by an aid organization. The target values above are values agreed upon by WAJ.

[2] Water supply pressure may exceed 100 m in distribution pipelines some areas between the Hofa reservoir and Bait Ras, as mentioned later.



Source: Prepared by the Study Team based on YWC data

Figure 2.8 Water Transmission in Northern Governorates

2) Water demand in the four northern governorates

The equivalent average water demand in 2026 is 98 MCM/year (268,000 m^3/d). The maximum demand in the same year is 314,000 m^3/d. The total volume of water from water sources is 91 MCM/y; so about 93% of the average water demand in 2026 will be satisfied.

The total population of the planned facilities is taken as the population of permanent residents of Jordan and the Syrian refugee population in 2017. Since the future change in refugees cannot be predicted, the population of refugees in 2017 is taken as constant and equivalent to the population of refugees in 2013. If all the refugees return to their own country, the planned population will be the population of permanent residents of Jordan in 2026. Accordingly, this project will consider provision of facilities for the population of permanent residents in 2026 assuming that all refugees return to their own country.

3) Volume of water in the existing sources in the four northern governorates

The volume of internal water sources in 2013 in the four northern governorates is 72 MCM/y (200,000 m^3/d).

4) Volume of water in the water sources in future in the four northern governorates

Kfw has been rehabilitating mainly well fields in the eastern part and has completed the first stage work in April 2014. It is expected to complete the second stage work currently in progress by the end of this year. Upon completion, volume of source water is anticipated to increase by 9 MCM/y (25,000 m^3/d). The developed 100 MCM/y Disi fossil groundwater was deployed in 2013 and has already been supplying water to Amman. Of this, 10 MCM/y (27,000 m^3/d) will be allocated in 2017 to the four northern governorates. If the increased volume of 19 MCM/y is added to the existing volume of water source of 72 MCM/y (volume pumped in 2013), the total for the four northern governorates will become 91 MCM/y.

5) Water balance of four northern governorate

The water demand and the volume of water sources in the future in the four northern governorates in

2017 will be as given below.

- Average demand in 2026: 98 MCM/y (268,000 m^3/d), maximum demand is 276,000 m^3/d
- Future water sources: 91 MCM/y (250,000 m^3/d)

6) Design distribution flow from the Hofa reservoir

Based on the demand and amount of available internal water sources of each locality of northern governorates, flow from Hofa reservoir is estimated as described here. In 2017 as shown in Figure 2.9, 19.1 MCM/year of water will be available at Hofa reservoir from the eastern water sources. Of this, 8.1 MCM/year of water will be supplied to Ajloun governorate through Hofa pumping station and the remaining 11.0 MCM/year will be supplied to Irbid city and other areas including Hawwara and Bait Ras. On the other hand, after fulfilling the water demand of localities on western side, 14.30 MCM/year of water will be available at Zebdat reservoir from the western water sources. Consequently, 25.3MCM/year of water will be allocated to Irbid city and other areas.

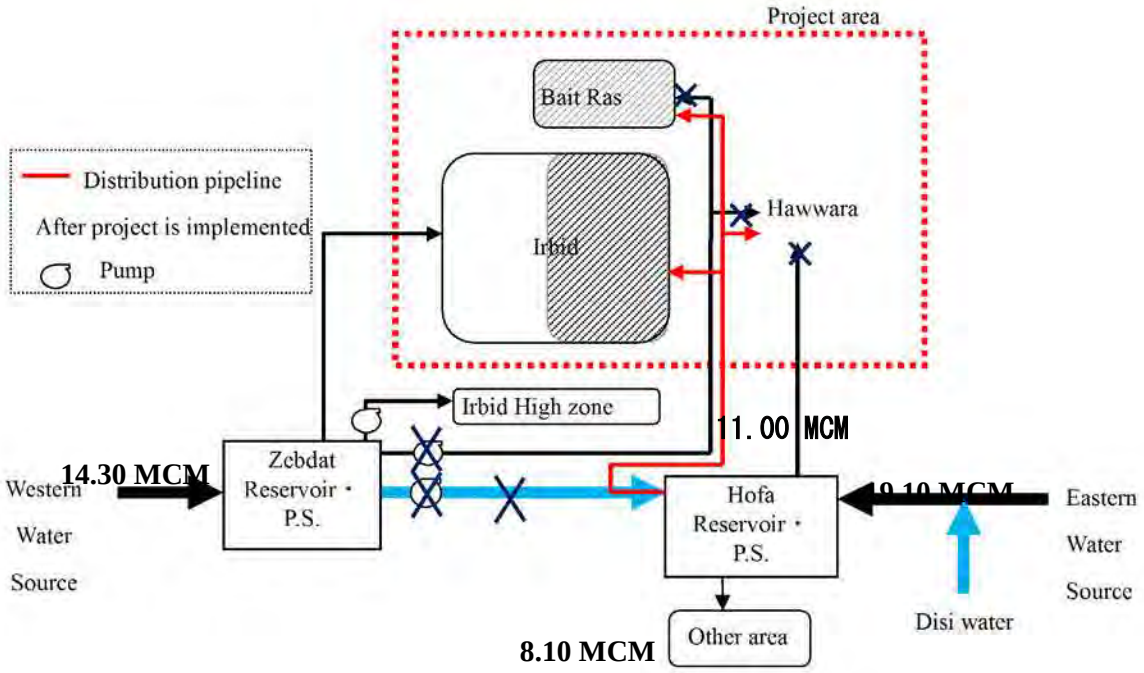


Figure 2.9 Water Balance near Irbid City (2017 average base, MCM/y)

The Water Reallocation Strategy 2010 of MWI takes the increasing water demand in summer as 17% of the water for domestic use. To satisfy the demand in summer, YWC increases the water pumped from wells and purchases water from wells owned by private parties. Accordingly, the design distribution flow from Hofa reservoir are the daily average flow of 30,000 m^3/d (equivalent to 11 MCM/y)and 35,000 m^3/d with the daily maximum.

(4) Water supply per capita per day

The water supply per capita per day for the population of permanent residents of Jordan in the study area in 2013 is 82 Lpcd. The water supply per capita per day with the addition of the estimated Syrian refugee population is 68 Lpcd.

The water supply per capita per day for the population of permanent residents of Jordan in the study area in 2017 will be 125 Lpcd. The water supply per capita per day with the addition of the estimated Syrian refugee population will be 106 Lpcd, which is an improvement from the present status.

The water supply volume per capita per day is a reference value since the present status is unknown and is an estimated value. In case of permanent residents of Jordan only, the present value is taken as 65 Lpcd, the target value in 2017 is taken as 100 Lpcd, the present value including refugees is taken as 54

Lpcd, and the corresponding value for the target year 2017 is taken as 85 Lpcd.

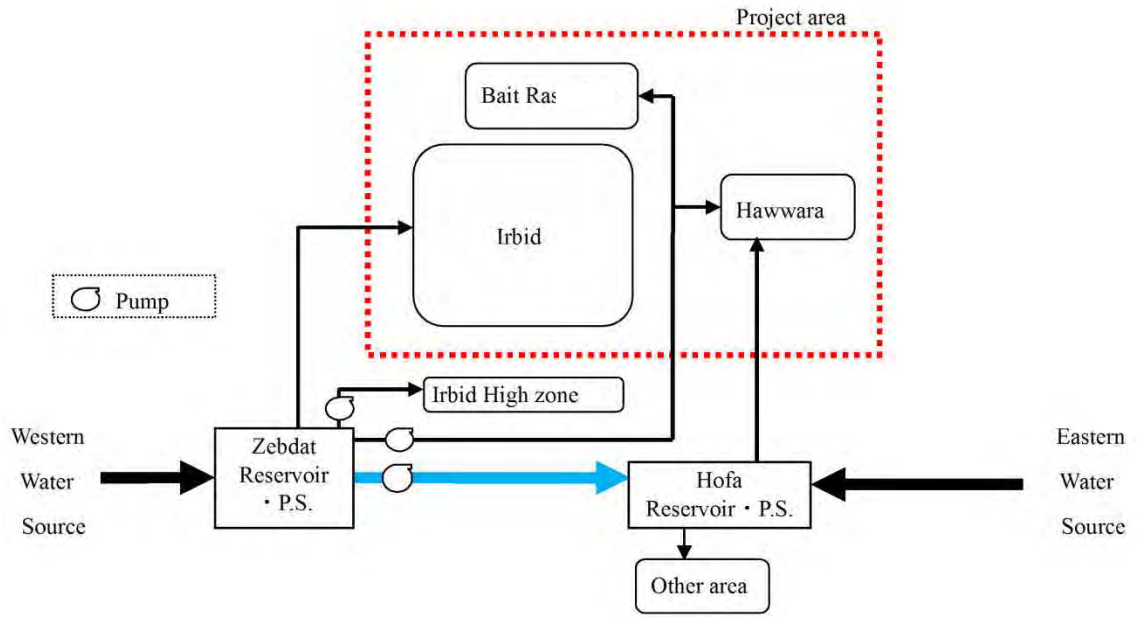
(5) Plan for distribution pipeline between Hofa reservoir and Bait Ras

The construction of facilities in detail for this project with the pre-requisites of water allocation mentioned above is as follows:

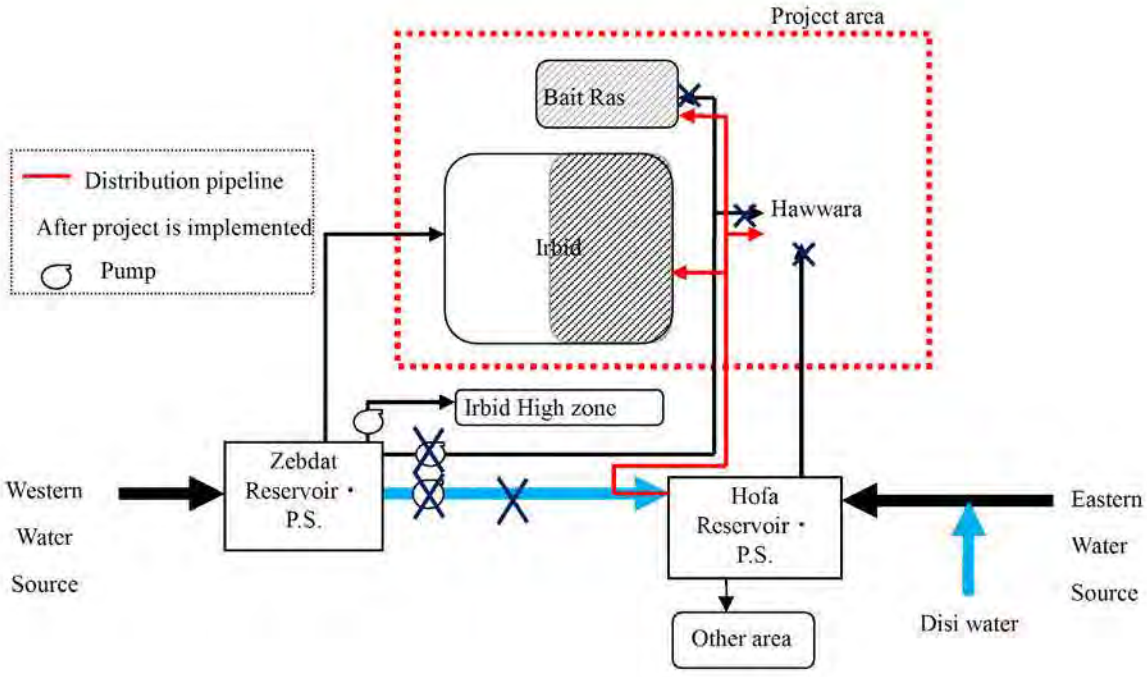
- New installation of distribution pipeline between Hofa reservoir and Bait Ras
- Laying and connecting pipelines to the existing pipelines of the eastern part of Irbid City (3 nos.) and Hawwara (1 no.)
- Connections to existing distribution pipeline of Bait Ras
- Installation of pressure-reducing valves to avoid excessive water supply pressure although water distribution by gravity flow is employed from the Hofa reservoir
- Installation of branches for distributing water in the future to high distribution zones in the southern part, Aidoon in the southern part, Sarieh in the south-eastern part, and the two zones in the eastern part (Bushra and Hakama) in Irbid City

By providing the facilities mentioned above, the high lift pumps between Zebdat pumping station and Bait Ras can be abolished; also, the water distributed to Bait Ras by pumps, to some areas in the eastern part of Irbid City, and to Hawwara can be switched over to water distribution by gravity flow system from the Hofa reservoir.

Figures 2.10 and 2.11 (level differences) show the conceptual sketches for distribution of water before and after the project in the study area is implemented.



(1) Present situation



(2) After project is implemented

Figure 2.10 Conceptual Sketch of Distribution of Water Before and After Implementing the Project in the Study Area

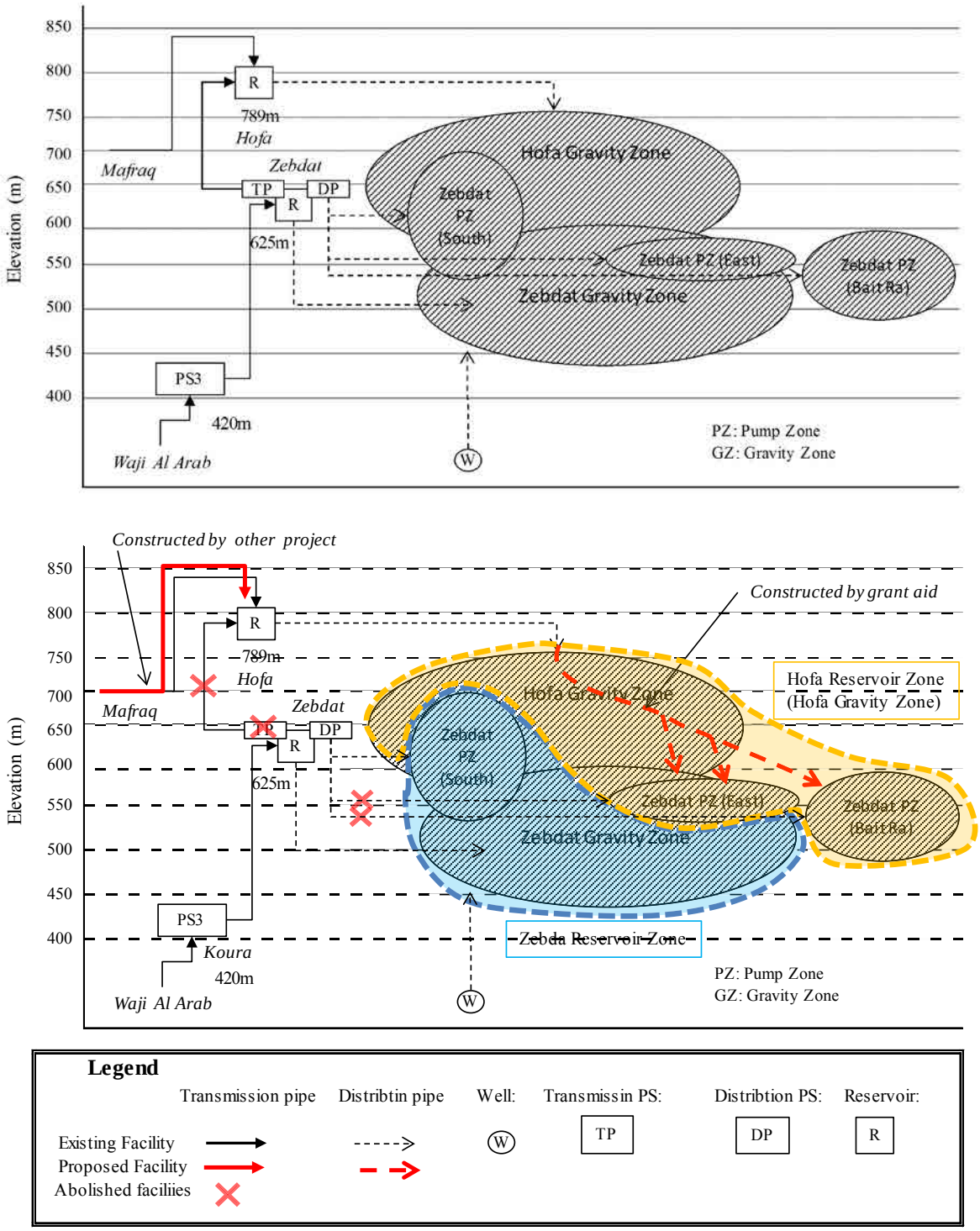


Figure 2.11 Conceptual Sketch of Distribution of Water Before and After Implementing the Project in the Study Area (Level Differences)

(6) Plan of distribution facilities

1) Checking the capacity of the distribution reservoir

The existing capacity of Hofa reservoir is 17,000 m^3 consisting of 12,000 m^3 and 5,000 m^3 reservoirs. In 2017, from Hofa reservoir or pumping stations, the following amount will be distributed or conveyed:

- Distributed Amount
  - 11.00 MCM/year (daily average of 30,000 m^3/day and daily maximum of 35,000 m^3/day) to Irbid city and other areas

- 4.09 MCM/year (daily average of 11,200 m^3/day and daily maximum of 13,000 m^3/day) to a part of Bani Obaid district

- Conveyed Amount
  - 4.01MCM/year to Ajloun governorate

If the volume required for regulating the fluctuation in conveying water through sub-transmission mains is set at 1 hour equivalent of the maximum daily flow, it is calculated as 538 m^3. Subtracting this 1 hour capacity from the total capacity of Hofa reservoir amounts to 16,462m^3. Apparently, Hofa reservoir has the storage capacity of 8.2 hours equivalent of the maximum daily water distribution flow. (Reference: *8 ~ 12hr is standard in the Design Criteria for water supply facilities, 1990. 12hr is considered for the emergency cases).

2) Use of existing pipelines and diameter and route of newly installed distribution pipeline

Design distribution flow from Hofa reservoir for Irbid city and other areas in this Study is 11.00 MCM/year (daily average of 30,000 m^3/day and daily maximum of 35,000 m^3/day) as mentioned before. Diameter of distribution pipes is planned for the maximum hourly flow of 2,226 m^3/hr (which is the hourly average flow based on daily maximum flow multiplied by the peak factor of 1.5).

A request was received to lay the main pipeline section (15.6 km) excluding the connecting pipeline (branch) with 800 mm from the Hofa reservoir to Bait Ras. Based on results of hydraulic analysis, it was decided to use the existing pipeline (600 mm) in the 3.7 km section from the Hofa reservoir.

This existing pipeline is a steel pipeline laid in 1992, and is being used as the transmission pipeline from the Zebdat pumping station to the Hofa reservoir. However, transmission of water will become redundant with the introduction of Disi fossil groundwater and water sources in the eastern part; therefore, it was decided to divert the water to a part of the planned distribution pipeline in this project considering the reasons listed below (Refer to Figure 2.12).

- The 3.7 km pipeline section from Hofa reservoir will be converted from transmission pipe (from Zebdat to Hofa) to distribution pipe (from Hofa to Irbid). The elevation ranges from 780 m to 685 m. The maximum water pressure in this section will be 105 m, which is the difference between the high water level of 790 m of the Hofa reservoir and the lowest ground level of 685 m in this section
- The maximum water pressure of the above-mentioned section at present or before conversion is estimated to be 146 m. This is estimated as follows:
  - 146 m = A + B – C = 631 + 200 - 685
  - A. water level of Zebdat reservoir (high water level: 631 m)
  - B. pump head of 200 m at Zebdat pumping station
  - C. the lowest elevation in this section is 685 m
- The diversion is feasible since this static water pressure after diversion will be lower than the water pressure before the diversion.
- According to YWC, no accidents to existing pipelines have been recorded.

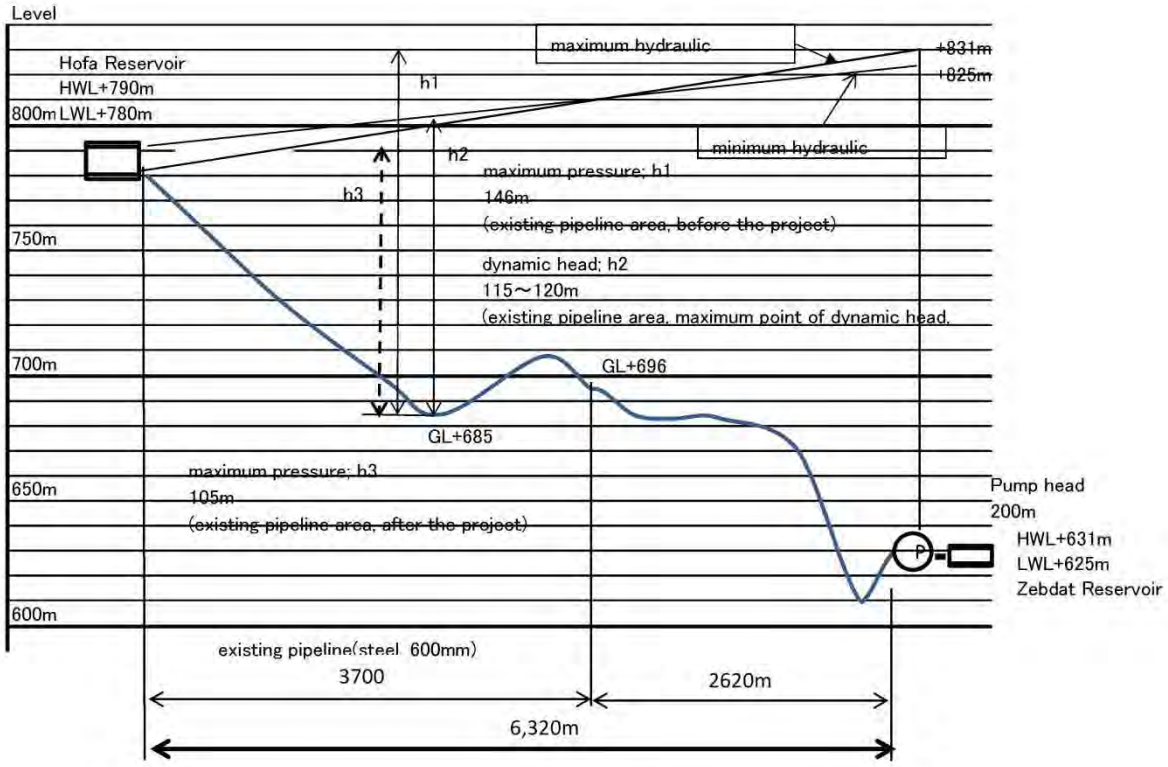


Figure 2.12 Water Pressure before and after Converting Existing Transmission Mains from Zebdat to Hofa Reservoir to Distribution Mains

A new pipeline branching off from the existing pipeline is planned. Two alternative proposals (south route and north route) for the new pipeline were compared (see Figure 2.13). Table 2.11 shows the comparison of alternative proposals for the distribution pipeline route. The south route was used based on the results of evaluation. If the water distributed from the Zebdat reservoir increases after the water sources in the western part are developed in the future, the north route becomes a hydraulically superior proposal; however, since this route passes through city area with dense traffic volume, approval for the route could not be obtained from YWC. The present project is an urgent project aiming to mitigate the water demand due to inflow of Syrian refugees as quickly as possible. Therefore, the north route was avoided since extension of work period is likely because of the difficulties in working in dense traffic areas, and the south route was used.

At the eastern end of the route used is a national road that connects to Amman. The route is planned from south to north along the bypass road (2-3 lanes on one side) on the eastern part of Irbid City after crossing the national road.

Table 2.11 Comparison of Distribution Pipeline Routes

Item	South route	North route
Description	Runs east from an elevation of 700 m. Elevation drops abruptly to 590 m, as the route runs northward to Bait Ras.	Runs north from the branch-off point with the South route toward the city area and curves to the east when the elevation reaches 600 m, meets the South route and then follows it.
Urban area	Outskirts	Existing urban area
Traffic volume	Low	High
Workability	Good	Poor
Chances of work extension	Low	High
Use as a gravity flow distribution pipeline from Zebdat reservoir in the future	Distribution pipeline from the Zebdat reservoir can be extended to the Hawwara area branch-off point	Distribution line from the Zebdat reservoir can be extended to the 600-m elevation point
Use as a distribution pipeline to surrounding areas (Aidoon)	Can be diverted	Additional pipeline required
Agreement by YWC	Obtained	Not obtained
Conclusion	Adopted	

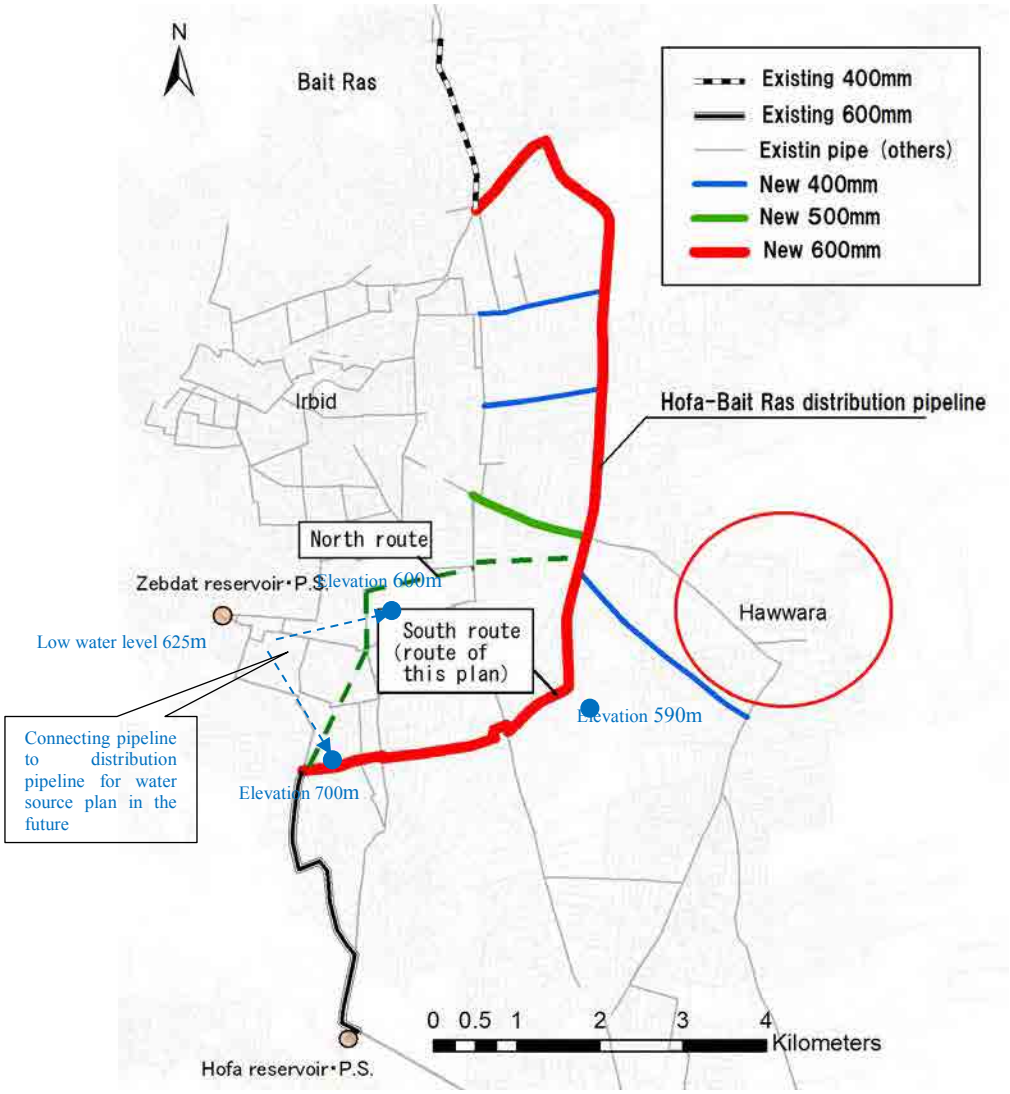


Figure 2.13 Alternative Proposals for Distribution Pipeline Route

3) Plan to use distribution pipelines in the future

This distribution pipeline will be used for distributing water from the Hofa reservoir to Irbid City and so on; however, there is a high probability that the purpose of this distribution pipeline may change in the future according to the position and volume of water sources that supply water to Irbid City. It is important to plan in such a way that the purpose of this change is complied with, and the pipeline can be used in the distribution system of Irbid in the future.

Water demand is likely to increase after 2026 and water shortage is expected to worsen. For this reason, the inflow from the eastern well field to the Hofa reservoir is likely to reduce year after year. To prepare for this eventuality, the plan to expand the water resources in the western part (30 MCM/y) is being promoted by WAJ and EIB. When this plan is implemented, the total volume of water sources will increase to about 121 MCM/y. Upon completion, there is a high probability that the water demand in Irbid City will depend on the existing Zebdat reservoir and pumping station for its entire amount. In this case, the distribution line may be connected to the distribution pipeline of the plan at the Hawwara area branch-off point, and the section in the second half after the Hawwara area branch-off point used as the distribution pipeline of Irbid City and Bait Ras. On the other hand, the section in the first half up to the Hawwara area branch-off point can be diverted to the distribution pipeline of the high zones to the south and to Aidoon.

4) Connecting pipelines and branch pipelines

Connecting pipelines will be laid in Hawwara (1 location) and the existing pipelines connected in eastern part of Irbid City (3 locations), the destination of distribution lines, and in Bait Ras (one location) to connect to the existing pipeline. Moreover, branched pipes with blind flanges will be provided so that they can be used when new connections or changes to the distribution system are made in the future. Branching positions will run from south to north and arranged as listed below (Refer to Figure 2.14).

- High zones in Irbid City (1 location; presently Zebdat pumped water distribution zone)
- Aidoon (3 locations; presently a mix of Zebdat pumped water distribution zones and Hofa gravity flow water distribution zones of the Hofa reservoir; 1 location; road to Hoson; 2 location; planned road to Sarieh; presently, gravity flow water distribution zone of Hofa reservoir)
- Bushra (1 location; presently distribution zone from independent water source)
- Hakama (1 location; presently distribution zone from independent water source)

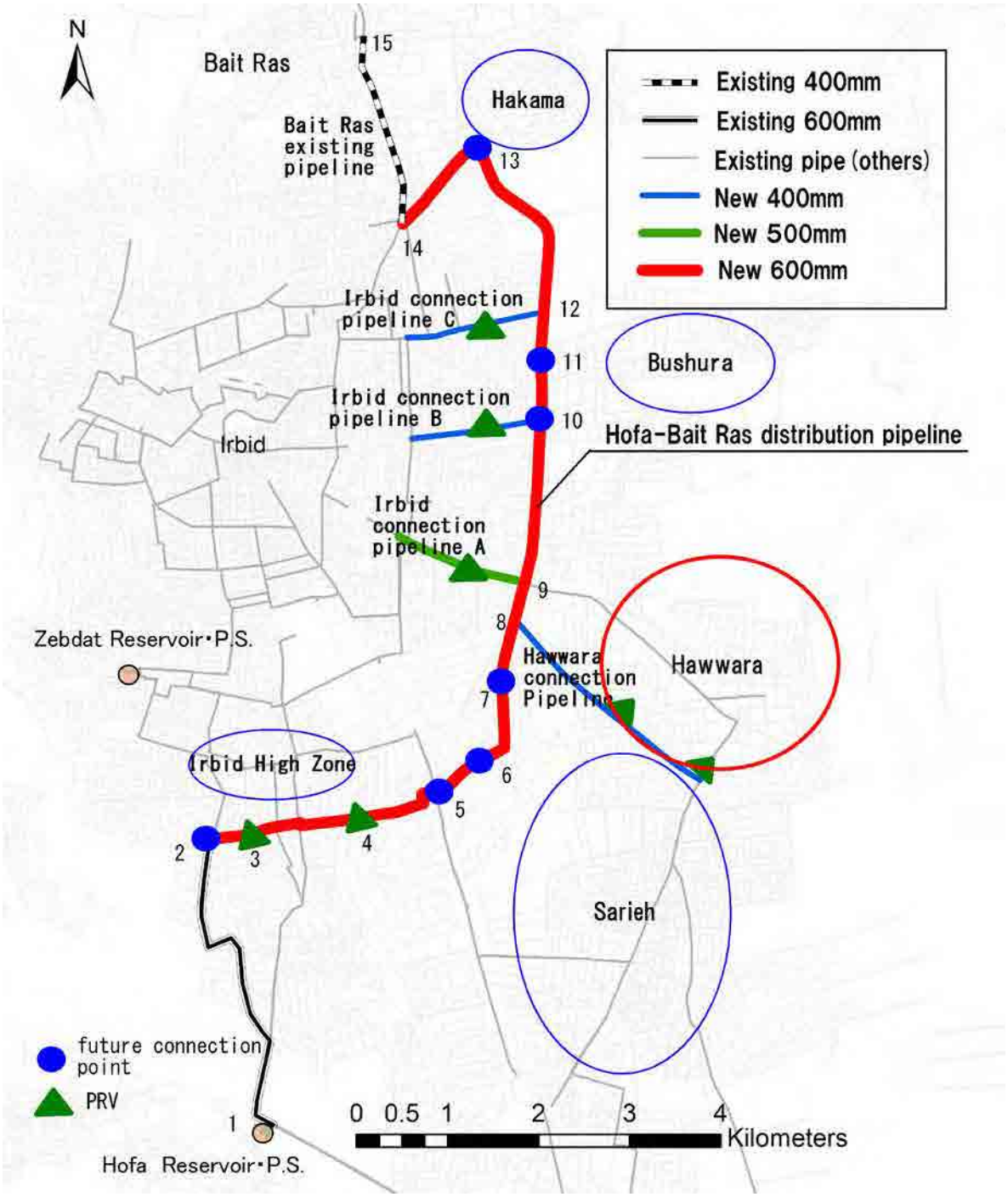


Figure 2.14 Water Distribution Pipeline Route between Hofa and Bait Ras (Including Connecting Pipelines, Branch-off points, and Locations of PRV Installation)

5) Pipe diameter and pressure reduction

Conditions for deciding pipe diameter were taken as follows:

- Must be gravity flow distributed water
- Maximum flow velocity of 3 m/s to restrict corrosion within pipe
- The difference in elevation between the Hofa reservoir and the distribution destination is more than 200 m; therefore, pressure-reducing valves will be installed to optimize the water pressure. The pipe diameter will be decided considering this pressure reduction.
- The effective water pressure at the existing pipe connection point in the eastern part of Irbid City will be as close as possible to the effective water pressure from the existing Zebdat reservoir.

Essentially, boundary valves should preferably be set after fixing the distribution zones to avoid mutual interference of distribution systems; however, this requires rearrangement of distribution pipeline network, which will incur additional costs and time; therefore, such action will not be adopted in this plan. However, measures will be adopted using pressure-reducing valves and so on, so that water pressures from the Hofa reservoir and the Zebdat reservoir are provisionally equalized as far as possible.

6) Hydraulic studies of distribution pipelines

a. Studies during maximum flow per unit time

The difference in elevation in the first half section of the pipeline (about 6 km section with elevation of 780 m at the Hofa reservoir and elevation of 590 m at the merging point of the national road) is 190 m and the water pressure in this section is to be controlled with installation of pressure reduction valves at two locations (points at about 4 km and 5 km from the Hofa reservoir) for optimizing the pressure in this section. The pressure reduction range at each location will be set at about 50 m, and the secondary side water level for each location will be set at 712 m and 670 m. Under this condition, it was decided to ensure the effective head of 10 m, that is, water pressure of 610 m at the end of the distribution pipeline in Bait Ras. After satisfying this condition, the pipe diameter for satisfying the maximum flow rate per hour was selected as 600 mm. The water pressure in sections with low elevation (Irbid C branch point to Hakama branch point; see Table 2.12 and Figure 2.15) was generally below 80 m.

The pipe withstand-pressure setting was taken as the sum of the static pressure and the water hammer pressure of 0.49 MPa. If pressure reducing valves at both locations failed simultaneously, the static water pressure from the Hofa reservoir attains its maximum value. The static water pressure can be expressed as the difference between the high water level of 790 m of the Hofa reservoir and the elevation of a location.

The elevation and static water pressure of the distribution destination are as follows:

- Irbid City eastern part (elevation from 530 m to 580 m): Static water pressure from 210 m to 260 m
- Bait Ras: (elevation from 550 m to 600 m): Static water pressure from 190 m to 240 m
- Hawwara: (elevation from 520 m to 580 m): Static water pressure from 210 m to 270 m

Steel pipes and cast iron pipes are the pipe types that can withstand these internal pressures; but ductile cast iron pipe resistant to corrosion and having good workability was selected. Based on the internal pressure setting, K-9 pipe was selected.

Table 2.12 and Figure 2.15 show the results of hydraulic calculations. The flow velocity per second is 0.51 to 2.19 m, and the dynamic water gradient is 0.59 to 8.84‰ for pipe diameter of 600 mm.

Table 2.12 Distribution Pipeline Plan (at maximum of 2,226 m^3/h)

Section			Cum. Length (m)	Flow (m^3 /hour)	Pipe Dia (mm)	Velocity (m/sec)	Hydraulic Gradient (‰)	Dynamic Head(m)	Ground Level (m)	Effective Head(m)
1:Hofa	～	2(For Irbid High Zone)	3,700	2,226	600	2.19	8.84	747.3	698	49.3
2(For Irbid High Zone)	～	3:Pressure Reducing Valve 1	3,760	2,226	600	2.19	8.84	746.8	695	51.8
								712.0		17.0
3:Pressure Reducing Valve 1	～	4:Pressure Reducing Valve 2	5,100	2,226	600	2.19	8.84	700.1	635	65.1
								670.0		35.0
4:Pressure Reducing Valve 2	～	5:(For Hoson)	6,460	2,226	600	2.19	8.84	658.0	595	63.0
5:(For Hoson)	～	6:(For Aidoon A)	6,900	2,226	600	2.19	8.84	654.1	587	67.1
6:(For Aidoon A)	～	7:(For Aidoon B)	8,040	2,226	600	2.19	8.84	644.0	578	66.0
7:(For Aidoon B)	～	8:For Hawwara	8,660	2,226	600	2.19	8.84	638.5	569	69.5
8:For Hawwara	～	9:For Irbid A	9,260	2,055	600	2.02	7.63	633.9	564	69.9
9:For Irbid A	～	10: For Irbid B	11,026	1,541	600	1.51	4.48	626.0	561	65.0
10: For Irbid B	～	11:(For Bushra)	11,820	1,541	600	1.51	4.48	622.5	556	66.5
11:(For Bushra)	～	12:For Irbid C	12,216	1,027	600	1.01	2.11	625.2	543	82.2
12:For Irbid C	～	13:(For Hakama)	14,340	514	600	0.51	0.59	624.0	545	79.0
13:(For Hakama)	～	14: Bait Ras branch	15,543	514	600	0.51	0.59	623.2	548	75.2
14:Bait Ras branch	～	15: Bait Ras Reservoir	17,820	514	400	1.14	4.23	613.6	600	13.6

Note 1: Branching equipment installed for future connections at locations with no brackets.

Note 2: Flow velocity coefficient C of 110 adopted using hydraulic calculations

Note 3: Pipelines already installed between 1. Hofa and 2. (For Irbid High Zone)

Note 4: * Pipelines already installed between 14. Bait Ras branch and 15. Bait Ras reservoir. To study gravity flow system for water distributed up to the Bait Ras distribution reservoir, which is the end point of the installed pipeline, the existing pipeline was also included in hydraulic analysis.

Note 5: Functions of ring-shaped distribution pipeline for the Irbid extension were provided in the main distribution pipeline so that it could be used flexibly also to suit water source positions and water volumes in the future. For this reason, the water volume allocated to the Hofa reservoir is largely allocated in the vicinity.

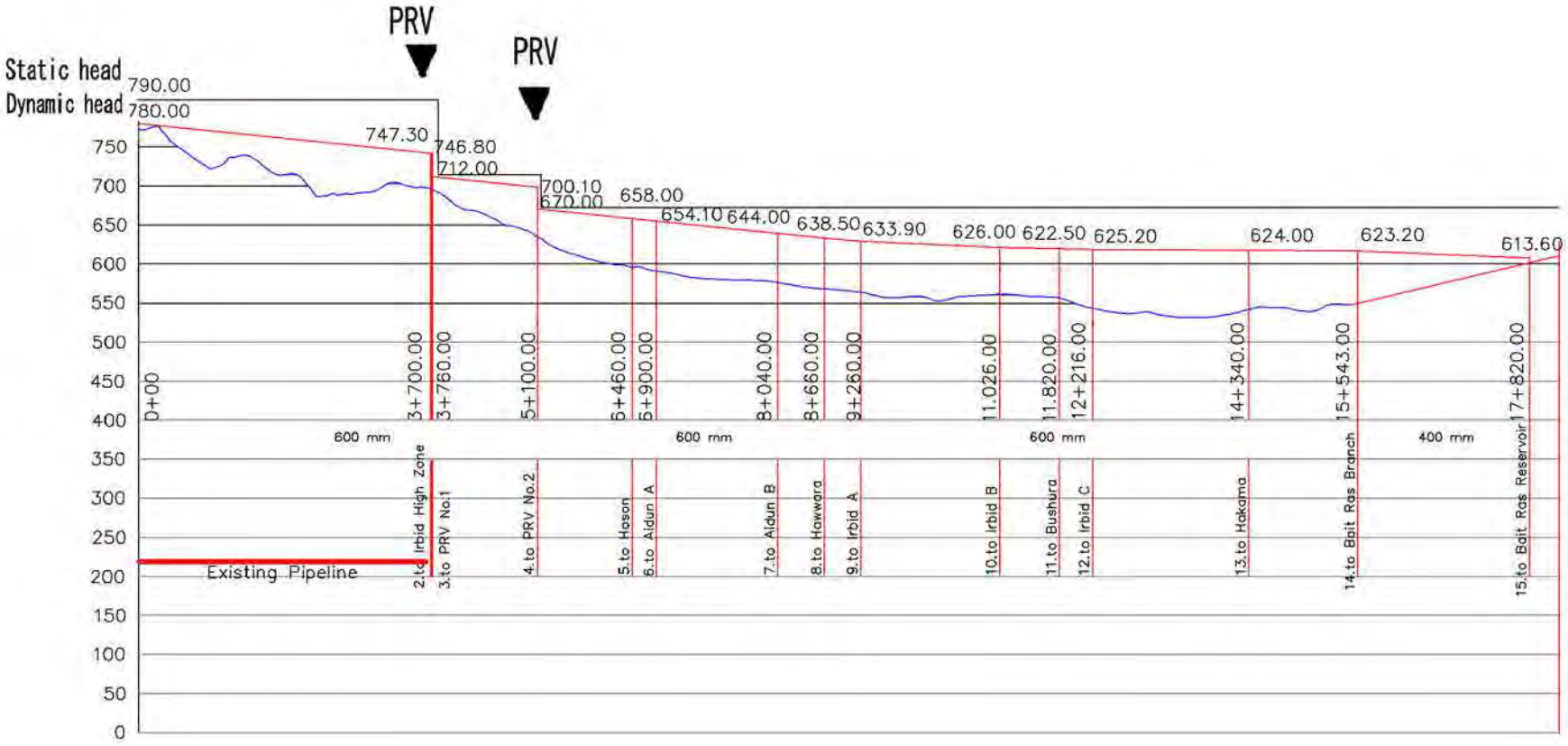


Figure 2.15 Hydraulic Grade Line of Distribution Pipeline from Hofa to Bait Ras (at daily maximum)

b. Studies during daily maximum flow rate

Normally studies are not carried out for selected pipe diameter and pressure-reducing valves during hourly maximum flow rate, but in this plan the water pressures during daily maximum flow rate from the Hofa reservoir were also checked at the distribution conditions. Since the daily maximum flow rate is smaller than the hourly maximum flow rate, the internal pipe losses will be smaller. For this reason, the water pressure in the pipe will be higher than the water pressure during hourly maximum flow rate. In second half sections with comparatively low elevation (after Irbid A branch point; see Table 2.13 and Figure 2.16), the water pressure exceeds 80 m and reaches 100 m. However, pipes that can withstand pressures greater than this pressure have been selected, so there is no problem here. Connection pipes will be provided in this section and pressure-reducing valve provided in the existing pipe connections; however, since direct supply from this section is not possible, the water supply pressure will not reach 100 m.

With the conditions mentioned above, hydraulic analysis was carried out and results are given below.

Table 2.13 Distribution Pipeline Plan (at daily maximum of 1,484 m^3/h)

Section			Cum. Length (m)	Flow (m^3 /hour)	Pipe Dia (mm)	Velocity (m/sec)	Hydraulic Gradient (‰)	Dynamic Head(m)	Ground Level (m)	Effective Head(m)
1:Hofa	～	2:(For Irbid High Zone)	3,700	1,484	600	1.46	4.18	764.5	698	66.5
2:(For Irbid High Zone)	～	3:Pressure Reducing Valve 1	3,760	1,484	600	1.46	4.18	764.3	695	69.3
								712.0		17.0
3:Pressure Reducing Valve 1	～	4:Pressure Reducing Valve 2	5,100	1,484	600	1.46	4.18	706.4	635	71.4
								670.0		35.0
4:Pressure Reducing Valve 2	～	5:(For Hoson)	6,460	1,484	600	1.46	4.18	664.3	595	69.3
5:(For Hoson)	～	6:(For Aidoon A)	6,900	1,484	600	1.46	4.18	662.5	587	75.5
6:(For Aidoon A)	～	7:(For Aidoon B)	8,040	1,484	600	1.46	4.18	657.7	578	79.7
7:(For Aidoon B)	～	8:For Hawwara	8,660	1,484	600	1.46	4.18	655.1	569	86.1
8:For Hawwara	～	9:For Irbid A	9,260	1,370	600	1.35	3.60	653.0	564	89.0
9:For Irbid A	～	10: For Irbid B	11,026	1,027	600	1.01	2.11	649.2	561	88.2
10: For Irbid B	～	11:(For Bushra)	11,820	1,027	600	1.01	2.11	647.6	556	91.6
11:(For Bushra)	～	12:For Irbid C	12,216	685	600	0.67	1.00	648.8	543	105.8
12:For Irbid C	～	13:(For Hakama)	14,340	342	600	0.34	0.28	648.3	545	103.3
13:(For Hakama)	～	14:Bait Ras branch	15,543	342	600	0.34	0.28	647.9	548	99.9
14:Bait Ras branch	～	15: Bait Ras Reservoir*	17,820	342	400	0.76	1.99	643.4	600	43.4

Note 1: Existing pipeline connected or connection pipe branched at the location with no brackets.

Note 2: Flow velocity coefficient C of 110 adopted using hydraulic calculations

Note 3: Pipelines already installed between 1. Hofa and 2. (For Irbid High Zone)

Note 4: * Pipelines already installed between 14. Bait Ras branch and 15. Bait Ras reservoir. To study gravity flow system for water distributed up to the Bait Ras distribution reservoir, which is the end point of the installed pipeline, the existing pipeline was also included in hydraulic analysis.

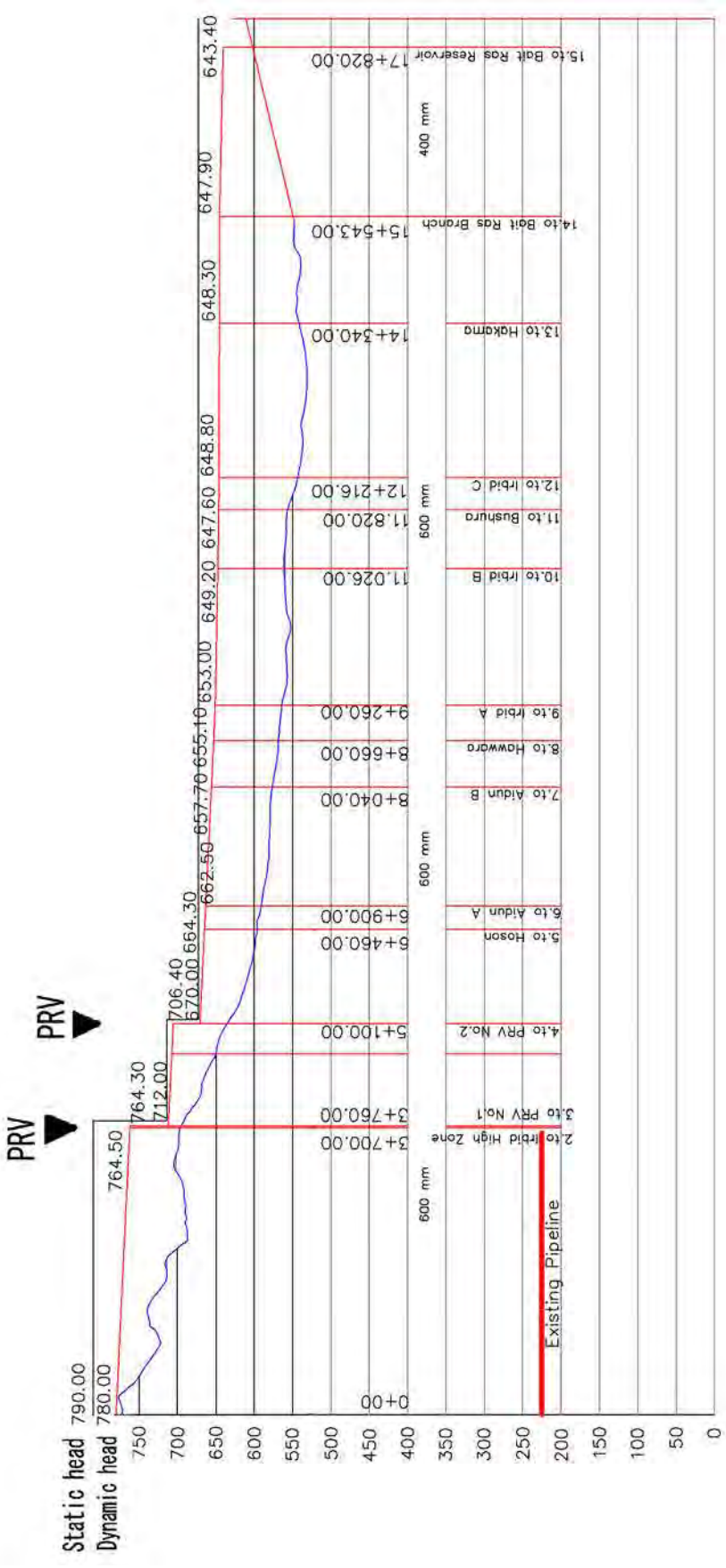


Figure 2.16 Hydraulic Grade Line of Distribution Pipeline from Hofa to Bait Ras (at daily maximum flow)

7) Pressure-reducing valve

The pressure-reducing valve plan (for positions, see Figure 2.14) of the distribution main part studied above is summarized below. The plan considers hourly maximum water supply but water may be distributed considering daily maximum during actual operation, therefore, both were studied.

Pressure-reducing valves were planned at a total of five locations: two locations in the distribution main and three locations in the branch pipe (connection pipe) to Irbid City and Hawwara.

When the main from Hofa reservoir is laid, the area connected by connecting pipeline of Irbid City will receive water from the Zebdat reservoir. Water pressures at the boundary points of both distribution zones must be equalized for balanced water distribution from the two distribution reservoirs. Consequently, the secondary water pressure at the branch points of three locations to Irbid City will be set at 610 mm to make the effective water pressure 50 to 70 m.

Water is distributed to the eastern part of Irbid near the boundary point by distribution pump (lift 200 m) of the Bait Ras area. Judging from the low water level of 625 m of the Zebdat pumping station, and the elevation of 550 to 600 m of the Bait Ras area, the dynamic water level of this plan is evidently greater than 610 m at this point of time near the branch point. Similarly, the dynamic water level presently at the connection point (elevation 550 m) of the existing pipeline of the Bait Ras area is greater than the dynamic water level of this plan. The same can be said of Hawwara area also; however, pressure-reducing valve is planned at the existing pipe connection point for reducing the effective head of the overall Hawwara area. This is described in detail in the rehabilitation plan of Hawwara.

In the upstream section of the proposed pipeline between Hofa reservoir and Aidoon district, installation of series of 2 pressure reducing valves (PRVs) is planned in consideration of the high pressure on the downstream side in the event of failure of the pressure reducing valves.

Assuming one PRV fails, maximum pressure will increase to 2.2 MPa (water head of 219 m), adding water hammer pressure 0.49 MPa. Pipe material* and thickness is selected to withstand this high pressure and, use of pipes protection by concrete blocks or restraint fitting and its combination is also planned.

Note:* Pipe material is selected considering maximum water pressure of 2.94 MPa which is the maximum hydrostatic head along the pipeline plus water hammer pressure.

Table 2.14 Pressure-reducing Valve Plan

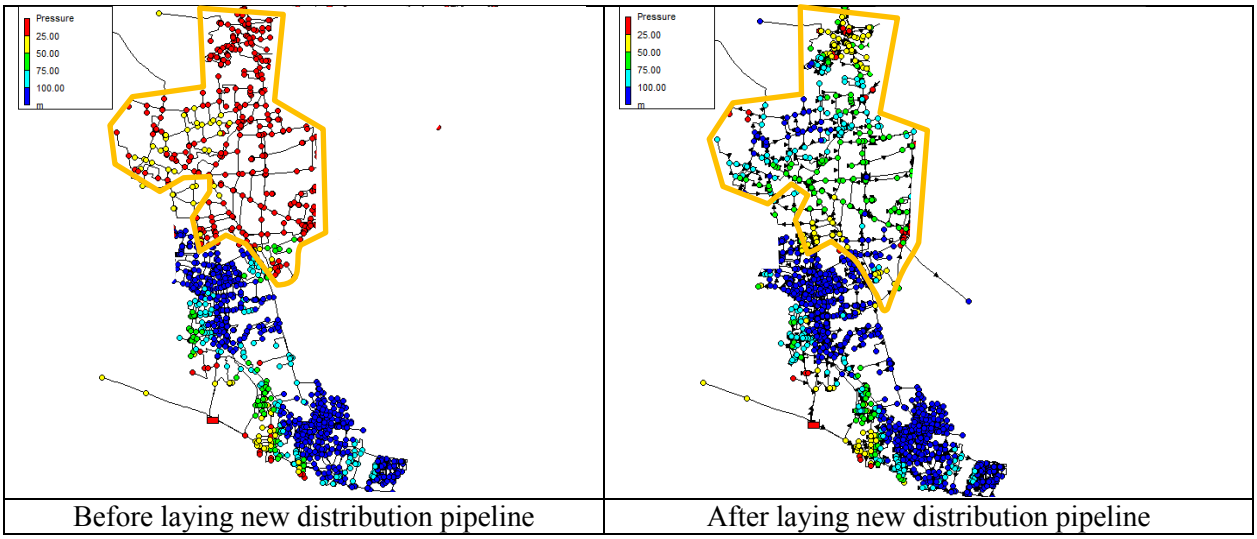
Distance from the Hofa reservoir (km)	Static water level (m)	Dynamic water level (hourly max.) (m)	Dynamic water level (daily max.)(m)	Elevation (m)	Secondary side water level (m)	Pressure-reduction range (m)	Effective head (static water level *1(m)	Effective head (hourly max.) *2(m)	Effective head (daily max.) *2(m)
Distribution pipeline									
3,760	790	747	764	695	712	35～52	95	52～17	69～17
5,100	712	700	706	635	670	30～36	77	65～35	71～35
Connection pipe toward Irbid City									
9,260	670	634	653	564	610	24～43	106	70～46	89～46
11,026	670	626	649	561	610	16～39	109	65～49	88～49
12,216	670	625	649	543	610	15～39	127	82～67	106～67

Note 1: Pressure-reducing valve plan for Hawwara is done separately

Note 2: *1 is value before pressure reduction; *2 is the value before and after pressure reduction.

8) Effects of newly installed (proposed) distribution pipelines

The figures below show the effects of improvement in water pressure after laying new distribution pipelines. The figure on the left is for existing pipeline network; the figure on the right is after laying new distribution pipelines in the existing pipeline network. The nodal demand is the result of pipeline network analysis after allocating the planned hourly maximum demand. While negative pressure occurs in the northern and eastern parts in Irbid City, and in the major part of Bait Ras only in the existing pipeline network, water pressure has improved significantly and the target water supply pressure has been ensured after the new distribution pipeline was laid.



Before laying new distribution pipeline	After laying new distribution pipeline

Figure 2.17 Effects of Proposed Distribution Pipeline

(7) Conceptual design of distribution pipeline

Distribution pipeline is designed according to the following policies:

- The planned route will be as shown in Figure 2.13.
- Pipe used will be ductile pipe (DCIP) if the pipe diameter exceeds 100 mm. The minimum pipe diameter in this plan is 400 mm; all pipes are DCIP. Ductile cast iron pipe has good strength and durability, good shock resistance, and good flexibility. It can follow changes in the ground, and it is used generally in Jordan for pipe diameters above 100; therefore DCIP was selected. Specifications of DCIP will conform to ISO 2531 (K-9 pipe).
- Buried pipe criteria will conform to Jordan's standards (WAJ and Ministry of Public Works and Housing standards).
- Air valves and drain valves will be installed at required locations according to the route profile, and flow regulating valves installed at the required locations for O&M. In principle, one will be installed at each location at 1 to 2-km interval in straight line sections.
- To satisfy the water supply pressure indicated in the design conditions, pressure-reducing valves will be installed at the required locations. Pressure will be reduced in two stages to avoid cavitation when the pressure reduction range becomes large.
- To avoid excessively high flow velocity due to excessive flow at the exit of the Hofa reservoir, flow regulating valve (butterfly valve) will be installed.
- Excavation of main road crossings has not been approved by the Ministry of Public Works and Housing during discussions. Therefore, trenchless construction method will be used in principle at important road crossings. The casing pipe system will be applied in this plan; its description is given below. (See Figure 2.18).

Table 2.15 No Dig (Trenchless) Work Plan

Item	Pipe type	Pipe diameter	Work method	No. of locations	Distance
Main	DCIP	600 mm	Pipe laying with joints to prevent pull-out	6	30m×1, 70m×1, 75m×3, 100m×1
Casing pipe	Reinforced concrete pipe for jacking method	1,000 mm	Blade jacking method		

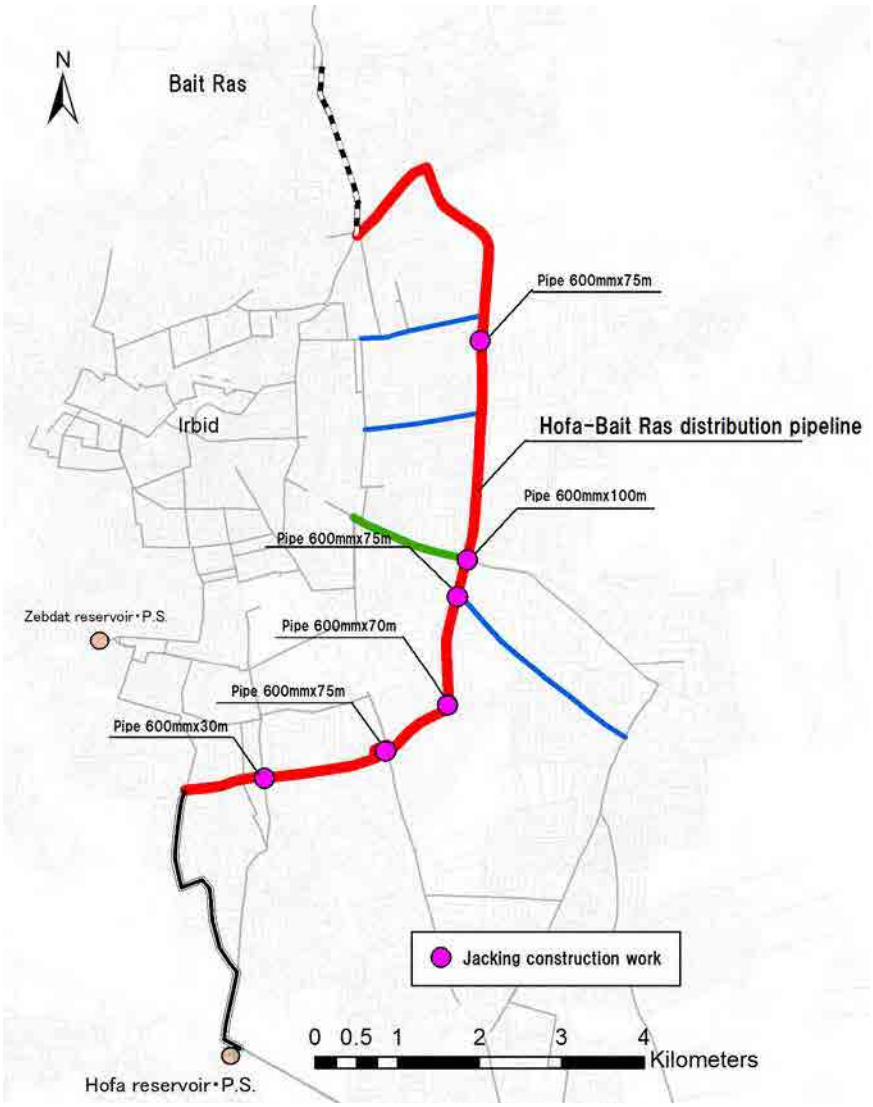


Figure 2.18 Locations of Distribution Pipeline Work using Trenchless Construction Method

(8) Rehabilitation plan for Hawwara distribution pipeline network

1) Planned population

The population in the future of the project area (in 2026) was estimated using the population growth rate by prefecture given by the Department of Statistics (DOS) as shown in Table 2.16. The plan for Hawwara estimates an increase in population by 5,044 persons compared to the present population of 15,622 persons. The population in 2026 is equal to the population of permanent residents in 2017 plus the number of Syrian refugees presently (as of 2013).

Table 2.16 Estimated Population in the Project Area

Locality	Population (persons)	
	2012	2026
Hawwara	15,622	20,666

The served population ratio has reached 98%, and the served population is taken as the administrative population.

2) Status of distribution of water

Together with Sarieh and Hoson, Hawwara forms one distribution zone, which is a gravity flow distribution zone with water flowing from the Hofa reservoir (780 m). The Hawwara lies on a gradual slope at an elevation of 520 m to 580 m. The trunk road connecting Mafraq near the boundary of both areas has been completed, and urbanization is expected to progress.

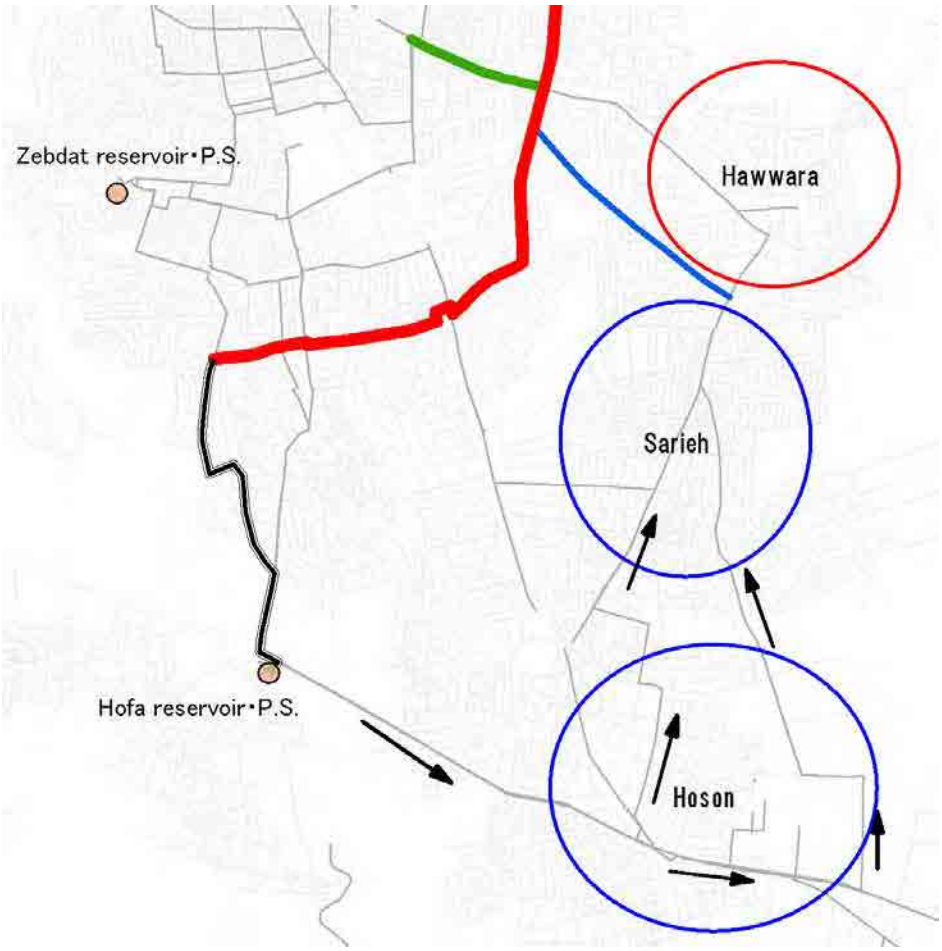


Figure 2.19 Hofa Reservoir-Hawwara Distribution System (Gravity Flow)

3) Plan of water sources

Water can be distributed by the gravity flow system through the Hofa reservoir—Hoson distribution pipeline just as it is being done presently, and through the new distribution pipeline from the Hofa reservoir—Bait Ras to be installed in the plan for distribution pipeline to the Hawwara area. From the hydraulic viewpoint, a route where head losses are small, that is, where distance of distribution pipeline from the Hofa reservoir is short, will be preferred. For this reason, water will be distributed through Hoson up to the Sarieh similar to the present system. Hydraulic conditions do not change for the Hawwara area regardless of the route. However, considering that the distribution volume will increase through the Zebdat reservoir and not through the Hofa reservoir when the western water sources are developed, new distribution pipelines will be installed passing through the Bait Ras so that it becomes easy to switch over to the distribution pipeline through the Zebdat reservoir.

4) Distribution zones

The difference in elevation in the Hawwara area is about 60 m (520 m to 580 m). To equalize the effective head in the area, the area was divided into two distribution zones (see Figure 2.20) considering the roads and the existing pipeline network.

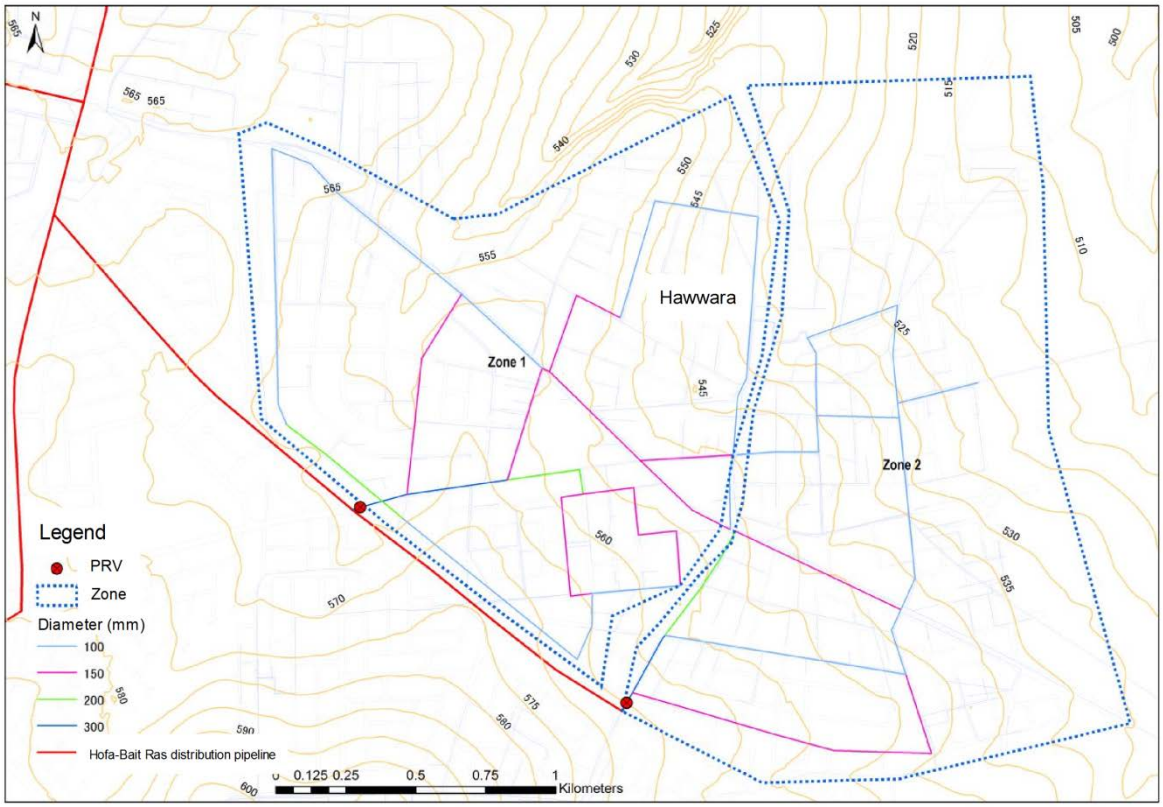


Figure 2.20 Distribution Zones of the Hawwara

5) Pipeline network calculations

Pipeline network calculations (see Appendix 4) for hourly maximum water supply by distribution zone were carried out. The flow velocity is restricted to less than 1 m/s, and the hydraulic grade line is appropriate. The distribution of effective head (see Table 2.17 and Figure 2.21) is shown below; it is generally restricted to about 50 m.

Table 2.17 Distribution of Effective Head in the Distribution Zone

Distribution zone		Elevation (m)	Effective head (m)
1	Hawwara high zone	536-567	49-77
2	Hawwara low zone	521-567	41-60

The difference in elevation between the Hofa reservoir (780m) and Hawwara is 160-250m. Accordingly, pressure-reducing valves are proposed to be installed at the inlets of distribution zones 1 and 2, as shown in Figure 2.21, so as to obtain the appropriate effective head.

Table 2.18 Pressure-reducing Valve Plan of the Hawwara

Distribution zone		Dynamic water level (Hourly max.) (m)	Elevation (m)	Secondary side water level (m)	Pressure-reduction range (m)	Effective head (Hourly max.) (m)
1	Hawwara high zone	632	565	617	15	52
2	Hawwara low zone	632	565	596	36	31

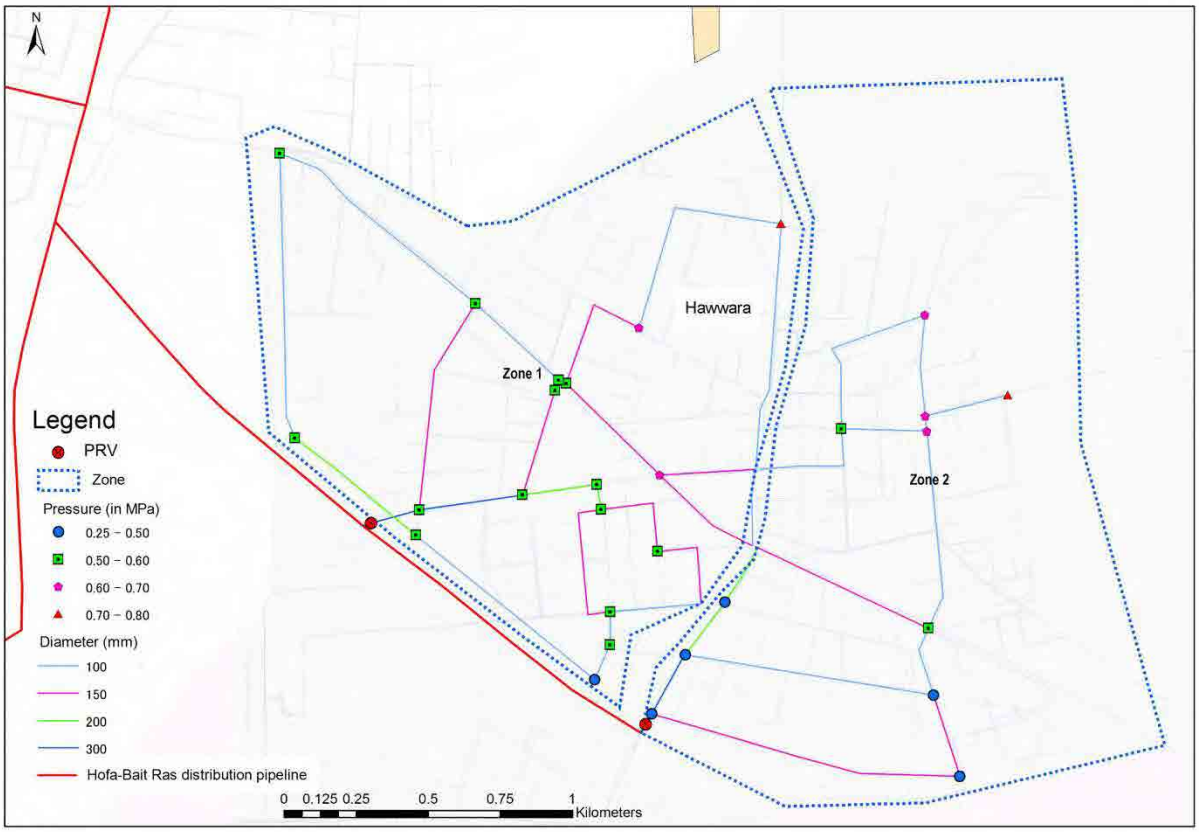


Figure 2.21 Network Plan and Pressure Distribution (Hourly Maximum)

6) Selection of area and scope of the study area

7) Pipeline status study and network analysis for the Hawwara area are carried out. The necessary pipe diameter and length are calculated, and later, the estimated project cost has been worked out. The results showed that the estimated project cost for rehabilitation of the entire network in the Hawwara area will exceed the expected project cost. Accordingly, distribution pipelines and water supply pipelines for a part of the Hawwara area will be planned in line with the policies mentioned above.

The renewal of pipelines will be implemented on priority considering the distance of Hawwara zones from the new distribution pipelines. After comparing with the expected project cost, the scope of rehabilitation of distribution pipelines is proposed to be taken up in zone 1A, which is the reallocation of the distribution zone 1.

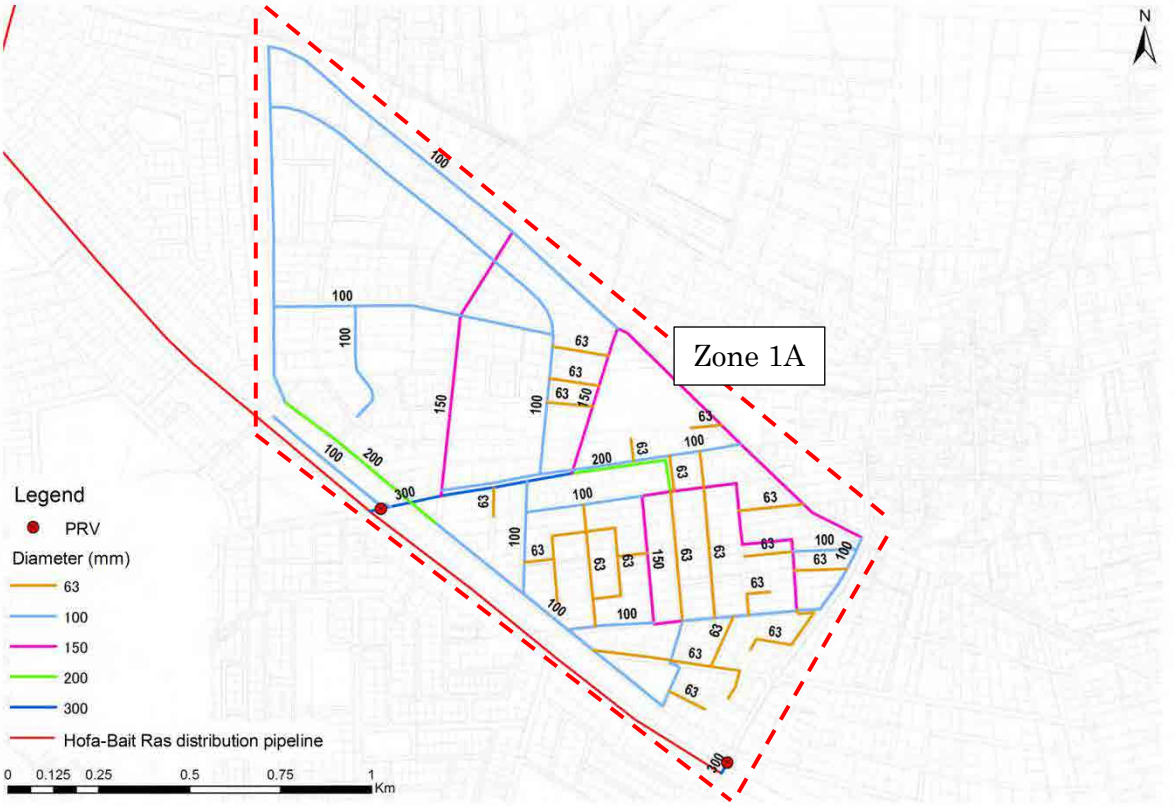


Figure 2.22 Scope of Hawwara Area Plan

8) Design for rehabilitation of distribution pipeline network

The distribution pipeline network will be designed as described below.

- Pipe used will be ductile pipe (DCIP) if the pipe diameter exceeds 100 mm. Specifications of DCIP will conform to ISO 2531 (K-9 pipe). Pipe used will be HDPE pipe if the pipe diameter is less than 100 mm. 63mm will be designed as minimum diameter.
- Buried pipe criteria will conform to Jordan's standards (WAJ and Ministry of Public Works and Housing standards).
- Air valves and drain valves will be installed at required locations according to the route profile, and flow regulating valves will be installed at the required locations for O&M. In principle, one will be installed at each location at 1 to 2-km intervals in straight line sections.

2.2.3 Outline Design Drawing

Outline design drawings are listed below (refer to Appendix-6).

Outline design drawing list

Drawing No.	Drawing Title
No. 1	General site plan
No. 2 - 3	Typical trench cross section for pipeline in the road
No. 4 - 23	Plan and profile of distribution pipeline (Hofa－Bait Ras)
No. 24	Layout plan (Hawwara)
No. 25 - 27	Typical drawing of pit

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

This project will be implemented in accordance with the framework of Japan's grant aid scheme. Following approval by the Governments of Jordan and Japan, the Exchange of Notes (E/N) regarding the detail design was signed in March 2014 and based on this study amendment of GA by Water Authority of Jordan (WAJ) and JICA, was signed in June 2014. Subsequently, Water Authority of Jordan (WAJ); the implementation agency of the Government of Jordan, will conclude a contract with a Japanese consultant and construction company, and the detail design and construction work will be implemented.

Considering the framework of grant aid and the content of construction of facilities, the construction plan will be formulated for the project to which aid is applicable, in accordance with the basic guidelines below.

(1) Project Implementing Entity

The national organization in Jordan responsible for the supervision related to this project will be the Ministry of Water and Irrigation (MWI). The WAJ will take up the role of the organization implementing the project under this Ministry. The WAJ is responsible for the water supply and sewerage project of the whole country. It consists of 8 Directorates. The responsible department related to design and construction work in this project is the Technical Affairs Directorate, and the operation and management after completion of the facilities will be implemented by Yarmouk Water Company (YWC).

(2) Consultant

The Japanese consultant company will conclude an agreement with the project-implementing agency of the Government of Jordan, and will perform the detail design and work supervision. The consultant will also prepare the tender documents, will examine the tenderer's qualifications, and assist in the tendering work for selecting the contractor by open tender. After the start of construction of the facilities, the consultant will supervise the construction from an objective standpoint and also ensure that the grant aid is being appropriately utilized.

(3) Contractor

In accordance with the framework of Japan's grant aid scheme, the Japanese contractor selected through open tendering will carry out the construction of facilities according to the construction plan. As the construction work is to be performed at a remote site quite different from the social environment and social background in Japan, the contractor is required to possess adequate capability to complete the work overseas. Furthermore, since this plan requires the use of locally-procured materials and equipment, and work in congested urban areas, the contractor shall be adequately aware of the local market, local labor laws, the geography of the place, and the local customs and acceptable practices.
The contractor will maintain a proper communication system even after handing over the facilities after completion of the project since after sales services such as response to breakdowns and procurement or replacement parts will be necessary during operation and maintenance after completion of the project.

2.2.4.2 Implementation Condition

(1) Construction of Distribution Pipelines

The routes for laying the pipelines include main roads and service roads where the traffic frequency is high; thus, third-party safety measures, measures against effects of traffic, and measures against existing buried objects, especially underground high voltage cables, become important. Considerations are necessary for preventing any adverse effects on the activities of the local industries and businesses as far as possible. The work of laying pipelines in sections other than main roads and urban areas should be performed during the daytime by the open-cut method. The work of laying pipelines in sections within the urban areas and main roads will be performed by the open-cut method at night time considering the

industrial and business activities at the site.
The work of laying distribution main pipelines will be critical path in the project due to the long length. Therefore, the effective construction sequence of the work of laying distribution main pipelines is considered and the necessary and rational construction period is calculated.

(2) Procurement of materials
Basic materials, such as cement, aggregate and reinforcement bars, etc. are able to be procured in the local markets. However, ductile iron pipe for transmission and distribution pipelines is not possible to be procured in the local markets; thus, it should be imported from the third countries or Japan.
Basic labor force and construction machines is able to be procured in the local markets, however, the contractors which has ability to meet with specifications and quantity of the project have an office in Amman. Therefore, the procurement of engineers and construction materials is assumed to take in Amman.

2.2.4.3 Scope of Works

Table 2.19 Demarcation of Construction Works of Facilities between the Two Countries

Construction	Japan	Jordan
1. Installation of distribution pipeline		
(1) To install distribution pipelines	●	
(2) To cooperate for construction work on the road including acquisition of its approvals and permissions, and traffic control procedure		●
(3) To cooperate during pipe connection work such as attendance at water suspension work, its notice to people and etc.		●
2. Common items for construction works		
(1) To provide temporary stock yards for construction materials and machineries and lands for temporary works		●
(2) To take all necessary measures to secure disposal sites for excavation debris and drains for wastewater from construction works		●
(3) To provide necessary water and chemicals (chlorine) for trial operation of the facilities constructed		●

2.2.4.4 Consultant Supervision

(1) Work supervision system of consultant
The consultant will supervise and offer guidance to the contractor to achieve "completion of construction of facilities within the predetermined work period," "the work indicated in the contractual drawings," and "implementation of safe work." Furthermore, the consultant also has the role of supervising and confirming from a neutral standpoint that the construction of the facilities is being implemented appropriately under the framework of grant aid.

1) Main supervisory duties of consultant
The description of the main supervisory duties that the consultant is required to perform is given below.
a) Progress control
The consultant will confirm the validity of the progress chart submitted by the contractor, compare the actual progress of construction of facilities with the progress shown in the progress chart, and confirm the progress status of the work on daily, monthly and weekly bases. If delay is a cause for concern, the consultant will issue a warning to the contractor. If a delay occurs, the consultant will study and investigate the causes and measures together with the contractor, and will guide the contractor in the adoption of the required measures. The work supervision will include the following:

- Checking the amount of work done
- Results of input and output of important materials and equipment
- Results of input and output of engineers, workers, etc.

b) Quality control

The quality of facilities and work specified in the agreement is to be ensured. If there is concern about ensuring quality, the consultant will issue a warning to the contractor and also request that the required modifications and measures be adopted. Quality supervision will be implemented using the measures below.

- Verification of catalogs, specifications, and manufacturing drawings of materials and equipment
- Site inspections, such as inspection of rolling, reinforcing bar arrangement, and concrete strength during work
- Site checks of work implementation status, work methods, etc., and guidance
- Witnessing of trial operation and inspection of performance
- Binding supervising records and its transfer to the Client

c) Safety control

The consultant will perform the validity check of the safety control plan of the contractor and check its implementation status. The consultants will supervise the work on site beforehand to prevent accidents at work and accidents to a third party. Quality control will be implemented using the measures below.

- Confirm the measures for safety control plan and the presence of a safety control manager appointed by contractor
- Confirm the validity of the safety control plan proposed and the safety manager appointed by contractor
- Confirm the status of progress of the safety control plan
- Check the scheduled operating route of work vehicles, confirm the validity of precautions during operation, and adherence to the plan
- Check the content of the benefit system for workers and confirm that holidays and recesses are being enforced

The routes for bringing in construction materials and equipment, and the time of transporting the same will be appropriately arranged. Measures such as arranging adequate watchmen during day and night times will be adopted.

2) Work supervision system

The consultant will build the necessary work supervision system for implementing work supervision with the focus on quality control and safety control of the processes mentioned above, and will aim to implement work in the plan smoothly. In this case, work supervision considering the gist of the basic design is necessary, therefore, a system consistent with the series of tasks of basic design, detail design and work supervision will be built. The consultant will build the supervision systems mentioned below since work supervision needs to be implemented in both Japan as well as at the site.

a) On-site work supervision

Since it is important to confirm that the construction work is being performed appropriately under the framework of grant aid, the work supervision on site needs to be performed by Japanese engineers who thoroughly understand the grant aid scheme. The Japanese work supervision system on site considered necessary for this plan is shown in the table below. During the work period, the quality of work will be confirmed by engineers in charge of design and the chief consultant, who hold together the entire project including work within Japan, and who will give instructions such as warnings to the work supervisors at the appropriate time. The consultant will also employ local engineers, and implement work supervision using the local engineers together with the Japanese engineers.

Table 2.20 Japanese Supervision Organization in the Site

Job title	Field (MM)	No. of travels	Responsible for
Supervision engineer (Chief consultant)	1.0	2	Overall work supervision, checking kick-off meetings, site conditions, delivery on site, construction overview in each year, client communication and defect liability inspection
Resident representative supervision engineer	17.0	1	Resident supervision during construction, check on soil bearing capacity, procurement materials, piping materials and so on at the beginning, and supervision, final inspection
Completion inspection	0.17	1	Inspection for completion
Total	18.17	4	

b) Work supervision in Japan

Systems necessary for overall supervision of the project mentioned below will be maintained in Japan, and the overall work supervision including work at site and work in the country will be supervised.

- Checking the contents of the agreement and the process, progress, and quality
- Studies to resolve issues that have occurred on site and instructions to contractors
- Technical and financial assistance for consultant's local offices

(2) Contractor's work control system

Some parts of piping installation work can be carried out by domestic subcontractors. However, piping works such as jacking method and non-suspension water method should be performed by Japanese experts and skilled technicians. Laying of distribution pipelines are performed in trunk roads near important facilities and buildings, therefore, strict safety controls are necessary.

For this reason, contractors with extensive overseas experience in similar work with overall quality, process and safety controls must be selected. The resident and short term engineers of contractors required according to the scale and type of the facilities of the project may be as assumed below.

Table 2.21 Contractor's Work Control System

Job title	Responsible for
Representative engineer	As a responsible person in the large scale project in Irbid Governorate, on-site representative is in charge of discussions with national organizations of Jordan and with relevant constriction companies, checks and adjustments of various work ranges and processes, formalities such as work permits, overall work control including contraction work, labor, and safety.
Office Manager	On-site labor control, financial control, procurement of materials and equipment, transportation control, and general administrative aspects related to fulfilling the contract.
Chief Engineer (Pipelines, Test pit)	Responsible for test pit survey and the whole piping work. In charge of quality control, progress control and safety control of the piping work. The engineer who has throughout experience of urban civil engineering and laying work of pipelines should be dispatched since laying work of distribution pipelines is implemented in urban area, and should manage construction work in plural sites.
Civil engineer (Pipelines 1) Irbid	Responsible for laying work of pipelines in Irbid. The engineer who has a through experience of urban civil engineering and laying work of pipelines should be dispatched since laying work of distribution pipelines is implemented in urban area, and should manage construction work in plural sites
Civil engineer (Pipelines 2) Hawwara	Responsible for laying work of pipelines in Hawwara. The engineer who has a through experience of urban civil engineering and laying work of pipelines should be dispatched since laying work of distribution

Job title	Responsible for
	pipelines is implemented in urban area, and should manage construction work in plural sites

The contractor will also employ local engineers, and implement work control using the local engineers together with the Japanese engineers mentioned above.

2.2.4.5 Quality Control Plan

This plan requires quality control of various works such as pipe laying work in congested urban areas. The control items to be implemented for quality control of important works are shown in Table 2.22.

Table 2.22 Quality Control Plan

Type of work	Control item	Method	Standard
Pipe materials	Strength and size Lining and painting	Factory inspection Visual inspection	Japanese standards
Pipe laying work	Joint accuracy Leakage	Clearance gauge measurement Leak test	Japanese standards
Paving work	Base course	CBR test	Japanese standards
Foundation work	Soil bearing capacity	Plate bearing test	Japanese standards
Concreting work	Concrete quality	Mixing test Compressive strength test Air test Aggregate test	Japanese standards
Reinforcement	Strength Reinforcing bar arrangement	Tensile test, bending test Reinforcing bar arrangement test	Japanese standards

2.2.4.6 Materials and Equipment Procurement Plan

(1) Locations for procurement of materials and equipment

1) Labor

Ordinary laborers and general skilled laborers (carpenters, plumbers, etc.) will be hired locally by the contractor.

2) Materials and equipment

General construction materials and equipment such as cement and reinforcing bars can be procured locally. Ready-mixed concrete can be supplied from the ready-mixed concrete plant in Amman city.
Since ductile cast iron pipes and valves are not being manufactured in Jordan, these items will be procured from Japan or third countries.

3) Construction machinery

No companies that lease construction machinery exist in Jordan, but general construction machinery such as large breakers, backhoes, bulldozers, dump trucks and truck cranes can be leased from local construction companies. Procurement companies that offer construction machinery at economic prices will be scheduled considering the lease rate, transportation cost, and number of days for which the machinery is offered.
Considering the local conditions mentioned above, the procurement items of main materials and equipment to be used in the project are shown in Table 2.23.

Table 2.23 Procurement Plan for Main Materials and Equipment

Item	Local	Japan	Third Country	Remark
Materials and equipment				
Cement	○			
Aggregate	○			
Reinforcing bars	○			
Concrete form materials and timbering work materials		○		
Polyethylene pipe	○			
Ductile cast iron pipe		○	○	Malaysia
Valves		○		
Base course material	○			
Asphalt	○			
Construction machinery				
Backhoes (0.28 m^3, 0.45 m^3, 0.8 m^3, 1.4 m^3)	○			
Breaker (1,300 kg)	○			
Truck cranes (16 t)	○			
Trucks with crane (4 t load/ 2.9 lift)	○			
Dump truck (10 t)	○			
Sprinkler truck	○			
Grader (3.1 m)	○			
Tire roller (8-20 t)	○			
Concrete pump vehicles (90-110 m^3/h)	○			
Vibrating roller (0.8-1.1 t, 3-4 t)	○			
Tamper (60-80 kg)	○			
Concrete cutter (0.5 m)	○			
Generator	○			
Air Compressor	○			

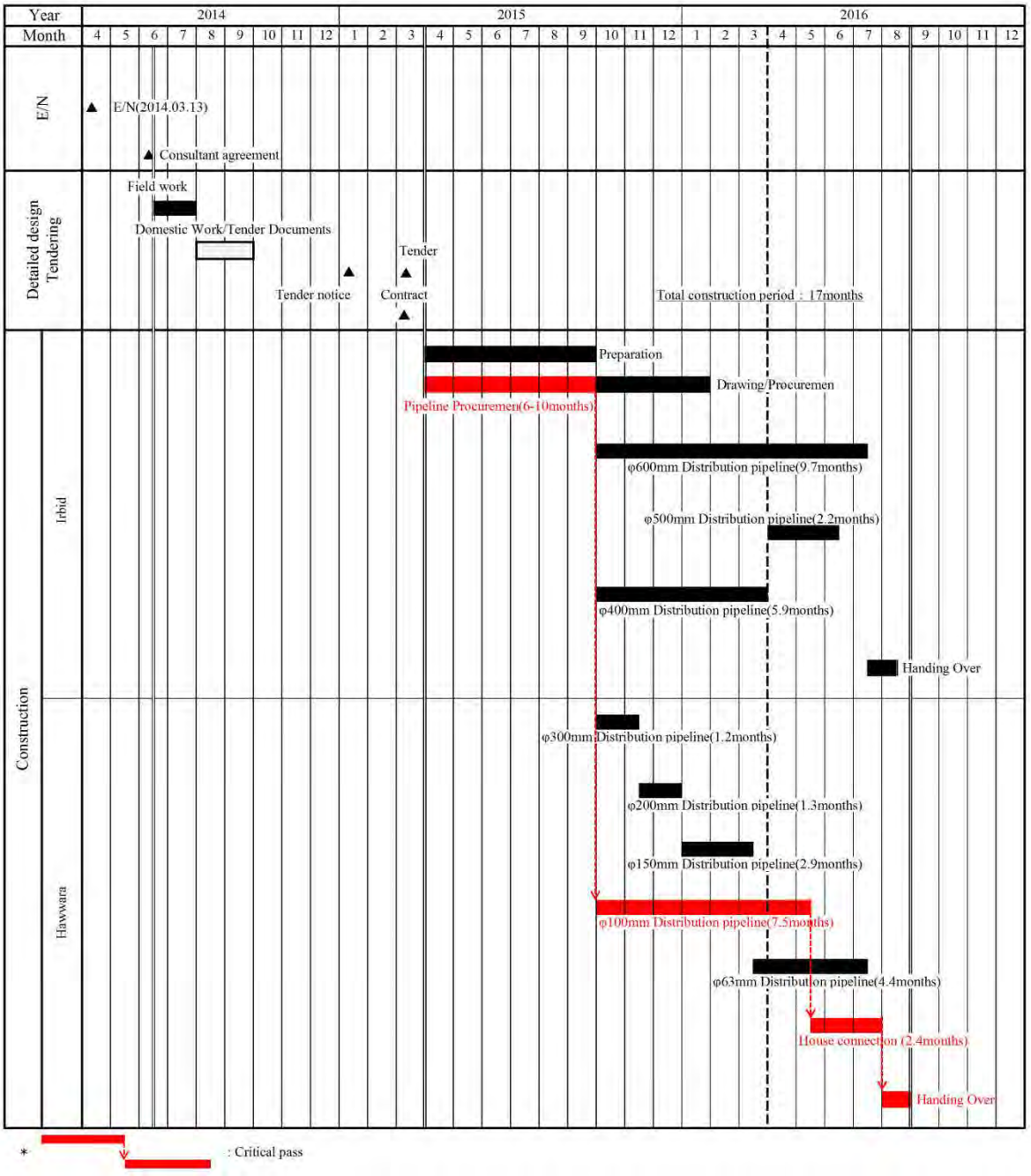
(2) Transportation plan

Straight pipes and large-sized materials and equipment will be packaged in bundles or as bare packages, considering long-term transportation by sea, loading and unloading at ports, and transport on land to the project area of the materials and equipment procured from Japan and third countries. The unloading port in Jordan is only Aqaba port. Accordingly, the imported materials and equipment will be unloaded at Aqaba port and transported over land to the project area.

2.2.4.7 Implementation Schedule

Expected implementation schedule is shown below.

Table 2.24 Implementation Schedule



2.2.5 Operational Guidance Plan

The contractor shall prepare the operation and maintenance manual for equipment, and implement the operational guidance.

- Pressure-reducing valve

The consultant shall prepare the operation and maintenance manual for distribution pipeline and accident response.

2.3 Obligation of Recipient Country

The project is composed of Japanese cooperation and the works to be undertaken by Jordanian side with

self-effort. The necessary measures and obligations with scheduling of Jordanian side activities for the project are listed as follows:

Table 2.25 Obligation of Recipient Country

Items
1. Installation of distribution pipeline
(1) To provide water and chemicals for testing
(2) To cooperate for construction work on the road including acquisition of its approvals and permissions, and traffic control procedure
(3) To cooperate during pipe connection work such as attendance at water suspension work, its notice to people and etc.
2. Common Items for construction works
(1) To provide temporary stock yards for construction materials and machineries and lands for temporary works
(2) To prepare disposal site for waste soil
(3) To provide water and chemicals for testing
3. Other Items
(1) To coordinate for required approvals and permissions from relevant authorities to implement detailed design and construction works
(2) To cooperate in consultation with residents living near the construction sites and to coordinate procedures for traffic control in works with relevant authorities
(3) To carry out necessary procedures for issue of A/P required for payments to Japanese Consultants and Contractor and to bear the commissions for advising and payment to a bank in Japan for banking services based upon the Banking Arrangement
(4) To ensure prompt unloading and customs clearance of the goods for the project at the port of disembarkation in Jordan
(5) To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contract such facilities as may be necessary for their entry into Jordan and stay there for the performance of their works.
(6) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Jordan with respect to the supply of the products and services under the verified contract. And to take necessary measures for such tax exemption.
(7) To use, operate and maintain properly the facilities and equipment constructed or procured under the Japan's Grant Aid program.
(8) To bear all the expenses, other than to be borne by the grant Aid, necessary for construction of the facilities

2.4 Project Operation Plan and Maintenance Plan

2.4.1 Basic Principle of Operation and Maintenance

Basic policies for operation and maintenance (O & M) of planned facilities are listed as following.

a) Pipelines planned in this project are the facilities which are currently operated and maintained by YWC staff, and therefore, they can be operated and maintained by the existing staff without increase in the staff. The number of water supply facilities will be increased. However, the O & M of the planned distribution would be much easier than the current complicated distribution system. Therefore, these facilities could be operated and maintained without any increase in the current number of the staff.

2.4.2 Organization of Operation and Maintenance

(1) Organization of Operation and Maintenance

The main component of the project is new and renewal of the existing water distribution system. The planned water supply system will reduce the effort of YWC staff because planned transmission and distribution system will reduce daily valve operation for water rationing in the service area and water will be effectively distributed with less effort. In addition, leakage accidents will be reduced as water

pressure is optimized.

(2) Major Facility and Monitoring Equipment

Major existing and new facility and monitoring/control equipment of the Project are given in the Table below. The monitoring items are the same as the YWC staff's daily monitoring ones. Thereby, new facility will be able to be successfully operated and maintained by the YWC staffs.

Table 2.26 Major Facility and Monitoring Equipment

Facility	Facility Name		Monitoring management
PRV	New	8	Patrol

(3) Major Facility and Monitoring Equipment

The inspection items and period to be implemented in pumping station, distribution reservoirs, transmission pipelines and distribution pipelines are shown in Tables below.

Table 2.27 Periodical Inspection Items for Transmission and Distribution Pipes

Inspection item	Inspection interval	
	Monthly	Annually
① State of water leakage, if any		○
② State of ground subsidence, if any	○	
③ Conditions of sluice valve, air valves, plugs and lids	○	
④ State of damage, if any	○	
⑤ Availability of emergency equipment and tools		○
⑥ Blow-off valve function	○	

Table 2.28 Periodical Inspection Items for Pressure Reducing Valve

Equipment	Inspection items
① Pressure reducing valve	Should manage pressure reducing valve data (Setting pressure, manufacturer, installation year and date of periodical inspection, etc.) Periodical inspection by visual check for finding cavitation damages (Six-month inspection) Periodical inspection for soil removal of strainer

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

The part of estimated costs for this project covered by Jordanian side is summarized in Table below.

Table 2.29 Summary of Estimated Costs to be Covered by Jordanian Side

Items	Project cost (thousand JD)	Remark
1. Laying work of distribution pipelines		
(1) Provision of necessary water and chemicals (chlorine) for trial operation of the facilities constructed	15.0	
2. Others		
(1) Provision of temporary stock yards for construction materials and machineries and lands for temporary works		
(2) Preparation of disposal site for waste soil		
3. Commissions for issue of A/P (Authorization to pay) and B/A (Banking Arrangement)	5.0	
Total	20.0	

Estimated conditions

1) Date of Estimation : July 2014
2) Work Period : The work period for detailed design and construction is shown in the implementation schedule stated earlier.
3) Other : The estimation of the project cost is made in accordance with the grant aid scheme of the Government of Japan

2.5.2 Operation and Maintenance Cost

Most of expenditures of YWC are salaries and wages. Maintenance Cost of new facility is described below.

(1) Maintenance cost of new facility

The major maintenance item of new facility is repair of pipeline. The staff has already been engaged for the patrol and repair of pipeline. It is possible to maintain new facility by current staff, so there is no increase in relevant salaries and wages.

2.5.3 Other Relevant Issues

(1) Installation of distribution pipes

Roads for installation of distribution pipes of the project are classified as national road and municipality road. The installation of pipes in the project should comply with the standard of Ministry of Public Works and Housing in case of the national road and the standard of WAJ for municipality road. It is required to communicate with respective organization and employ appropriate procedures for construction work. In addition, it is also required to closely communicate with concerned organizations such as police and not to affect social lives of neighborhoods because planned pipes run through traffic area in some locations.

(2) Utilization of existing pipe and Repair period of Hofa Reservoir

The part of pipeline Hofa-Bait Ras is to use the existing transmission pipeline from Zebdat Reservoir to Hofa Reservoir. Therefore the construction of connection of this existing pipeline and new pipeline, and switching of outflow and inflow pipeline at Hofa Reservoir should be implemented after the confirmation of necessary Condition for transmission with YWC.

Necessary Condition is stated below.

- To finish the rehabilitation and increase of eastern water source, and to assure the water quantity to Irbid
- To complete the transmission pipeline for Disi water to Northern Governorate in Amman and Zarqa

(3) Repair timing

YWC distributes the water to Bait Ras and part of Hawwara by pump and distribution pipeline.

Therefore, the construction of switching to Hofa-Bait Ras pipeline in both areas should be considered without the suspension of water supply in these areas.

CHAPTER 3 PROJECT EVALUATION

3.1 Pre-requisites for Project Implementation

(1) Budgetary measures for implementation of work by counterpart

Budgetary measures must be properly adopted and accomplished without delay for implementing work to be done by the Jordanian side.

(2) Tax exemption measures

The Jordanian side shall guarantee exemptions on taxes related to project activities such as value added tax (VAT), customs duty, and various other taxes and financial surcharges. WAJ shall take up the necessary formalities for tax exemption, and if the exemption is not obtained, shall bear the tax for the same.

(3) Diversion of existing transmission pipeline to the present plan

By ensuring the volume to be transmitted to the relevant areas, transmission of water to unwanted areas such as "Hofa reservoir and pumping stations from the Irbid City Zebdat reservoir and pumping stations" should be stopped, and unwanted transmission pipelines should be diverted to the present plan.

3.2 Investment Items of Counterpart (to be borne) Necessary for Realizing Overall Project Plan

(1) Proper implementation of work under the counterpart's responsibility

The supply of water test and chlorination agents for water flow tests during the distribution pipeline laying work, and the provision of temporary sites and disposal area when starting the work and during its implementation are considered to be work that can be adequately performed by the counterpart even after considering that the financial base of the WAJ is slightly weak. However, the work for which the counterpart is responsible must be accomplished properly to ensure that the project is completed without problems.

3.3 External Conditions

Issues that should be tackled by the Jordanian side which are pre-requisites for realizing the overall plan of the project and external conditions of the project are as given below.

(1) Political and security status in Jordan do not deteriorate significantly

Elements that can destabilize security exist, such as refugees who enter Jordan because of insurrections in neighboring countries, especially the steep increase in Syrian refugees. For completion of the project, the level of security in Jordan must not deteriorate excessively.

(2) The planned water flow is transmitted continuously

Facilities for distributing Disi groundwater to the four northern governorates for which preparations are being made by WAJ must be completed and the planned water flow must reach the Hofa reservoir continuously.

3.4 Project Evaluation

3.4.1 Validity

(1) Population benefitted

The population estimated to be benefitted when water is supplied according to the design plan for laying distribution pipelines between the Hofa reservoir and Bait Ras is 473,000 (the estimated served population by the Hawwara area distribution network rehabilitation plan is included in the served

population mentioned here).

(2) Project targets and BHN

The targets of the project are: 1) to increase the volume of water supplied to the area where water demand has tightened (because of the inflow of Syrian refugees into the host communities) by using the source water volume that has increased because of rehabilitation of well field in the eastern part of the four northern governorates and because of development of DISI fossil groundwater; and (2) to reduce the water leakage by rehabilitating the distribution pipeline network of Hawwara area, and aims to satisfy basic human needs (BHN).

(3) Improving lifestyle of the residents and stabilizing their livelihood

The project will contribute to improving the water supply services and thereby improving the lifestyle of the residents. It will also contribute to improving the welfare program for the northern part of Jordan where a large number of Syrian refugees have taken shelter, contribute to harmony between Syrian refugees and host community, and stabilize the livelihood in the country.

(4) Contributing to realization of targets of medium and long-term development plans

The "National Water Strategy" which is Jordan's medium to long-term plan has the policy of effectively using limited water sources to the maximum extent. This project will contribute to the realizing the targets of the medium to long-term plan through reduction in water leakage and non-revenue water.

(5) Matching Japan's aid policy and guidelines

Japan has announced aid equivalent to 60 million dollars at the 68th UN General Assembly meeting in September 2013 as humanitarian aid to Syria. The implementation of rehabilitation and provision of water sector facilities will contribute to lightening the load on the host communities that have accepted the Syrian refugees and matches the above mentioned guidelines; therefore it is highly valid.

3.4.2 Effectiveness

(1) Quantitative effects

A flow of 30,000 m^3/day will be newly allocated to Irbid City and Bait Ras and Hawwara areas from the Disi groundwater and water sources in the eastern part to the Hofa reservoir through distribution pipelines between the Hofa reservoir and Bait Ras. When the water distributed from the Hofa reservoir and pumping station is added to the distribution system to Irbid City, Bait Ras area and Hawwara area, and water distributed from the existing Zebdat reservoir and pumping station is considered, water will be distributed from two systems. This allocated volume is the average allocated volume of the target year 2017, but it may reduce after the said year. The water source volume to the four northern governorates is constant and has not increased; therefore, the water source volume will be allocated depending on the demand in each demand area of the four northern governorates after the said year. The population growth rate varies depending on the governorate. The growth rates in Mafraq, Jerash and Ajloun governorates are high while the growth rate in Irbid governorate is low. For this reason, the demand of Mafraq governorate, which is the supply destination from the eastern water source, will increase relatively compared to the overall demand in the four governorates. Consequently the inflow to the Hofa reservoir will reduce, and thereby, the water distributed to Irbid City, Bait Ras area and Hawwara area from the Hofa reservoir and pumping station will also reduce, while the water distributed from the Zebdat reservoir and pumping station will increase relatively.

Table 3.1 Quantitative Effects of the Project

Name of index	Freshly allocated volume of water
Distribution pipeline flow between Hofa reservoir and Bait Ras area	Daily average30,000 m^3 Annual 11 MCM (million m^3)

Note 1: As of 2014, facilities for distributing water from the Hofa reservoir to Irbid City, Bait Ras area, and Hawwara area do not exist.

Note 2: The target value will be measured using flow meter installed in the distribution pipeline between the Hofa reservoir and Bait Ras area through the SCADA project (aid by Spanish government) for the water supply project of the four northern governorates. The discussion between the Spanish consultant and WAJ is ongoing as of July 2014, and details will be fixed henceforth. However, flow meter is expected to be installed at this point which becomes an important location.

(2) Qualitative effects

① Water is being supplied generally once a week; however, the supply time will be increased with the increase in supply volume. The annually distributed volume of water from the Zebdat reservoir to Irbid City and Bait Ras area is about 12 MCM (total for Irbid, Upper Zebdat, Bait Ras area and Hawwara area in 2013). However, at the completion of this project, the annual volume will increase by 11 MCM so that the total volume will become approximately 23 MCM/year. Consequently, the supply time may be expected to double and will become twice a week in 2017 when the project starts.

② The per capita water supply volume will increase with the increase in the supply time and the allocated (supplied) volume, and the unsatisfactory water supply area will also decrease. Although the allocated volume is fixed, the demand will increase after 2017; therefore, the per capita water supply volume will again decrease, and the unsatisfactory water supply area is expected to increase again.

③ The non-revenue water will decrease with the setting of distribution zones of the Hawwara area, rehabilitation of the distribution pipeline network and regulation of distribution pressure.

3.4.3 Conclusion

Based on the content above, this project will contribute to improving the living environment of residents of Irbid City, Irbid governorate, Bait Ras area and the Hawwara Area in Jordan. Effects as mentioned above are anticipated; therefore, the implementation of grant aid cooperation is highly significant and is expected to be very effective.

Appendices

[Appendices]

Appendix I: Member List of the Study Team I-1
Appendix II: Study Schedule II-1
Appendix III: List of Parties Concerned in the Recipient Country III-1
Appendix IV: Minutes of Discussions IV-1
Appendix V: Other Relevant Data V-1

Appendix -1 Monitoring Form
Appendix -2 Environmental Check List
Appendix -3 Expected Water Demand and Production
Appendix -4 Result of Network Analysis
Appendix -5 Amount of Well Production in Northern Governorates in 2011 to 2013
Appendix -6 Outline design drawing
Appendix -7 Inflow to Hofa reservoir
Appendix -8 Environmental and Social Considerations
Appendix -9 Result of Test Pit

Appendix I: Member List of the Study Team

1. Member List of the Study Team in the Preparatory Survey

Name	Job title	Occupation	Period (arr. – dep.)
Mr. Shigeyuki MATSUMOTO	Team Leader	Director, Water Resources Management I, Water Resources and Disaster Management Group, Global Environment Dep. JICA	Jan 5 to 10 , 2014
Ms. Mina YARIUCHI	Project Coordinator	Program Officer, Water Resources Management I, Water Resources and Disaster Management Group, Global Environment Dep. JICA	Jan 5 to 10 , 2014
Mr. Kazufumi MOMOSE	Chief Consultant	TEC International Co., Ltd.	Jan 5 to Feb 7 , 2014
Mr. Yoshikata KUBOSAKI	Water Supply Planning (Water Group Coordinator)	TEC International Co., Ltd.	Jan 5 to Feb 28 , 2014
Mr. Suguru MORIGUCHI	Water Supply Facility Design 1	TEC International Co., Ltd.	Jan 5 to Feb 28 , 2014
Mr. Makoto HOMMA	Water Supply Facility Design 2	TEC International Co., Ltd.	Jan 5 to 25 , 2014 Jan 30 to Feb 28 , 2014
Mr. Hiroto Iwashige	Equipment Planning / Procurement Planning / Cost Estimation 1	TEC International Co., Ltd.	Jan 20 to Feb 28 , 2014
Mr. Alokkumar Katayama	Project Coordinator / Water Supply Facility Design Assistance (GIS)	TEC International Co., Ltd.	Jan 5 to Feb 27 , 2014

2. Member List of the Study Team in Explanation of the Draft Report

Name	Job title	Occupation	Period (arr. – dep.)
Mr. Jyunji WAKUI	Team Leader	Senior Representative JICA Jordan Office, JICA	
Mr. Kazufumi MOMOSE	Chief Consultant	TEC International Co., Ltd.	Apr 4 to 30 , 2014 May 9 to 31 , 2014
Mr. Yoshikata KUBOSAKI	Water Supply Planning (Water Group Coordinator)	TEC International Co., Ltd.	Mar 29 to May 31 , 2014
Mr. Alokkumar Katayama	Project Coordinator / Water Supply Facility Design Assistance (GIS)	TEC International Co., Ltd.	Apr 15 to May 31 , 2014

Appendix II: Study Schedule

1. Preparatory Survey

		Team Leader	Project Coordinator	Chief Consultant	Water Supply Planning (Water Group Coordinator)	Water Supply Facility Design 1	Water Supply Facility Design 2	Equipment Planning / Procurement Planning / Cost Estimation 1	Project Coordinator / Water Supply Facility Design Assistance (GIS)
		Shigeyuki MATSUMOTO	Mina YARIUCHI	Kazufumi MOMOSE	Yoshikata KUBOSAKI	Suguru MORIGUCHI	Makoto HOMMA	Hiroto Iwashige	Alokkumar Katayama
5-Jan	Sun	Leaving Tokyo							Same as on the left
6-Jan	Mon	Arriving at Amman, Meeting with Japanese Embassy							Ditto
7-Jan	Tue	Meeting with WAJ, JICAoffice							Ditto
8-Jan	Wen	Meeting with YWC							Ditto
9-Jan	Thu	Modification and signing of MD Meeting with UNICEF Leaving Amman		Modification and signing of MD Meeting with UNICEF		Data collection	Data collection		Modification and signing of MD Meeting with UNICEF
10-Jan	Fri	Arriving at Tokyo		Team meeting					Team meeting
11-Jan	Sat			Ditto					Ditto
12-Jan	Sun			Data collection					Same as on the left
13-Jan	Mon								
14-Jan	Tue			Field survey (sub project)					Ditto
15-Jan	Wen								
16-Jan	Thu								
17-Jan	Fri			Team meeting					Team meeting
18-Jan	Sat			Ditto					Ditto
19-Jan	Sun			Field survey (sub project)					Field survey (sub project)
20-Jan	Mon							Leaving Tokyo	
21-Jan	Tue							Arriving at Amman	
22-Jan	Wen							Data collection	
23-Jan	Thu								
24-Jan	Fri			Team meeting					
25-Jan	Sat			Ditto					
26-Jan	Sun			Field survey (sub project)				Request and collection of quotation	Field survey (sub project)
27-Jan	Mon								
28-Jan	Tue								
29-Jan	Wen								
30-Jan	Thu								
31-Jan	Fri			Team meeting					
1-Feb	Sat			Ditto					
2-Feb	Sun			Preparation of the meeting				Request and collection of quotation	Compilation of the result data
3-Feb	Mon			JICA Headquarters TV meeting			Preparation of the meeting		
4-Feb	Tue			JCC meeting					
5-Feb	Wen			Compilation of the result data				Request and collection of quotation	Compilation of the result data
6-Feb	Thu								
7-Feb	Fri			Leaving Amman	Team meeting				
8-Feb	Sat			Arriving at Tokyo	Ditto				
9-Feb	Sun				Field survey (sub project)			Request and collection of quotation	Field survey (sub project)
10-Feb	Mon								
11-Feb	Tue								
12-Feb	Wen								
13-Feb	Thu								
14-Feb	Fri				Team meeting				
15-Feb	Sat				Ditto				
16-Feb	Sun				Preparation of the sub contract			Request and collection of quotation	Preparation of the sub contract
17-Feb	Mon								
18-Feb	Tue								
19-Feb	Wen								
20-Feb	Thu								
21-Feb	Fri				Team meeting				
22-Feb	Sat				Ditto				
23-Feb	Sun				Confirmation with sub contractor			Request and collection of quotation	Confirmation with sub contractor
24-Feb	Mon								
25-Feb	Tue								
26-Feb	Wen								Leaving Amman
27-Feb	Thu				Leaving Amman				Arriving at Tokyo
28-Feb	Fri				Arriving at Tokyo				

2. Survey of explanation of the Draft Outline

		Team Leader	Chief Consultant	Water Supply Planning (Water Group Coordinator)	Project Coordinator / Water Supply Facility Design Assistance (GIS)
		Jyunji WAKUI	Kazufumi MOMOSE	Yoshikata KUBOSAKI	Alokkumar Katayama
29-Mar	Sat			Leaving Tokyo	
30-Mar	Sun			Arriving at Amman	
31-Mar	Mon			Data collection	
1-Apr	Tue				
2-Apr	Wen				
3-Apr	Thu				
4-Apr	Fri		Leaving Tokyo	Compilation of the result data	
5-Apr	Sat		Arriving at Amman		
6-Apr	Sun		Field survey (Hofa-Bait Ras) Data collection		
7-Apr	Mon				
8-Apr	Tue				
9-Apr	Wen				
10-Apr	Thu				
11-Apr	Fri		Team meeting		
12-Apr	Sat		Ditto		
13-Apr	Sun		Field survey (Hawwara, Sarieh) Data collection		
14-Apr	Mon				
15-Apr	Tue				Leaving Tokyo
16-Apr	Wen				Arriving at Amman
17-Apr	Thu				Data collection
18-Apr	Fri		Team meeting		
19-Apr	Sat		Ditto		
20-Apr	Sun		Preparation of the meeting		
21-Apr	Mon				
22-Apr	Tue				
23-Apr	Wen		Design/Cost estimation meeting		Compilation of the result data
24-Apr	Thu		Preparation of the meeting		
25-Apr	Fri		Team meeting		
26-Apr	Sat		Ditto		
27-Apr	Sun		Preparation of the meeting		
28-Apr	Mon				
29-Apr	Tue		Design/Cost estimation meeting with WAJ		
30-Apr	Wen		Leaving Amman	Material and equipment survey	
1-May	Thu				
2-May	Fri			Team meeting	
3-May	Sat			Ditto	
4-May	Sun			Data collection of Irbid municipality and contour	
5-May	Mon				
6-May	Tue				
7-May	Wen				
8-May	Thu				
9-May	Fri		Arriving at Amman	Team meeting	
10-May	Sat		Team meeting		
11-May	Sun		Meeting of design policy with YWC		
12-May	Mon				
13-May	Tue				
14-May	Wen				
15-May	Thu				
16-May	Fri		Team meeting		
17-May	Sat		Ditto		
18-May	Sun		Meeting of design policy with WAJ		
19-May	Mon				
20-May	Tue				
21-May	Wen				
22-May	Thu				
23-May	Fri		Team meeting		
24-May	Sat		Ditto		
25-May	日		Preparation of the meeting		
26-May	月				
27-May	火				
28-May	水	Grant aid committee			
29-May	木		Compilation of the result data		
30-May	金		Leaving Amman		
31-May	土		Arriving at Tokyo		

Appendix III: List of Parties Concerned in the Recipient Country

＜Jordanian side＞

a) Water Authority of Jordan (WAJ)

Eng. Tawfiq Z. Habashneh	Secretary General
Eng. Malek Rawashdeh	Assistant Secretary General
Eng. Iyad Dahiyat	PMU director
Eng. Udo Kachel	PMU Consulting Engineer
Eng. Ziad Haddadin	Assistant Secretary General of tender
Eng. Ehklass Nassar	Project manager

b) Ministry of Water ane irrigation

Eng. Nisreen Haddadin	JCC Committee member

c) Yarmouk Water Company

Eng. Mohammad Al-Rababah	General Manager
Eng. Ashraf Batineh	Director of Technician department
Eng. Salameh Mahasneh	Investment program manager
Eng. Asem Bataineh	Director of Sewerage diredtorate
Eng. Salem Alshloul	Director of Irbid Water diredtorate
Eng. Kefah Mrayan	Director of Laboratories Department
Eng. Ahmad Shiekha	Manager of Main Project
Eng. Belel Alrabeea	Manager of GIS unit
Eng. Mahmoud Obiedat	Director of reuse & environment
Eng. Essam Jaradat	Director of commercial Department
Mr. Abdullah Alkurdi	Director of Human Resource
Mr. Jehad Alzoobi	Director of financial Department
Eng. Walid Taha	Wells & Main conveyers Manager
Eng. Qasem Ababneh	Manager of Water Production
Mr. Emad Alsarhaan	Logistic support manager

d) UNICEF

Mr. Syed Jamal Shah	WASH sector cordinator
Mr. Saeed Hameed	WASH specialist

e) Embassy of the Federal Republic of Germany

Dr. Irene Fellmann	Development Counsellor

＜Japanese side＞

a) JICA Jordan office

Mr. Syokiti SAKATA	Chief Representative
Mr. Jyunji WAKUI	Senior Representative
Mr. Masaki ITAGAKI	Representative
Ms. Tomomi HIRATA	Representative
Mr. Hani H. Al-Kurdi	Deputy Chief Program Officer

b) Embassy of Japan

Mr. Norimasa YOSHIDA	First Secretary
Mr. Shinya KUWANA	Second Secretary

Appendix IV: Minutes of Discussions

1. Preparatory Survey

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
ON
THE PROGRAMME FOR URGENT IMPROVEMENT OF WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIAN REFUGEES IN NORTHERN GOVERNARATES IN THE HASHEMITE KINGDOM OF JORDAN

In response to the request from the Government of the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), the Government of Japan decided to conduct a Preparatory Survey on the Programme for Urgent Improvement of Water Sector for the Host Communities of Syrian Refugees in Northern Governorates (hereinafter referred to as "the Programme") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Jordan the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Shigeyuki Matsumoto, Director, Water Resources Management Division I, Water Resources and Disaster Management Group, Global Environment Department, JICA, and is scheduled to stay in the country from January 6, 2014.

The Team held discussions with the officials concerned of the Government of Jordan and conducted a field survey at the survey area.

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets.

Amman, January 9, 2014

Shigeyuki Matsumoto
Leader
Preparatory Survey Team
Japan International Cooperation
Agency (JICA)

Mr. Tawfiq Z. Habashneh
Secretary General
Water Authority of Jordan
Ministry of Water and Irrigation

1

ATTACHMENT

1. Objective of the Programme

To improve water sector services urgently in the host communities of Syrian refugees

2. Site of the Programme

The site of the Programme is the Northern governorates (Irbid, Jerash, Ajloun and Mafraq) as shown in **Annex-1**.

3. Responsible and Implementing Agency

The responsible and implementing agency is the Water Authority of Jordan (hereinafter referred to as "WAJ").

Yarmouk Water Company (hereinafter referred to as "YWC") is responsible for operation and maintenance of the water facilities in the northern governorates.

4. Items requested by the Government of Jordan

After discussions between the Jordanian side and the Team (hereinafter referred to as "the both sides"), the items described in **Annex-2** were requested by the Jordanian side.

The both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis in Japan, and the final components of the Programme would be decided by the Japanese side.

5. Japan's Grant Aid Scheme

5-1) The Jordanian side understands the general information on the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-3**.

5-2) The Jordanian side will take the necessary measures, as described in **Annex-3**, for smooth implementation of the Programme, as a condition for the Japanese Grant Aid to be implemented. Both sides confirmed the detailed contents of Jordanian side's undertakings would be decided through the Project for the Study on Water Sector for the Host Communities of Syrian Refugees.

5-3) The Team explained that essential information on sub-projects including allocation of the Grant would be complied in the list attached to Grant Agreement (hereinafter referred to as "G/A") of the Programme and the list might be modified, not exceeding the amount agreed on E/N and G/A, according to the progress and results of the Project for the Study on Water Sector for the Host Communities of Syrian Refugees and confirmed at the Committee for the Programme established by both sides.

5-4) JICA will explain the detailed procedures regarding modification of the list to the Jordanian side before conclusion of G/A

6. Schedule of the Survey

6-1) The consultant members of the Team will conduct studies in Jordan until March, 2014.

6-2) JICA will prepare the draft preparatory survey report in English and dispatch a mission in order to explain its contents to the Jordanian side around June, 2014.

6-3) In case that the contents of the report are accepted in principle by the Jordanian side, JICA will finalize the report and send it to the Jordanian side around August 2014. The Jordanian side understands that execution of the Preparatory Survey (hereinafter referred to as "the Survey") does not necessary imply the Japanese Government's commitment of the implementation.

7. Other relevant issues

7-1) Implementation of the Survey

The Team explained that the consultancy service of the Survey was included in the scope of work for the Project for the Study on Water Sector for the Host Communities of Syrian Refugees, as "Component A; preparation for grant aid program", which was implemented according to the Record of Discussions signed on November 13, 2013, between WAJ and JICA.

7-2) Scope of the Preparatory Survey

The Team explained that though the above-mentioned Record of Discussions stated that the report for component A would be 20 copies of the survey report and reference material for tender documents, the reference material for tender documents would be excluded from the scope of the Survey. The tender documents will be prepared by a consultancy service to be included in the Grant Aid Programme instead.

7-3) Programme Cost Estimate

The Team explained to the Jordanian side the estimated Programme cost as attached in **Annex-4**. Both sides confirmed that this cost estimate is provisional and would be examined further by the Government of Japan for its final approval. Furthermore, both sides confirmed that this project cost estimate is CONFIDENTIAL, and should never be duplicated in any forms or released to any other parties until the relevant contracts are awarded by the Government of Jordan, in order to secure fairness of tender procedure.

7-4) Priorities of the Sub-projects

The Jordanian side confirmed there were no amendment on their initial idea on priorities of the sub-projects. The Team explained the priorities should be finally examined with criteria during the Survey such as technical validity, urgency, effectiveness and necessity of each sub-project.

7-5) Measures to be taken by the Jordanian side for Smooth Implementation of the Survey

The Jordanian side agreed to facilitate the Survey by the following activities:

- Provision of necessary data related to the Survey
- Making appointment with related government officers
- Coordination with relevant agencies
- Accompany with the Team member for site visit
- Other necessary facilitation for the Team

7-6) Necessity of Technical Assistance ("Soft Component" of the Programme)

The Team explained that the technical assistance ("soft component") would be examined through the Study on Water Sector for the Host Communities of Syrian Refugees.

7-7) Tax Exemption

The both sides confirmed that the tax exemption including Value Added Tax (VAT), custom duty, and any other taxes and fiscal levies in Jordan which is to be arisen from the activities of the Programme will be ensured by the Jordanian side. The Jordanian side will take any procedures necessary for tax exemption.

7-8) Coordination with Other Projects

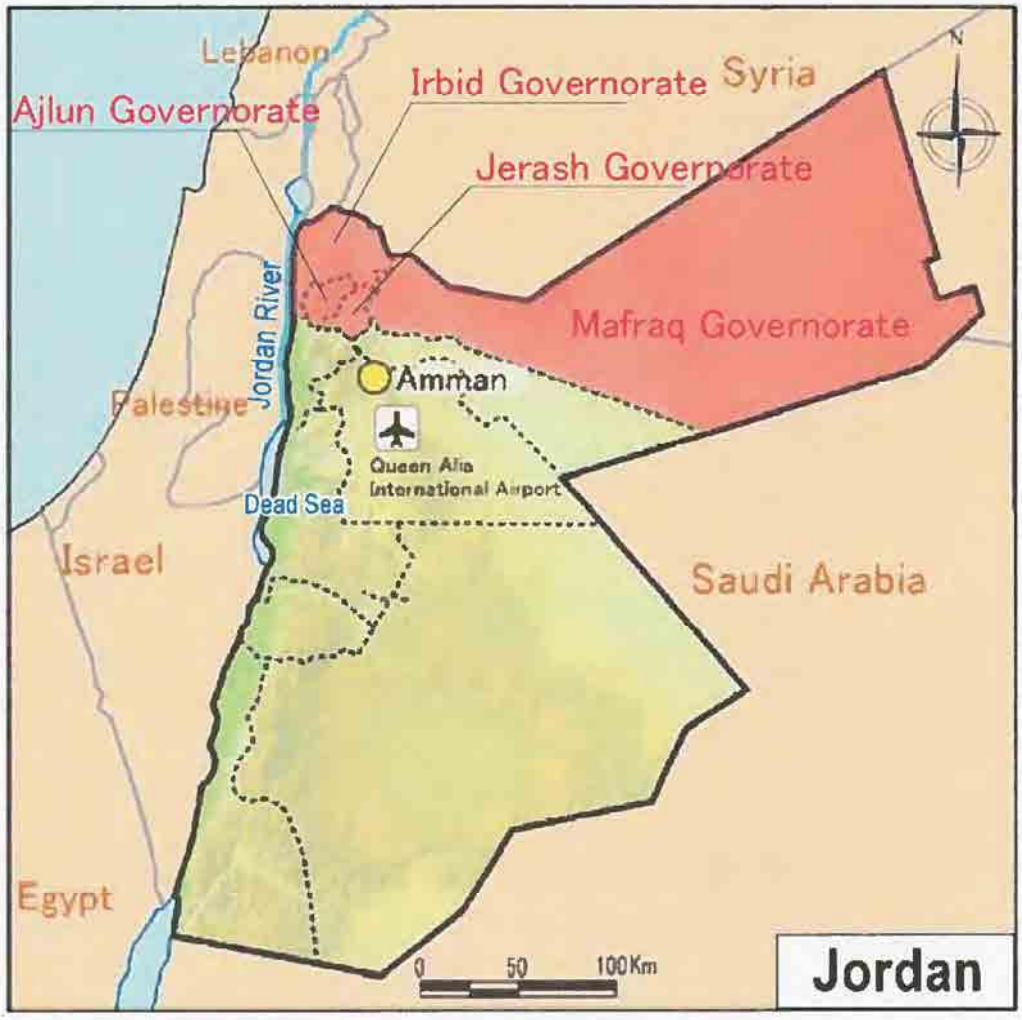
The both sides confirmed that the Programme should be coordinated with any other project supported by other development partners, NGOs, and Jordanian official organizations in order to avoid duplication.

7-9) Environmental Impact Assessment (EIA)

The both sides confirmed that the Jordanian side would be responsible for taking any measures to complete EIA, in case EIA was necessary for implementing the Programme.

Annex-1	Project Sites Map
Annex-2	Items Requested by the Jordanian Side
Annex-3	Japan's Grant Aid Scheme
Annex-4	Estimated Budget and Cost

Annex-1: Project Sites Map



Annex-2: Items Requested by the Jordanian Side

Priority	Project Title	Brief Description
	Improvement of water supply system to host communities of Syrian refugees in YWC area	
1A	Irbid Main Conveyor Stage 1 (400 mm DI pipe of 2.5 Km length)	It will transport water from Zabda reservoir to Alia cross increase the efficiency of water distribution in Irbid
1B	Hofa to Bait Ras Conveyor pipe	To increase the efficiency of water transport and distribution in Irbid city, and Bait Ras town which a continuous water shortage suffering (700 mm DI pipes)
1C	Main conveyor from Aqib 96 to Zatary Pump station (15 km length of 600mm diameter)	The current conveyor from Aqib wells to Zatary pump station is old and not sufficient to convey the amount of water that produced from Aqib wells, accordingly, new larger diameter pipe is needed
2	Rehabilitation of Hawara water network	Hawara is about 30,000 population town located at the eastern part of Irbid city, its network is old and the non revenue water portion is high, accordingly the network replacement is needed.
3	Miscellaneous Wastewater Networks in Irbid City	YWC has a program of connecting unconnected houses to the city sewer network, this activity works against environmental pollution especially in the poor areas of the city.
4	Sarieh Water network rehabilitation	Similar to Hawara above
5	Rehabilitation of Mafraq pump station	Many of the pump station in Mafraq governorate are in a bad condition, accordingly rehabilitation of those station is needed
6	Ramtha Southwest area wastewater networks	Ramtha was the first area in Jordan that hosts the Syrian refugees, it is the nearest city to the Syrian boarders and the refuges flux to it was started from the early stages of the crises. The targeted area is not connected to the sewage network accordingly this will enhance the environmental situation in this extensively affected area.

Annex-3: JAPAN'S GRANT AID SCHEME

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was reborn on October 1, 2008. After the reborn of JICA, following the decision of the Government of Japan (hereinafter referred to as "the GOJ"), Grant Aid for General Project is extended by JICA.

Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures (Attachment 1)

Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal & Approval
  -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  -Agreement concluded between JICA and a recipient country
- Implementation
  -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial

form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey Will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Attachment 2

(6) Proper Use

The Government of recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) Export and Re-export

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

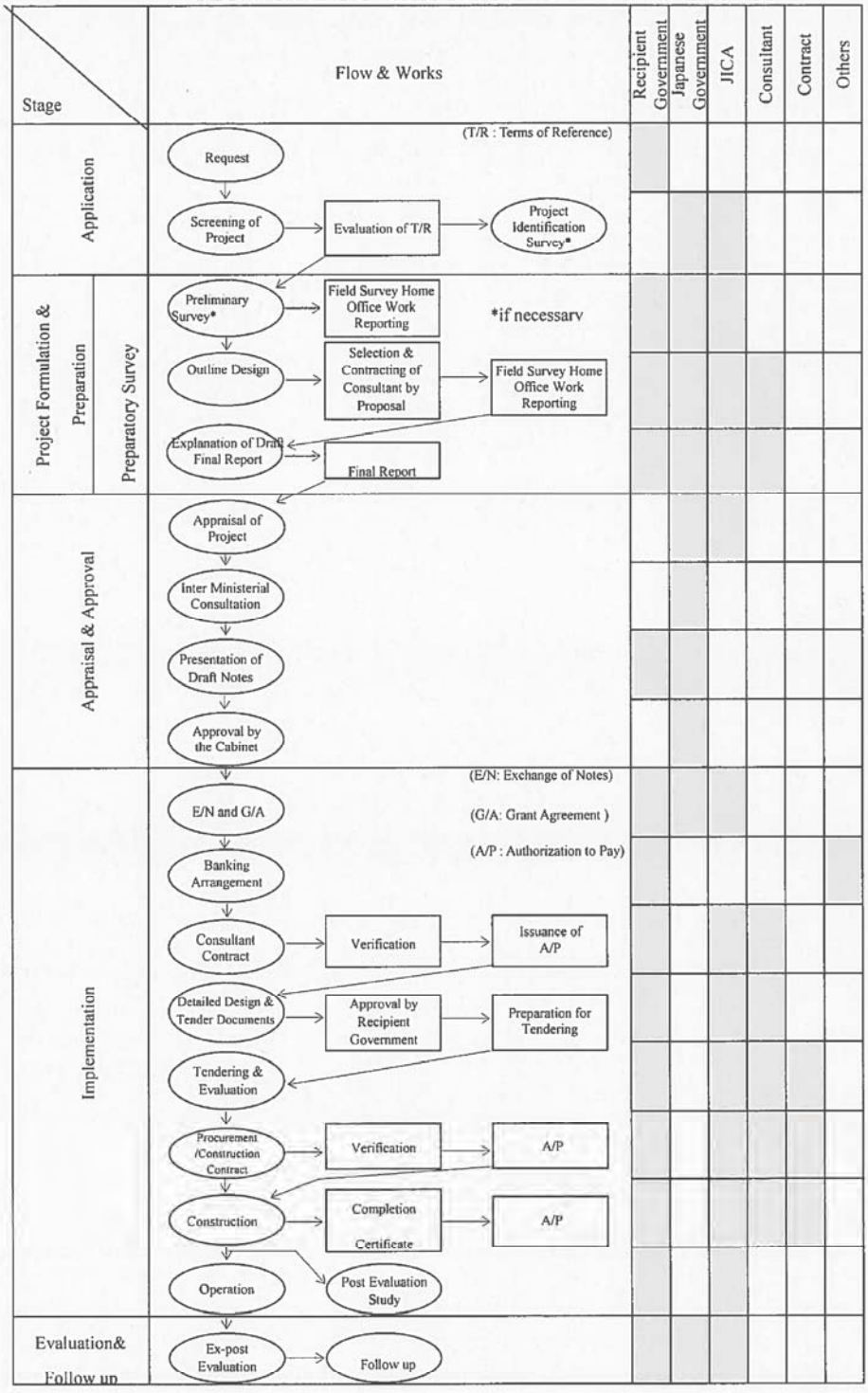
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

Attachment 1 for Annex-3

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Attachment 2 for Annex-3

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure lots of land necessary for the implementation of the Project and to clear the sites;		●
2	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Internal transportation from the port of disembarkation to the project site	●	
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
4	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
5	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		●
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
8	To give due environmental and social consideration in the implementation of the Project.		●

(B/A: Banking Arrangement, A/P: Authorization to pay)

2. Explanation of the Draft Report

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
ON
THE PROGRAMME FOR URGENT IMPROVEMENT OF WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIAN REFUGEES IN NORTHERN GOVERNARATES
(EXPLANATION OF THE DRAFT REPORT)

The Government of Japan decided to conduct the Preparatory Survey on the Programme for Urgent Improvement of Water Sector for the Host Communities of Syrian Refugees in Northern Governorates (hereinafter referred to as "the Programme") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA"), therefore JICA has conducted the Preparatory Survey on the Programme. Through discussions, field surveys, and technical examination of the study results in Japan, JICA prepared Outline of the Programme.

In order to explain and to consult with the Government of the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan") on Outline of the Program, JICA dispatched to Jordan the Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Junji WAKUI, Senior Representative, JICA Jordan Office, on 28th May, 2014.

As a result of discussions, both sides confirmed the main items described in the attached sheet.

Amman, 4th June 2014

Mr. Junji WAKUI
Leader
Preparatory Survey Team,
Japan International Cooperation Agency

Eng. Tawfiq Z. Habashneh
Secretary General,
Water Authority of Jordan
Ministry of Water and Irrigation

ATTACHMENT

1. Outline of the Programme

The Jordanian side agreed and accepted in principle the Outline of the Programme explained by the Team. The Project sites map and components of the Project are respectively shown in **Annex-1** and **Annex-2.**

2. Responsible and implementation agency

2-1) The Responsible Agency is the Ministry of Water and Irrigation (hereinafter referred to as "MWI").

2-2) The Implementing Agency is the Water Authority of Jordan (hereinafter referred to as "WAJ").

3. Japan's Grant Aid Scheme

3-1) The Jordanian side understood the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-3.**

3-2) The Jordanian side will take the necessary measures, as described in **Annex-4,** for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

4. Submission of the Report

JICA will prepare draft final report in June 2014, and complete the final report in accordance with the confirmed items and send it to the Government of Jordan in October 2014.

5. Other Relevant Issues

5-1) Undertakings of the Jordanian side

The Team explained to the Jordanian side its undertakings as listed in **Annex-4,** and the Jordanian side understood and agreed to execute them. The following items are to be emphasized:

1) Securing bulk water supply to Irbid City

The both sides confirmed that, contents of the Programme are designed based on the following conditions: 1) an additional water of 10 MCM a year would be allocated to northern governorates from southern governorates delivered from Disi in a few years. Construction work of transmission pipeline to convey the water from Amman to Za'atary Pumping Station is currently at the stage of tendering, and planned to complete in 2017. 2) An additional water of 9 MCM a year will be available due to wells rehabilitation and development in 2014 in the eastern well fields. WAJ agreed to make best efforts to implement the projects on schedule in order to secure necessary volume of

water in the north governorates.

2) Necessary budget to be covered by the Jordanian side

The Japanese side explained necessary project cost to be covered by the Jordanian side and necessary annual operation and maintenance cost. The Jordanian side agreed to secure necessary budget.

3) Tax Exemption

The both sides confirmed that the tax exemption including Value Added Tax (VAT), customs duty, and any other taxes and fiscal levies in Jordan, which is to be imposed in relation to the Project activities, will be ensured by the Jordanian side. WAJ will take any necessary procedures for tax exemption, and in case that tax exemption is not secured, the cost of tax will be borne by WAJ.

5-2) Environmental and Social Considerations

Both sides confirmed Environmental and Social considerations issues as follows:

1) IEE/IEIA

The Jordanian side will take proper procedures for EIA as mentioned in ANNEX 5 of Minutes of Discussions signed on 4th March, 2014. .

2) Environmental Checklist

Environmental and Social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as **Annex-5**.

3) Monitoring for Environmental and Social Considerations

Results of environmental monitoring will be provided to JICA as a part of Project Progress Report by filing in the Monitoring Form attached as **Annex-6** on a monthly basis during construction in accordance with the Monitoring Plan for the Programme. In case JICA finds that there is a need for improvement in a situation with respect to environmental considerations after the agreed monitoring period, JICA may request to extend the period of monitoring and reporting.

4) Disclosure of Monitoring Result

JICA may disclose the part of the monitoring results as shown in Annex-6 conducted by WAJ on its web site. The Team explained that JICA will disclose further information, when third parties request, with permission of WAJ.

The Jordanian side confirmed that it will take stipulated procedures for information disclosure in accordance with Jordanian relevant laws. In addition, the Team requested and the Jordanian side agreed to disclose the monitoring results to local project stakeholders.

Annex- 1 Project Sites Map

Annex- 2 Component of the Project

Annex- 3 Japan's Grant Aid Scheme

Annex- 4 Major Undertakings to be taken by Each Government

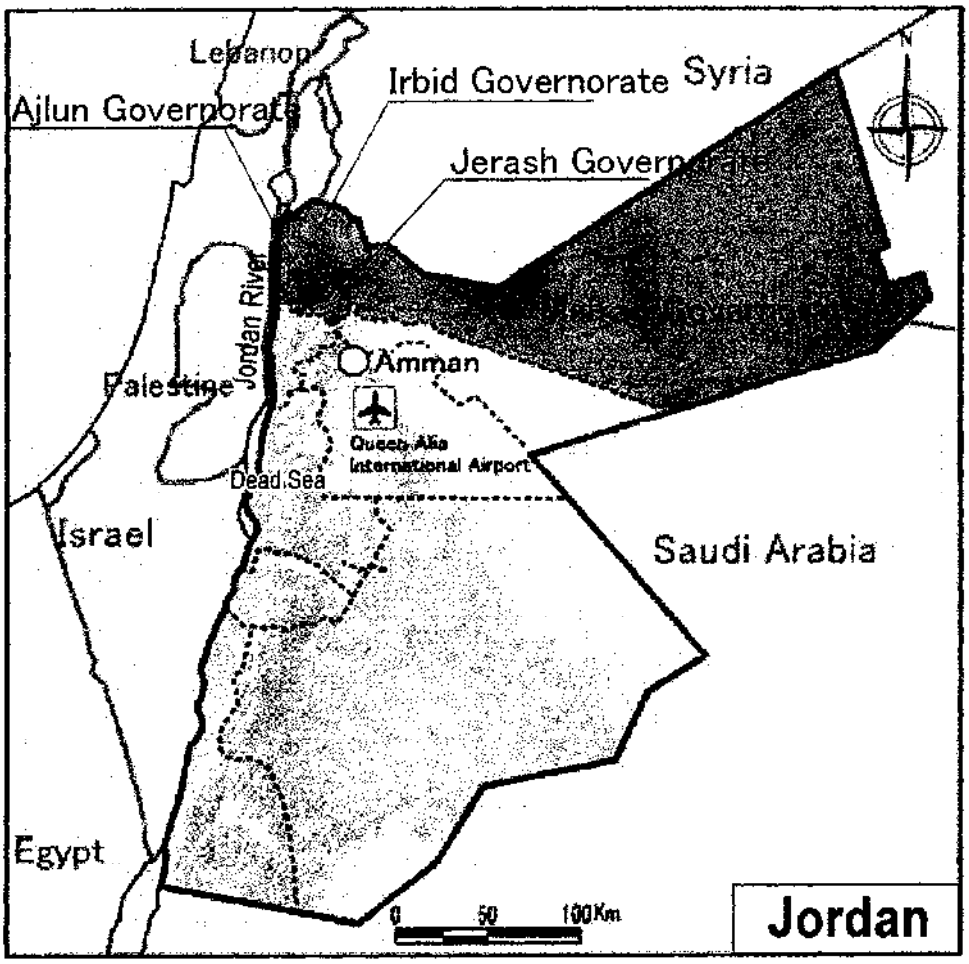
Annex- 5 Check List (Environmental and Social Considerations)

Annex- 6 Monitoring Form

Annex-7 List of Subproject

Annex-8 Project Cost to be borne by Each Government

Annex- 1 Project Sites Map



Annex- 2 Component of the Programme

Area	Items		Unit	Capacity/ Quantity
Hofa -Bait Ras distribution pipeline	Pipeline	400mm DI	m	5,675
		500mm DI	m	1,480
		600mm DI	m	11,812
		Total	m	18,967
	Pressure reducing valve (PRV)		location	5
	Trenchless construction		location	6
Water network rehabilitation in Hawwara and Sarieh	Pipeline	63mm HDPE	m	17,000
		100mm DI	m	9,689
		150mm DI	m	6,129
		200mm DI	m	1,351
		300mm DI	m	845
		Total	m	35,014
	House connection with Meter		location	3,000
	Pressure reducing valve (PRV)		location	2
	Trenchless construction		location	2
Supply of Equipment for Operation and Maintenance	-		-	0

Annex- 3 Japan's Grant Aid Scheme (Grant aid Programme)

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

"The Grant Aid Programme" is new programmatic approach of the Japan's Grant Aid aiming to provide assistance, in quick, flexible and comprehensive way, with a recipient country especially in an effort to reconstruct and recovery from the natural disaster and/or conflict. "The Programme" is expected to be composed of several subprojects and shall be conducted by implementation agencies of the government of the recipient country with the Japan's Grant Aid.

1. Procedures

(1) Outline Designs

In the case of the Grant Aid Programme, JICA will conduct surveys to formulate several candidate subprojects for the Programme in order to response to the request from the government of the recipient country. Based on the result, Japanese side (the GOJ and JICA) and Recipient Country side discuss the priority and urgency among the long-listed subprojects and select some of them to be covered by JICA's outline design studies.

Outline design studies for subprojects are usually conducted in technical assistance (so-called "urgent development study"). During the designs, implementation type for subprojects can be chosen from "General Type" or "Agent Type" flexibly.

(2) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the government of the recipient country, and procurement conditions.

In the case of the Grant Aid Programme, Cabinet Approval, E/N and G/A will be conducted for the Programme, not for each subproject. Indicative amount of the grant allocated to subprojects will be confirmed prior to signing of G/A. Subproject list including indicative amount of the grant allocated to subprojects will be attached to G/A. (Indicative amount of the grant allocated to subprojects is not necessarily confirmed prior to signing G/A if the Programme consists of single-sector subprojects and expected to be implemented by single agency.)

Results of outline design study of each subproject shall be confirmed by both sides before commencing the subproject. Subproject list could be modified based on the mutual consent after discussion of the Committee for the Programme, if necessary.

2. Japan's Grant Aid Scheme

(1) Procedures for Implementation of the Subproject (s) (General Type)

1) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the outline design

studies will be recommended by JICA to the recipient country to continue to work on the Programme's implementation after the E/N and G/A.

2) Eligible source country

Under the Subproject(s) (General Type), in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

3) Necessity of "Verification"

The government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

4) Banking Arrangements (B/A)

a) The government of the recipient country or its designated authority should open an account under the name of the government of the recipient country in a bank in Japan. JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the bank to JICA under an Authorization to Pay (A/P) issued by the government of the recipient country or its designated authority.

5) Authorization to Pay (A/P)

The government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the bank.

(2) Procedures for Implementation of the Subproject(s) (Agent Type)

1) The Agent

The Agent is the organization which provides procurement services of products and services on behalf of the government of the recipient country according to the Agent Agreement with the government of the recipient country. The Agent is recommended to the government of the recipient country by the GOJ and agreed between the two Governments in the A/M of E/N.

2) Agent Agreement

The government of the recipient country shall conclude an Agent Agreement within two months after the date of confirmation of outline designs of the Subproject(s) (Agent Type), in accordance with A/M. The scope of the Agent's services is shown in as Attachment 2 of ANNEX 3.

3) Approval of the Agent Agreement

The Agent Agreement, which is prepared as two identical documents, shall be submitted to JICA through the Agent. JICA confirms whether or not the Agent Agreement is concluded in conformity with the G/A and the Procurement Guidelines for Grant Aid, and approves the contract.

The Agent Agreement concluded between the government of the recipient country and the Agent shall become effective after the approval by JICA in a written form.

4) Payment Methods

The government of the recipient country shall open a Yen ordinary deposit account at a bank in Japan in the name of the government of the recipient country (the Recipient Account) and shall notify JICA in written form.

The Agent Agreement shall stipulate that "regarding all transfers of the fund to the Agent, the government of the recipient country shall designate the Agent to act on behalf of the government of the recipient country and issue a Blanket Disbursement Authorization ("the BDA") to conduct the transfer of

the fund (Advances) to the Procurement Account from the Recipient Account.

The Agent Agreement shall clearly state that the payment to the Agent shall be made in Japanese yen from the Advances and that the final payment to the Agent shall be made when the total Remaining Amount become less than 3 % of the Grant and its accrued interest.

5) Products and Services Eligible for Procurement

Products and services to be procured shall be selected from those defined in the G/A.

6) Firms

In principle, a Firm of any nationality could be contracted as long as the Firm satisfies the conditions specified in the tender documents.

7) Method of Procurement

In implementing procurement, sufficient attention shall be paid so that there is no unfairness among tenderers who are eligible for the procurement of products and services. For this purpose, competitive tendering shall be employed in principle.

8) Tender Documents

The tender documents should contain all information necessary to enable tenderers to prepare valid offers for the products and services to be procured by the Subproject(s) (Agent Type).

The rights and obligations of the government of the recipient country, the Agent and the Suppliers of the products and services should be stipulated in the tender documents to be prepared by the Agent. Besides this, the tender documents shall be prepared in consultation with the government of the recipient country.

9) Pre-qualification Examination of Tenderers

The Agent may conduct a pre-qualification examination of tenderers in advance of the tender so that the invitation to the tender can be extended only to eligible firms. The pre-qualification examination should be performed only with respect to whether or not the prospective tenderers have the capability of accomplishing the contracts concerned without fail. In this case, the following points should be taken into consideration:

- Experience and past performance in contracts of a similar kind
- Property foundation or financial credibility
- Existence of offices, etc. to be specified in the tender documents.

10) Tender Evaluation

The tender evaluation should be implemented on the basis of the conditions specified in the tender documents.

Those tenders which substantially conform to the technical specifications, and are responsive to other stipulations of the tender documents, shall be judged in principle on the basis of the submitted price, and the tenderer who offers the lowest price shall be designated as the successful tenderer.

The Agent shall prepare a detailed tender evaluation report clarifying the reasons for the successful tender and the disqualification and submit it to the government of the recipient country to obtain confirmation before concluding the contract with the successful tenderer.

The Agent shall, before a final decision on the award is made, furnish JICA with a detailed evaluation report of tenders, giving the reasons for the acceptance or rejection of tenders.

11) Additional Procurement

If there is an additional procurement fund after competitive and / or selective tendering and / or direct negotiation for a contract, and the government of the recipient country would like an additional procurement, the Agent is allowed to conduct an additional procurement following the points mentioned below:

- Procurement of the same products and services

When the products and services to be additionally procured are identical with the initial tender and a competitive tendering is judged to be disadvantageous, the additional procurement can be implemented by a direct contract with the successful tenderer of the initial tender.

- Other procurements

When products and services other than those mentioned above are to be procured, the procurement should be implemented through a competitive tendering. In this case, the products and services for additional procurement shall be selected from among those in accordance with the G/A.

12) Conclusion of the Contracts

In order to procure products and services in accordance with the G/A, the Agent shall conclude contracts with firms selected by tendering or other methods.

13) Terms of Payment

The contract shall clearly state the terms of payment. The Agent shall make payment from the "Advances", against the submission of the necessary documents from the Firm on the basis of the conditions specified in the contract, after the obligations of the Firm have been fulfilled. When the services are the object of procurement, the Agent may pay certain portion of the contract amount in advance to the firms on the conditions that such firms submit the advance payment guarantee worth the amount of the advance payment to the Agent.

(3) Other Relevant Issues on the Subprojects (General Type and Agent Type)

1) Procurement Guidelines

The government of the recipient country shall ensure that products and services of the subprojects are procured in accordance with JICA's Procurement Guidelines as designated in G/A.

2) Major Undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Programme, the recipient country is required to undertake such necessary measures as ANNEX 4.

3) Proper Use

The government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

4) Export and Re-export

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

5) Environmental and Social Considerations

A recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April 2010).

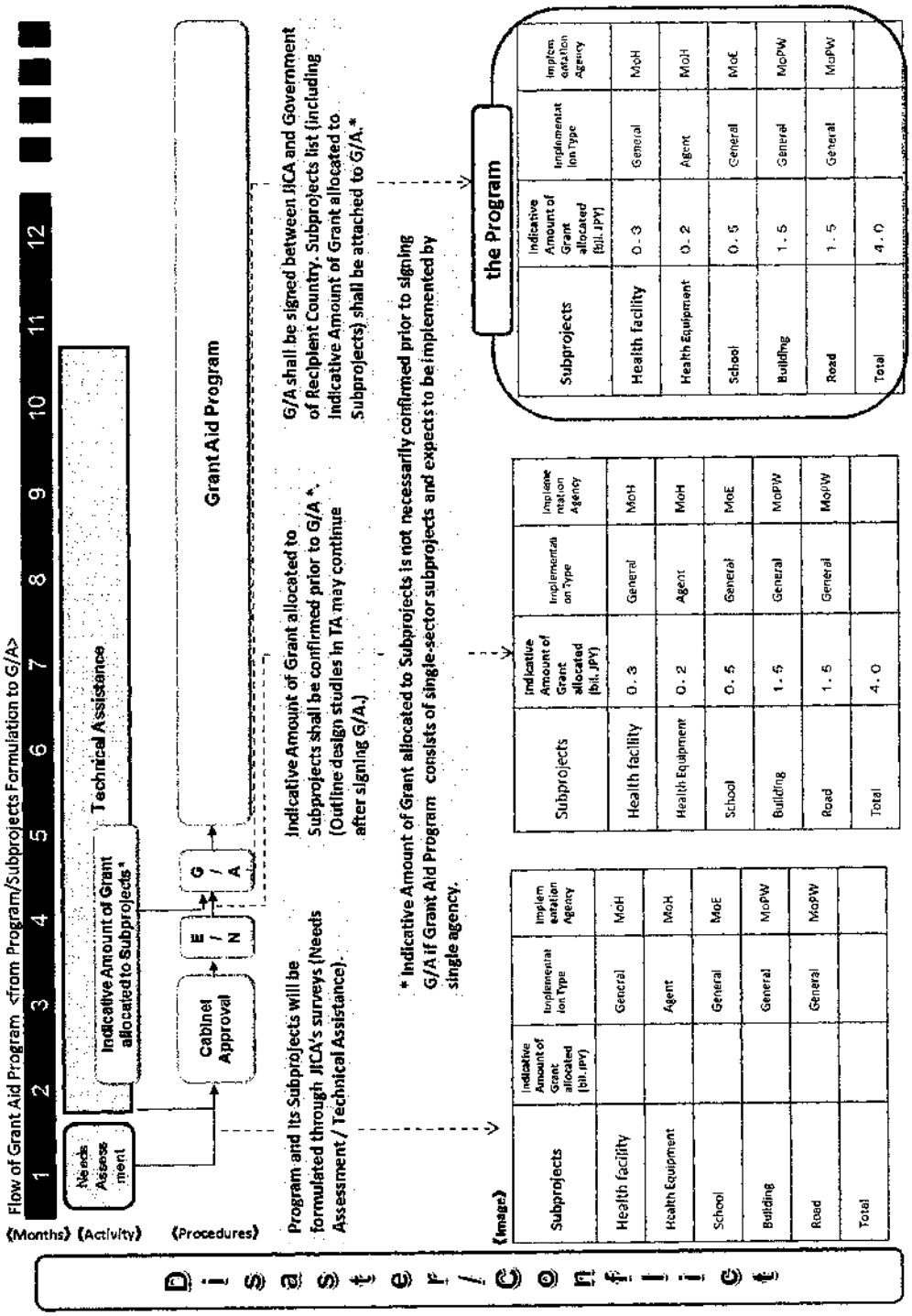
The Grant Aid Programme is categorized as "FI" based on the JICA Guidelines for Environmental and Social Consideration, unless all the categories of subprojects under the Grant Aid Programme are apparent before signing G/A. According to the JICA Guidelines for Environmental and Social Consideration, the executing agencies of subprojects under the Grant Aid Programme are required to fill in Environmental and Social Management System (ESMS) Check List and submit it to JICA. JICA and Recipient country side shall confirm all the ESMS Check Lists before signing of G/A. The executing agencies of subprojects shall submit Outlines of an Annual Environmental and Social Performance

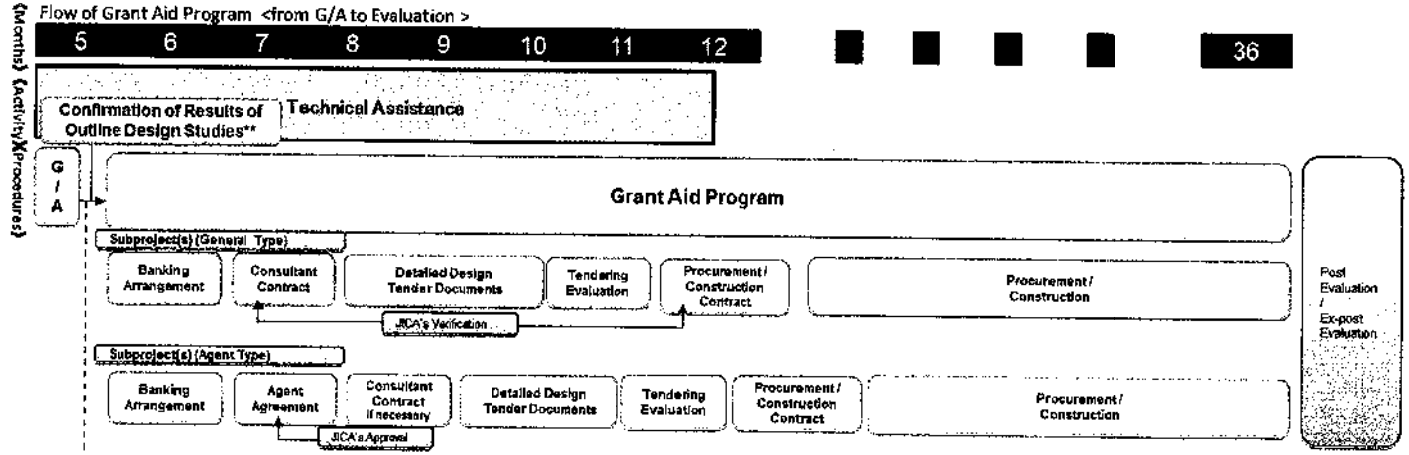
Report to JICA on an annual-basis[1]

(End)

[1] In case the Grant Aid Programme is expected to include subproject(s) of category A, the Programme needs to take a different procedure, such as confirming frameworks of environmental and social consideration documents between JICA and Recipient country side before signing G/A. The details of the procedure shall be explained by JICA, as needed.

FLOW OF GRANT AID PROGRAMME





Results of outline design study of each subproject shall be confirmed by both sides before commencing the subproject.**

(Image)

the Program

Subprojects	Indicative Amount of Grant allocated (bil. JPY)	Implementation Type	Implementation Agency
Health facility	0.3	General	MoH
Health Equipment	0.2	Agent	MoH
School	0.5	General	MoE
Building	1.5	General	MoPW
Road	1.5	General	MoPW
Total	4.0		

** For some subprojects, confirmation of results of outline design studies could be done before signing G/A. Timing of the confirmation depends on the progress of the relevant studies.

Subproject List could be modified based on the mutual consent after discussion of the Committee for the Program, if necessary.

the Program

Subprojects	Indicative Amount of Grant allocated (bil. JPY)	Implementation Type	Implementation Agency
Health facility	0.3	General	MoH
Health Equipment	0.2	Agent	MoH
School	0.5	General	MoE
Building	1.5 1.0	General	MoPW
Road	1.5 2.0	General	MoPW
Total	4.0		

Attachment 2 for Annex-3
(Schedule 2 of G/A)

Scope of the Agent's Services for the Subproject(s) (Agent Type)

1. Provision of information and advice to the Subcommittee.

2. Conclusion of an agreement for detailed design works and construction supervision with the consultants.

3. Ensuring that the Authority fully understand the procedures to employ the Agent and the procedures for the purchase of products and services for the Subproject(s) (Agent Type).

4. (1) Preparation for specifications of products for the Authority, including, where necessary, detailed discussions with the end-users.

   (2) Preparation for bid documents appropriate to the type and value of products and services for the Subproject(s) (Agent Type) to be purchased.

   (3) Advertisement of bids, where the international competitive bidding is to be held, the wording of which is to be agreed with the Authority.

   (4) Evaluation of bids, including both technical and financial considerations.

   (5) Submission of recommendations to the Authority for approval to place orders with suppliers and providers of products and services for the Subproject(s) (Agent Type).

5. Receipt and execution of the Advances in accordance with the employment contract with the Authority.

6. Negotiation and conclusion of contracts with suppliers and providers of products and services for the Subproject(s) (Agent Type), including satisfactory payments, shipment and inspection arrangements, where necessary.

7. Checking the progress of the Subproject(s) (Agent Type).

8. Providing the Authority with documents containing detailed information of progress of orders, notification of orders placed, amendments to contracts, delivery and service information, shipping documents, etc.

9. Payments to suppliers and providers of products and services for the Subproject(s) (Agent Type) from the Advances.

Annex- 4 Major Undertakings to be taken by Jordanian Government

NO	Items	To be covered by the Grant	To be covered by Recipient side
1.	Installation of distribution pipeline		
	1) To install distribution pipelines and water supply networks	•	
	2) To cooperate for construction work on the road including acquisition of its approvals and permissions, and traffic control procedure		•
	3) To cooperate during pipe connection work such as attendance at water suspension work, its notice to people and etc.		•
2.	Common items for construction works		
	1) To provide temporary stock yards for construction materials and machineries and lands for temporary works		•
	2) To take all necessary measures to secure disposal sites for excavation debris and drains for wastewater from construction works		•
	3) To provide necessary water and chemicals (chlorine) for trial operation of the facilities constructed		•
3.	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	•	
	2) Internal transportation from the port of disembarkation to the project site	•	
4.	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		•
5.	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
6.	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		•
7.	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
8.	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
9.	To give due environmental and social consideration in the implementation of the Project.		•

(B/A: Banking Arrangement, A/P: Authorization to pay)

Annex- 5 Check List (Environmental and Social Considerations)

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
1 licensing and explanation	(1) EIA and Environmental licensing	(a) Environmental assessment report (EIA report), etc. was created? (b) EIA report was either approved by the country's government? (c) Approved EIA report has collateral condition? If there is a collateral condition, the conditions are satisfied? (d) In the case other than the above, if necessary, environmental licensing from the competent authority of the local was acquired?	(a) N (b) N (c) N (d) N	(a) (b) (c) (d) At the stage that the scope of the water supply network of Hawwara and Sarich is determined by the basic design, the application for a preliminary review of the EIA to the MOE will be carried out.
	(2) Explanation to local stakeholders	(a) About the impact and the contents of the project, an appropriate description to local stakeholders including information disclosure was carried out, and the understanding was gained? (b) The comments from the residents were reflected on project content?	(a) N (b) N	(a) (b) After the above 1 (1), the EIA category to be carried out is specified by the central licensing committee. After the instruction, the explanation to stakeholders will be conducted, if necessary.
	(3) Consideration of alternatives	(a) Multiple alternatives of the project plan (when studying, and including items related to environmental and social) were considered?	(a) Y	(a) In Hofa-Bait Ras Pipeline, it is considered rerouting proposed and adopted the current plan.
2 Pollution measures	(1) Air quality	(a) Is there the air pollution caused by chlorine from the injection equipment and storage facility for chlorine disinfection? (b) Chlorine in the work environment is consistent with the occupational safety standards of the country?	(a) N (b)	(a) (b) Since the project is installation of water pipes and renovation of water supply network, chlorine is not used. Measures dust generated during the construction period is planned.
	(2) Water quality	(a) SS, BOD, COD, pH, and the like item of wastewater generated in accordance with the facility operation are consistent with drainage standards of the country?	(a) Y	(a) YWC manages it, and drinking water standard is satisfied. Since the project is installation of water pipes and the renovation of the water supply network, the project does not concern water quality management. However, the water quality of the terminal is improved by renovation.
	(3) Waste	(a) Waste sludge generated in accordance with the facility operation is either treated and disposed of properly in accordance with the provisions of the country?	(a) Y	(a) YWC manages it, and the criteria are satisfied. Since the project is installation of water pipes and the renovation of the water supply network, the project does not performed waste management
	(4) Noise and vibration	(a) Noise and vibration from the pump facility, etc., are consistent with the standards of the country?	(a) Y	(a) YWC manages it, and the criteria are satisfied. Since the project is installation of water pipes and the renovation of the water supply network, the project does not concern facility operation management. Measures noise and vibration generated during the construction period is planned.
	(5) Land subsidence	(a) When performing the pumping large amounts of groundwater, is there a possibility that the land subsidence occurs?	(a) N	(a) Since the project is installation of water pipes and the renovation of the water supply network, the project does not concern increase of groundwater intake.
3 Natural environment	(1) Protected areas	(a) Site is located in protected areas designated by laws of the country or international treaties and conventions? Project affects the protected areas?	(a)N	(a) The project area has more than 10km away from the Reverves the country specify, the impact does not affect.
	(2) Ecosystem	(a) Site includes virgin forest, tropical natural forest, habitat ecologically important (coral reefs, mangrove	(a) (b)	(a) (b)

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
		swamps, tidal flats, etc.) ? (b) Site includes the habitats of endangered species required protection by law of the country or international treaties and conventions? (c) If a significant impact on the ecosystem is concerned, measures to reduce the impacts on the ecosystem are conducted? (d) Water intake (surface water, underground water) by the project affects the aquatic environment such as rivers? Measures to reduce the impacts on the aquatic organisms, etc., are carried out?	(c) (d)	(c) (d)
	(3) Hydrology	(a) Water intake (groundwater, surface water) by the project affects an adverse effect on the flow of surface water and ground water?	(a)	(a)
4 Social environment	(1) Resettlement	(a) With the implementation of the project, involuntary resettlement occurs?If that occurs, efforts to minimize the impact of relocation are conducted?(b) For residents to transfer, appropriate description of compensation and life reconstruction measures would be done before the transfer?(c) Search for residents' relocation was carried out, and the resettlement plan including compensation by the replacement cost and the recovery of livelihoods after relocation is conducted?(d) Payment of compensation is either carried out in the pre-transfer?(e) Compensation policy has been developed in the document?(f) The plan, among the relocated residents, in particular for socially vulnerable such as women, children, the elderly, the poor, ethnic minorities, indigenous peoples, etc.has been made with appropriate consideration?(g) For relocated residents, the pre-transfer agreement can be gotten?(h) The organizational framework established to properly implement the resettlement is considered? Enough capacity to implement the plan and budget measures can be secured?(i) Monitoring for the impacts of resettlement is planned?(j) System for the complaint process is built?	(a)(b)(c)(d)(e)(f)(g)(h)(i)(j)	(a)(b)(c)(d)(e)(f)(g)(h)(i)(j)
	(2) Life and livelihood	(a) Adverse effect results to the life of residents by the project? Adequate measures are considered to reduce the impacts, if necessary? (b) Water intake (surface water, underground water) by the project affects existing water use?	(a) (b)	(a) (b)
	(3) Cultural heritage	(a) Is there risk by the project to heritages and historical sites which are archeologically, historically, culturally, and religiously precious? In addition, measures that have been stipulated in accordance with the country's laws are taken into account?	(a)	(a)
	(4) Landscape	(a) When the landscape to be considered particularly presents, the project adversely affects to it? If it is affected, necessary precautions is taken?	(a)	(a)
	(5) ethnic minorities, indigenous	(a) Consideration to reduce the impact to minority of the country, indigenous cultures and lifestyle have been made? (b) Rights related to land and resources of ethnic minorities and indigenous people are respected?	(a) (b)	(a) (b)
	(6) Working environment	(a) In the project, the Act on the working environment of the country must be observed is kept? (b) Safety considerations in the hard part of the individuals involved in the project such as installation of safety equipment according to industrial accident prevention, management of hazardous substances, etc. are being measures?	(a) (b) (c) (d)	(a) (b) (c) (d)

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
		(c) Support implementation in the soft part of the individuals involved in the project such as the establishment of safety and health plan and safety training for workers (including public health and traffic safety) is planned and implemented? (d) Appropriate measures that security personnel involved in the project make sure not to violate the safety of the project stakeholders and local residents are taken?		
5 Others	(1) Impact under construction	(a) Mitigation measures are prepared against pollution during construction (noise, vibration, turbid water, dust, exhaust gas, waste, etc.)? (b) The construction adversely affects the natural environment (ecosystem)? In addition, adequate measures considered to reduce impacts are prepared? (c) The construction adversely affects the social environment construction? In addition, adequate measures considered to reduce impacts are prepared? (d) The construction causes road congestion? Adequate measures considered to reduce impacts are prepared?	(a)(b)(c)(d)	(a)(b)(c)(d)
	(2) monitoring	(a) For items that are considered to have potential impacts of the above environment items, monitoring of project operators are planned and implemented? (b) How item of the plan, method, frequency, etc. are determined? (c) Monitoring system of the project operator (Continuity of the organization, personnel, equipment, and adequate budget) or be established? (d) The reporting procedure or the frequency, etc.from the project operator to the competent authority is stipulated?	(a) (b) (c) (d)	(a) (b) (c) (d)
6 points to note	Reference of other checklist	(a) If necessary, it should be evaluated also add the appropriate checks in check list according dam, the river.	(a)	(a)
	Notes on using environmental checklist	(a) If necessary, check the influence of environmental problems on a global scale or cross-border. (If such an element related to cross-border problems processing of waste, acid rain, ozone layer depletion, global warming can be considered).	(a)	(a)

Note 1) For the "standard of the country concerned" in the table, when there is a significant deviation as compared to the baseline which is internationally recognized, countermeasures are examined, if necessary. Items, which are not yet to be established in the local environmental regulations of the country, are examined by comparison with appropriate standards other than the country (including experience in Japan).
Note 2) Environmental Checklist is intended only to show the standard environment check items. Depending on the condition of the project and the local, it is necessary to add or delete items

Annex- 6 Monitoring Form for Environmental and Social Considerations

Construction Phase

1. Response /Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2 . Pollution

-Air Quality (Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
TSP	mg/cm3			0.26 (24h)				Quarterly
CO	ppm			26 (1h)				
NO2	ppm			0.21 (1h)				
SO2	ppm			0.135 (1h)				

- Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Noise Level	dB			Urban; 65 (Day), 55 (Night)				Daily

Remarks; Urban commercial area

- Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Traffic Vibration Level	dB					Urban; 70 (Day), 65 (Night)		Daily

Remarks; Urban commercial area

- Soil Contamination

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Treatment of oil leakage	Details of survey results, such as findings.	

3 .Natural Environment

- No Monitoring Items

4.Social Environment

- Livelihood

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Interference of approach to commercial places	Details of survey results, such as findings.	

- Cultural Heritage

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Unearthing of monument and relic	Details of survey results, such as findings.	

- Work Environment

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
· Safety measures for labor · Safety measures for inhabitant	Details of survey results, such as findings.	

- Accident

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
· Measures for traffic safety · Crossing guard situation	Details of survey results, such as findings.	

Appendix V: Other Relevant Data

Appendix -1 Monitoring Form
Appendix -2 Environmental Check List
Appendix -3 Expected Water Demand and Production
Appendix -4 Result of Network Analysis
Appendix -5 Amount of Well Production in Northern Governorates in 2011 to 2013
Appendix -6 Outline design drawing
Appendix -7 Inflow to Hofa reservoir
Appendix -8 Environmental and Social Considerations
Appendix -9 Result of Test Pit

Monitoring Form

Construction Phase

1. Response /Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2 . Pollution

-Air Quality (Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
TSP	mg/cm3			0.26 (24h)				Quarterly
CO	ppm			26 (1h)				
NO2	ppm			0.21 (1h)				
SO2	ppm			0.135 (1h)				

- Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Noise Level	dB			Urban; 65 (Day), 55 (Night)				Daily

Remarks; Urban commercial area

- Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Traffic Vibration Level	dB					Urban; 70 (Day), 65 (Night)		Daily

Remarks; Urban commercial area

- Soil Contamination

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Treatment of oil leakage	Details of survey results, such as findings.	

3 .Natural Environment

- No Monitoring Items

4.Social Environment

- Livelihood

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Interference of approach to commercial places	Details of survey results, such as findings.	

- Cultural Heritage

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Unearthing of monument and relic	Details of survey results, such as findings.	

- Work Environment

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
・Safety measures for labor ・Safety measures for inhabitant	Details of survey results, such as findings.	

- Accident

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
・Measures for traffic safety ・Crossing guard situation	Details of survey results, such as findings.	

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
1 licensing and explanation	(1) EIA and Environmental licensing	(a) Environmental assessment report (EIA report), etc. was created? (b) EIA report was either approved by the country's government? (c) Approved EIA report has collateral condition? If there is a collateral condition, the conditions are satisfied? (d) In the case other than the above, if necessary, environmental licensing from the competent authority of the local was acquired?	(a) N (b) N (c) N (d) N	(a) (b) (c) (d) At the stage that the scope of the water supply network of Hawwara and Sarieh is determined by the basic design, the application for a preliminary review of the EIA to the MOE will be carried out.
	(2) Explanation to local stakeholders	(a) About the impact and the contents of the project, an appropriate description to local stakeholders including information disclosure was carried out, and the understanding was gained? (b) The comments from the residents were reflected on project content ?	(a) N (b) N	(a) (b) After the above 1 (1), the EIA category to be carried out is specified by the central licensing committee. After the instruction, the explanation to stakeholders will be conducted if necessary.
	(3) Consideration of alternatives	(a) Multiple alternatives of the project plan (when studying, and including items related to environmental and social) were considered?	(a) Y	(a) In Hofa-Bait Ras Pipeline, it is considered rerouting proposed and adopted the current plan.
2 Pollution measures	(1) Air quality	(a) Is there the air pollution caused by chlorine from the injection equipment and storage facility for chlorine disinfection? (b) Chlorine in the work environment is consistent with the occupational safety standards of the country?	(a) N (b)	(a) (b) Since the projct is installation of water pipes and renovation of water supply network, chlorine is not used. Measures dust generated during the construction period is planned.
	(2) Water quality	(a) SS, BOD, COD, pH, and the like item of wastewater generated in accordance with the facility operation are consistent with drainage standards of the country?	(a) Y	(a) YWC manages it, and drinking water standard is sutisfied. Since the project is installation of water pipes and the renovation of the water supply network, the project does not concern water quality management. However, the water quality of the terminal is improved by renovation.
	(3) Waste	(a) Waste sludge generated in accordance with the facility operation is either treated and disposed of properly in accordance with the provisions of the country?	(a) Y	(a) YWC is managee it, and the criteria is satisfied. Since the project is installation of water pipes and the renovation of the water supply network, the project does not performed waste management
	(4) Noise and vibration	(a) Noise and vibration from the pump facility, etc., are consistent with the standards of the country?	(a) Y	(a) YWC is managee it, and the criteria is satisfied. Since the project is installation of water pipes and the renovation of the water supply network, the project does not concern facility operation management. Measures noise and vibration generated during the construction period is planned.
	(5) Land subsidence	(a) When performing the pumping large amounts of groundwater, is there a possibility that the land subsidence occurs?	(a) N	(a) Since the project is installation of water pipes and the renovation of the water supply network, the project does not concern increase of groundwater intake.
3 Natural environment	(1) Protected areas	(a) Site is located in protected areas designated by laws of the country or international treaties and conventions? Project affects the protected areas?	(a)N	(a) The project area has more than 10km away from the Reverves the country specify, the impact does not affect.
	(2) Ecosystem	(a) Site includs virgin forest, tropical natural forest, habitat ecologically important (coral reefs, mangrove swamps, tidal flats, etc.) ? (b) Site includs the habitats of endangered species required protection by law of the country or international treaties and conventions? (c) If a significant impact on the ecosystem is concerned, measures to reduce the impacts on the ecosystem is conducted? (d) Water intake (surface water, underground water) by the project affects the aquatic environment such as rivers? Measures to reduce the impacts on the aquatic organisms, etc., are carried out?	(a) (b) (c) (d)	(a) (b) (c) (d)
	(3) Hydrology	(a) Water intake (groundwater, surface water) by the project affects an adverse effect on the flow of surface water and ground water?	(a)	(a)

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
4 Social environment	(1) Resettlement	(a) With the implementation of the project, involuntary resettlement occurs ? If that occurs, efforts to minimize the impact of relocation is conducted? (b) For residents to transfer , appropriate description of compensation and life reconstruction measures would be done before the transfer ? (c) Search for residents rellocation was carried out, and the resettlement plan including compensation by the replacement cost and the recovery of livelihoods after relocation is conducted ? (d) Payment of compensation is either carried out in the pre-transfer ? (e) Compensation policy has been developed in the document ? (f) The plan, among the relocated residents, in particular for socially vulnerable such as women, children, the elderly, the poor, ethnic minorities, indigenous peoples, etc.has been made with appropriate consideration ? (g) For relocated residents, the pre-transfer agreement can be gotten ? (h) The organizational framework established to properly implement the resettlement is considered ? Enough capacity to implement the plan and budget measures can be secured ? (i) Monitoring for the impacts of resettlement is planned ?	(a) (b) (c) (d) (e) (f) (g) (h) (i) (j)	(a) (b) (c) (d) (e) (f) (g) (h) (i) (j)
	(2) Life and livelihood	(a) Adverse effect results to the life of residents by the project? Adequate measures is considered to reduce the impacts, if necessary? (b) Water intake (surface water, underground water) by the project affects existing water use ?	(a) (b)	(a) (b)
	(3) Cultural heritage	(a) Is there risk by the project to heritages and historical sites which are archeologically, historically, culturally, and religiously precious ? In addition, measures that have been stipulated in accordance with the country's laws are taken into account ?	(a)	(a)
	(4) Landscape	(a) When the landscape to be considered particularly presents, the project adversely affects to it? If it is affected, necessary precautions is taken?	(a)	(a)
	(5) ethnic minorities	(a) Consideration to reduce the impact to minority of the country, indigenous cultures and lifestyle have been made? (b) Rights related to land and resources of ethnic minorities and indigenous people are respected?	(a) (b)	(a) (b)
	(6) Working environment	(a) In the project, the Act on the working environment of the country must be observed is kept? (b) Safety considerationsin in the hard part of the individuals involved in the project such as installation of safety equipment according to industrial accident prevention, management of hazardous substances, etc. are being measures? (c) Support implementation in the soft part of the individuals involved in the project such as the establishment of safety and health plan and safety training for workers (including public health and traffic safety) is planned and implemented? (d) Appropriate measures that security personnel involved in the project make sure not to violate the safety of the project stakeholders and local residents are taken ?	(a) (b) (c) (d)	(a) (b) (c) (d)

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
5 Others	(1) Impact under construction	(a) Mitigation measures are prepared against pollution during construction (noise, vibration, turbid water, dust, exhaust gas, waste, etc.) ? (b) The construction adversely affects the natural environment (ecosystem) ? In addition, adequate measures considered to reduce impacts is prepared? (c) The construction adversely affects the social environment construction ? In addition, adequate measures considered to reduce impacts is prepared? (d) The construction causes road congestion? Adequate measures considered to reduce impacts are prepared?	(a) (b) (c) (d)	(a) (b) (c) (d)
	(2) monitoring	(a) For items that are considered to have potential impacts of the above environment items, monitoring of project operators are planned and implemented? (b) How item of the plan, method, frequency, etc. are determined? (c) Monitoring system of the project operator (Continuity of the organization, personnel, equipment, and adequate budget) or be established? (d) The reporting procedure or the frequency, etc.from the project operator to the competent authority are stipulated?	(a) (b) (c) (d)	(a) (b) (c) (d)
6 points to note	Reference of other checklist	(a) If necessary, it should be evaluated also add the appropriate checks in check list according dam, the river.	(a)	(a)
	Notes on using environmental checklist	(a) If necessary, check the influence of environmental problems on a global scale or cross-border. (If such an element related to cross-border problems processing of waste, acid rain, ozone layer depletion, global warming can be considered).	(a)	(a)

Note 1) For the "standard of the country concerned" in the table, when there is a significant deviation as compared to the baseline which is internationally recognized, countermeasures are examined, if necessary. Items, which are not yet to be established in the local environmental regulations of the country, is examined by comparison with appropriate standardsother than the country (including experience in Japan).
Note 2) Environmental Checklist is intended only to show the standard environment check items. Depending on the condition of the project and the local, it is necessary to add or delete items.

Governorate	District	Sub- District	Locality	Neighbourhood	Population (Persons)				Total Average Demand (MCM/year)				Existing Well ID	Internal Production from Wells (MCM/year)			Water to be Supplied from External Sources (MCM/year)			
					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
North Shooneh Sub-Transmission Zone																				
Irbid	Aghwar	Aghwar Shamaliyah	Shooneh		17,597	21,484	23,278	27,875	0.71	0.82	0.88	1.06								
Irbid	Aghwar	Aghwar Shamaliyah	Mashari'e		22,394	27,342	29,624	35,474	0.90	1.04	1.12	1.35								
Irbid	Aghwar	Aghwar Shamaliyah	Kravymeh		19,272	23,530	25,494	30,528	0.77	0.89	0.97	1.16								
Irbid	Aghwar	Aghwar Shamaliyah	Wadi El-Raian		6,616	8,078	8,752	10,480	0.27	0.31	0.33	0.40	AB3007	0.30	0.29	0.29				
			Wadi El-Raian										AB1362	0.10	0.09	0.12				
			Wadi El-Raian										AB1369	0.06	0.04	0.04				
			Wadi El-Raian										AB1350	0.00	0.20	0.22				
			Wadi El-Raian										AB1351	0.00	0.10	0.10				
			Wadi El-Raian										AB1382	0.00	0.00	0.00				
			Wadi El-Raian										AB1380	0.00	0.00	0.32				
			Wadi El-Raian										AB4505							
			Wadi El-Raian										AB4506	0.31	0.32	0.30				
			Wadi El-Raian										AB1377	0.00	0.07	0.10				
			Wadi El-Raian										AB4503	0.30	0.32	0.30				
Irbid	Aghwar	Aghwar Shamaliyah	Shaikh Hussein		8,682	10,600	11,485	13,753	0.35	0.40	0.44	0.52								
Irbid	Aghwar	Aghwar Shamaliyah	Manshiyyeh		7,786	9,506	10,300	12,334	0.31	0.36	0.39	0.47	AB3003	0.26	0.13	0.10				
			Manshiyyeh										AB1355	0.26	0.13	0.10				
Irbid	Aghwar	Aghwar Shamaliyah	Waqqas		6,387	7,798	8,449	10,117	0.26	0.30	0.32	0.38								
Irbid	Aghwar	Aghwar Shamaliyah	Adasiyyeh		2,971	3,628	3,930	4,706	0.12	0.14	0.15	0.18								
Irbid	Aghwar	Aghwar Shamaliyah	Tabaqat Fahl		1,038	1,267	1,373	1,644	0.04	0.05	0.05	0.06	AG3002	0.99	1.07	1.24				
			Tabaqat Fahl										AB0542	1.16	1.12	1.01				
			Tabaqat Fahl										AG3000	1.26	1.28	1.43				
			Tabaqat Fahl										AG3005	0.84	0.84	0.95				
			Tabaqat Fahl										AG3157	0.74	0.74	0.89				
Irbid	Bani Kenanah	Bani Kenanah	Mkhaibeh El-Tehta		3,051	3,725	4,036	4,833	0.12	0.14	0.15	0.18								
Irbid	Bani Kenanah	Bani Kenanah	Mkhaibeh El-Foaqa		0	0	0	0	0.00	0.00	0.00	0.00								
Irbid	Aghwar	Aghwar Shamaliyah	Baqoorah		698	852	923	1,106	0.03	0.03	0.04	0.04								
Irbid	Aghwar	Aghwar Shamaliyah	Wadi El-Arab		284	346	375	450	0.01	0.01	0.01	0.02								
Irbid	Aghwar	Aghwar Shamaliyah	Abu Saydo		3,653	4,460	4,833	5,787	0.15	0.17	0.18	0.22								
Irbid	Aghwar	Aghwar Shamaliyah	Siaikhat		889	1,085	1,176	1,408	0.04	0.04	0.04	0.05								
Irbid	Aghwar	Aghwar Shamaliyah	Abu Habeel		974	1,189	1,288	1,543	0.04	0.05	0.05	0.06								
Irbid	Aghwar	Aghwar Shamaliyah	Zmaliyyeh		1,073	1,310	1,420	1,700	0.04	0.05	0.05	0.06								
Irbid	Aghwar	Aghwar Shamaliyah	Marzeh		1,204	1,470	1,593	1,907	0.05	0.06	0.06	0.07								
Irbid	Aghwar	Aghwar Shamaliyah	Abu Ziad		60	73	80	95	0.00	0.00	0.00	0.00								
Irbid	Aghwar	Aghwar Shamaliyah	Majed		202	247	267	320	0.01	0.01	0.01	0.01								
Irbid	Aghwar	Aghwar Shamaliyah	Sakneh		488	596	646	773	0.02	0.02	0.02	0.03								
Irbid	Aghwar	Aghwar Shamaliyah	Qarn		921	1,125	1,218	1,459	0.04	0.04	0.05	0.06								
Irbid	Aghwar	Aghwar Shamaliyah	Karkamah		301	367	398	477	0.01	0.01	0.02	0.02								
Irbid	Aghwar	Aghwar Shamaliyah	Sbiereh		21	26	28	33	0.00	0.00	0.00	0.00								
Irbid	Aghwar	Aghwar Shamaliyah	Feddein		859	1,049	1,136	1,361	0.03	0.04	0.04	0.05								
			Total		**107,421**	**131,153**	**142,102**	**170,163**	**4.31**	**4.98**	**5.39**	**6.46**		**6.58**	**6.72**	**7.50**	**-3.19**	**-2.52**	**-2.11**	**-1.04**
Deir Al Sina Sub-Transmission Zone																				
Irbid	Koorah	Koorah	Dair Abi Sa'id		16,896	20,629	22,351	26,765	0.68	0.78	0.85	1.02	AF1001	0.49	0.57	0.49				
			Dair Abi Sa'id										AF1004	0.53	0.50	0.47				
			Dair Abi Sa'id										AF1002	0.66	0.76	0.75				
			Dair Abi Sa'id										AF1003	0.33	0.29	0.13				
Irbid	Koorah	Koorah	Jdaitna		13,975	17,063	18,488	22,137	0.56	0.65	0.70	0.84								
Irbid	Koorah	Koorah	Kofor El-Ma'		12,052	14,714	15,944	19,091	0.48	0.56	0.61	0.72								
Irbid	Koorah	Koorah	Ashrafiyyeh		10,474	12,788	13,856	16,592	0.42	0.49	0.53	0.63	AB1378							
			Ashrafiyyeh										AB3000							
Irbid	Koorah	Koorah	Kofor Awan		9,853	12,030	13,035	15,608	0.40	0.46	0.49	0.59	AG3006	0.36	0.27	0.36				
Irbid	Koorah	Koorah	Kofot Abil		8,093	9,881	10,706	12,820	0.32	0.38	0.41	0.49	AB1363	0.53	0.52	0.56				
			Kofot Abil										AB3005	0.21	0.29	0.36				
Irbid	Koorah	Koorah	Sammo'		7,610	9,291	10,067	12,055	0.31	0.35	0.38	0.46								
Irbid	Koorah	Koorah	Tebneh		6,934	8,466	9,173	10,984	0.28	0.32	0.35	0.42								
Irbid	Koorah	Koorah	Bait Ides		5,875	7,173	7,771	9,306	0.24	0.27	0.29	0.35								
Irbid	Koorah	Koorah	Kofor Rakeb		5,147	6,284	6,809	8,153	0.21	0.24	0.26	0.31								
Irbid	Koorah	Koorah	Jeffien		4,379	5,347	5,793	6,937	0.18	0.20	0.22	0.26								
Irbid	Koorah	Koorah	Jenien Essafa		4,482	5,473	5,929	7,100	0.18	0.21	0.23	0.27								

Governorate	District	Sub- District	Locality	Neighbourhood	Population (Persons)				Total Average Demand (MCM/year)				Existing Well ID	Internal Production from Wells (MCM/year)			Water to be Supplied from External Sources (MCM/year)			
					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Irbid	Koorah	Koorah	Zmal		3,710	4,530	4,908	5,877	0.15	0.17	0.19	0.22								
Irbid	Koorah	Koorah	Kofor Kiefia		739	902	977	1,171	0.03	0.03	0.04	0.04								
Irbid	Koorah	Koorah	Abu El-Qain		633	773	837	1,003	0.03	0.03	0.03	0.04								
Irbid	Koorah	Koorah	Roqqah		256	312	339	406	0.01	0.01	0.01	0.02								
Irbid	Koorah	Koorah	Sowwan		16	20	21	25	0.00	0.00	0.00	0.00								
Irbid	Koorah	Koorah	Rahwah		223	273	295	353	0.01	0.01	0.01	0.01								
Irbid	Koorah	Koorah	Kherber El-Hawi		9	11	12	14	0.00	0.00	0.00	0.00								
Irbid	Koorah	Koorah	Rkhayyem		154	188	204	244	0.01	0.01	0.01	0.01								
Irbid	Koorah	Koorah	Iskayeen		20	24	27	32	0.00	0.00	0.00	0.00								
Irbid	Taybeh	Taybeh	Taybeh		15,570	19,010	20,597	24,664	0.63	0.72	0.78	0.94	AB1174	0.11	0.13	0.03				
			Taybeh										AB4278	0.58	0.57	0.57				
			Taybeh										AB4285							
			Taybeh										AB4286	0.55	0.55	0.53				
Irbid	Taybeh	Taybeh	Samma		10,540	12,869	13,943	16,696	0.42	0.49	0.53	0.63	AE3001	1.52	1.58	1.52				
			Samma										AE1007	0.95	0.67	0.77				
			Samma										AE1008	1.96	2.11	1.94				
			Samma										AE1009	2.06	1.55	1.38				
			Samma										AE1010	2.04	1.72	1.45				
			Samma										AE1011	1.46	1.84	1.74				
			Samma										AE3005	0.69	0.62	0.53				
			Samma										AE3006	1.37	1.21	1.56				
			Samma										AE3016	1.73	1.34	1.56				
			Samma										AE3017	0.71	0.50	0.42				
			Samma										AE3018	0.91	1.02	1.00				
			Samma										AE3019	0.78	0.80	0.95				
			Samma										AE3020	1.66	1.62	1.77				
Irbid	Taybeh	Taybeh	Dair Ess'eneh		5,941	7,254	7,859	9,411	0.24	0.28	0.30	0.36								
Irbid	Taybeh	Taybeh	Makhraba		1,531	1,870	2,026	2,425	0.06	0.07	0.08	0.09								
Irbid	Taybeh	Taybeh	Mendah		1,274	1,555	1,685	2,018	0.05	0.06	0.06	0.08	AB3194	0.29	0.34	0.38				
Irbid	Taybeh	Taybeh	Zabdah El-		436	533	576	691	0.02	0.02	0.02	0.03								
Irbid	Taybeh	Taybeh	Abser Abu Ali		388	473	513	615	0.02	0.02	0.02	0.02								
			Total		**147,210**	**179,736**	**194,741**	**233,193**	**5.91**	**6.82**	**7.39**	**8.85**		**22.49**	**21.35**	**21.22**	**-15.31**	**-14.40**	**-13.83**	**-12.37**
Kufur Youba Sub-Transmission Zone																				
Irbid	Mazar Shamali	Mazar Shamali	Mazar Shamali		14,839	18,118	19,630	23,506	0.60	0.69	0.75	0.89								
Irbid	Mazar Shamali	Mazar Shamali	Dair Yoosef		7,016	8,566	9,281	11,114	0.28	0.33	0.35	0.42								
Irbid	Mazar Shamali	Mazar Shamali	Rhaba		9,144	11,165	12,096	14,485	0.37	0.42	0.46	0.55								
Irbid	Mazar Shamali	Mazar Shamali	Enbeh		7,958	9,716	10,527	12,606	0.32	0.37	0.40	0.48								
Irbid	Mazar Shamali	Mazar Shamali	Johfiyyeh		2,966	3,622	3,924	4,698	0.12	0.14	0.15	0.18	AB1316							
			Johfiyyeh										AB1375	0.67	0.77	0.86				
			Johfiyyeh										AB1441	1.02	0.92	0.94				
Irbid	Qasabah Irbid	Irbid	Kofor Yooba		13,780	16,824	18,229	21,829	0.55	0.64	0.69	0.83	AE1001	0.21	0.23	0.26				
Irbid	Qasabah Irbid	Irbid	Soom		6,311	7,705	8,349	9,997	0.25	0.29	0.32	0.38								
Irbid	Qasabah Irbid	Irbid	Zahar		5,701	6,960	7,542	9,031	0.23	0.26	0.29	0.34								
Irbid	Qasabah Irbid	Irbid	Bait Yafa		9,280	11,330	12,277	14,700	0.37	0.43	0.47	0.56								
Irbid	Qasabah Irbid	Irbid	Doaqarah		5,779	7,056	7,645	9,154	0.23	0.27	0.29	0.35	AE1016	0.19	0.17	0.15				
Irbid	Qasabah Irbid	Irbid	Jijiien		3,227	3,940	4,269	5,112	0.13	0.15	0.16	0.19								
Irbid	Qasabah Irbid	Irbid	Kofar Rahta		1,536	1,876	2,032	2,433	0.06	0.07	0.08	0.09								
Irbid	Qasabah Irbid	Irbid	Jamhah		2,568	3,136	3,398	4,068	0.10	0.12	0.13	0.15								
Irbid	Qasabah Irbid	Irbid	Natfeh		1,652	2,017	2,186	2,617	0.07	0.08	0.08	0.10								
Irbid	Qasabah Irbid	Irbid	Ham		1,248	1,524	1,651	1,977	0.05	0.06	0.06	0.08								
Irbid	Wastiyyah	Wastiyyah	Kofor Asad		9,875	12,056	13,063	15,643	0.40	0.46	0.50	0.59	AE3010							
			Kofor Asad										AE3014	0.71	0.00	0.00				
			Kofor Asad										AE3015	0.20	0.00	0.00				
			Kofor Asad										AE3021							
Irbid	Wastiyyah	Wastiyyah	Qmaim		6,256	7,638	8,276	9,910	0.25	0.29	0.31	0.38								
Irbid	Wastiyyah	Wastiyyah	Hoafa El-Wastitteh		4,236	5,172	5,604	6,710	0.17	0.20	0.21	0.25								
Irbid	Wastiyyah	Wastiyyah	Qom		1,513	1,848	2,001	2,397	0.06	0.07	0.08	0.09								
Irbid	Wastiyyah	Wastiyyah	Kofor An		3,166	3,865	4,188	5,015	0.13	0.15	0.16	0.19								
Irbid	Wastiyyah	Wastiyyah	Kharaj		2,594	3,167	3,431	4,109	0.10	0.12	0.13	0.16								
			Kharaj																	
			Total		**120,645**	**147,301**	**159,599**	**191,111**	**4.84**	**5.59**	**6.06**	**7.25**		**3.00**	**2.08**	**2.21**	**2.63**	**3.38**	**3.84**	**5.04**

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Bait Ras Sub-Transmission Zone																				
Irbid	Qasabah Irbid	Irbid	Bait Ras		22,078	26,956	29,207	34,973	0.89	1.02	1.11	1.33								
Irbid	Bani Kenanah	Bani Kenanah	Hariema		4,522	5,521	5,982	7,163	0.18	0.21	0.23	0.27	AD3012	0.43	0.45	0.47				
Irbid	Bani Kenanah	Bani Kenanah	Abu El-Loqas		1,549	1,891	2,049	2,454	0.06	0.07	0.08	0.09	AD3016	0.29	0.34	0.25				
Irbid	Bani Kenanah	Bani Kenanah	Kharja		5,283	6,450	6,989	8,369	0.21	0.24	0.27	0.32								
Irbid	Bani Kenanah	Bani Kenanah	Zaweh		1,047	1,279	1,385	1,659	0.04	0.05	0.05	0.06								
Irbid	Bani Kenanah	Bani Kenanah	Khrayybeh		1,747	2,133	2,311	2,767	0.07	0.08	0.09	0.11								
Irbid	Bani Kenanah	Bani Kenanah	Bareshta		214	261	284	339	0.01	0.01	0.01	0.01								
Irbid	Bani Kenanah	Bani Kenanah	Yarmook		1,034	1,262	1,368	1,638	0.04	0.05	0.05	0.06								
Irbid	Bani Kenanah	Bani Kenanah	Qasfah		882	1,077	1,167	1,397	0.04	0.04	0.04	0.05								
Irbid	Bani Kenanah	Bani Kenanah	Hebras		4,374	5,340	5,786	6,929	0.18	0.20	0.22	0.26								
Irbid	Bani Kenanah	Bani Kenanah	Hartha		4,916	6,002	6,504	7,787	0.20	0.23	0.25	0.30	AD3129	0.15	0.54	0.61				
Irbid	Bani Kenanah	Bani Kenanah	Aqraba		3,070	3,749	4,062	4,863	0.12	0.14	0.15	0.18								
Irbid	Bani Kenanah	Bani Kenanah	Yebla		4,564	5,572	6,037	7,230	0.18	0.21	0.23	0.27								
Irbid	Bani Kenanah	Bani Kenanah	Rfaid		2,532	3,091	3,350	4,011	0.10	0.12	0.13	0.15								
Irbid	Bani Kenanah	Bani Kenanah	Mzaireeb		1,466	1,789	1,939	2,322	0.06	0.07	0.07	0.09								
Irbid	Qasabah Irbid	Irbid	Kofor Jayez		3,818	4,661	5,051	6,048	0.15	0.18	0.19	0.23								
Irbid	Bani Kenanah	Bani Kenanah	Sama El-Roosan		3,487	4,257	4,612	5,524	0.14	0.16	0.18	0.21								
Irbid	Bani Kenanah	Bani Kenanah	Azriet		930	1,135	1,230	1,473	0.04	0.04	0.05	0.06								
Irbid	Bani Kenanah	Bani Kenanah	Samar		3,852	4,703	5,096	6,102	0.15	0.18	0.19	0.23								
Irbid	Bani Kenanah	Bani Kenanah	Kofor Soom		8,377	10,228	11,081	13,270	0.34	0.39	0.42	0.50								
Irbid	Bani Kenanah	Bani Kenanah	Saham		7,226	8,823	9,559	11,447	0.29	0.33	0.36	0.43								
Irbid	Bani Kenanah	Bani Kenanah	Esheh		179	218	237	284	0.01	0.01	0.01	0.01								
Irbid	Bani Kenanah	Bani Kenanah	Ebder		2,838	3,465	3,755	4,496	0.11	0.13	0.14	0.17								
Irbid	Bani Kenanah	Bani Kenanah	Hatem		6,629	8,093	8,769	10,501	0.27	0.31	0.33	0.40								
Irbid	Bani Kenanah	Bani Kenanah	Malka		7,784	9,504	10,297	12,330	0.31	0.36	0.39	0.47								
Irbid	Bani Kenanah	Bani Kenanah	Mansoorah		4,404	5,377	5,826	6,976	0.18	0.20	0.22	0.26								
Irbid	Bani Kenanah	Bani Kenanah	Um Qais		4,811	5,874	6,365	7,621	0.19	0.22	0.24	0.29								
Irbid	Bani Kenanah	Bani Kenanah	Hemah Aurdinyah		1,941	2,370	2,567	3,075	0.08	0.09	0.10	0.12								
Irbid	Bani Kenanah	Bani Kenanah	Saileh		871	1,063	1,153	1,380	0.03	0.04	0.04	0.05								
Irbid	Wastiyyah	Wastiyyah	Saidoor		1,810	2,210	2,394	2,867	0.07	0.08	0.09	0.11	AE3008	0.13	0.19	0.25				
													AB3010	0.25	0.00	0.00				
													AE3011	0.20	0.34	0.26				
													AB3010	0.00	0.21	0.49				
													AE3014	0.00	0.61	0.59				
													AE3015	0.00	0.61	0.62				
			Total		**118,235**	**144,354**	**156,412**	**187,295**	**4.75**	**5.48**	**5.94**	**7.11**		**1.45**	**3.29**	**3.54**	**1.21**	**1.94**	**2.40**	**3.57**
Zebdat Sub-Transmission Zone																				
Irbid	Qasabah Irbid	Irbid	Taqbel		612	747	810	969	0.02	0.03	0.03	0.04								
Irbid	Qasabah Irbid	Irbid	Um El-Jadayel		1,083	1,322	1,433	1,716	0.04	0.05	0.05	0.07								
Irbid	Qasabah Irbid	Irbid	Hoor		2,432	2,969	3,217	3,852	0.10	0.11	0.12	0.15								
Irbid	Qasabah Irbid	Irbid	Fo'arah		4,062	4,960	5,373	6,435	0.16	0.19	0.20	0.24	AE1004	0.14	0.14	0.13				
Irbid	Qasabah Irbid	Irbid	As'ara		1,188	1,450	1,572	1,882	0.05	0.06	0.06	0.07	AE3007	0.25	1.26	0.02				
Irbid	Qasabah Irbid	Irbid	Howwarah		15,622	19,074	20,666	24,746	0.63	0.72	0.78	0.94								
Irbid	Qasabah Irbid	Irbid	Boshra		13,936	17,015	18,435	22,076	0.56	0.65	0.70	0.84	AD1268	0.00	0.00	0.00				
			Boshra										AD3002	0.28	0.31	0.30				
			Boshra										AD3018	0.00	0.00	0.00				
Irbid	Qasabah Irbid	Irbid	Sal		8,505	10,384	11,251	13,473	0.34	0.39	0.43	0.51	AD3015	0.00	0.00	0.00				
			Sal										AD3161							
Irbid	Qasabah Irbid	Irbid	Mghayyer		10,625	12,973	14,056	16,831	0.43	0.49	0.53	0.64	AD0536	0.08	0.05	0.02				
Irbid	Qasabah Irbid	Irbid	Hakama		9,093	11,102	12,029	14,404	0.37	0.42	0.46	0.55	AD3037	0.09	0.03	0.00				
			Hakama																	
Irbid	Qasabah Irbid	Irbid	Maro		3,578	4,369	4,733	5,668	0.14	0.17	0.18	0.22								
Irbid	Qasabah Irbid	Irbid	Al'al		5,343	6,523	7,068	8,464	0.21	0.25	0.27	0.32								
Irbid	Qasabah Irbid	Irbid	Irbid		307,033	374,863	406,164	486,363	16.25	18.75	20.31	24.32								
				Al jamee	1,433	1,750	1,896	2,270	0.0758		0.09	0.1135								
				Al Tall	1,044	1,275	1,381	1,654	0.0553		0.07	0.0827								
				Al Hashme	2,732	3,336	3,614	4,328	0.1446		0.18	0.2164								
				Al Mallab	3,895	4,756	5,153	6,170	0.2061		0.26	0.3085								
				Al Medan	6,822	8,329	9,025	10,807	0.3611		0.45	0.5404								

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
				AlSalam	13,977	17,065	18,490	22,141	0.7397		0.92	1.1072								
				Al Audah	32,581	39,780	43,102	51,612	1.7243		2.16	2.5809								
				Al Naser	10,871	13,273	14,381	17,221	0.5753		0.72	0.8611								
				Al Karamah	13,256	16,185	17,536	20,999	0.7016		0.88	1.0501								
				Hanena	15,617	19,068	20,660	24,739	0.8265		1.03	1.2371								
				Al Yarmouk	4,242	5,179	5,612	6,720	0.2245		0.28	0.3360								
				El Herafeyeen east	486	593	643	770	0.0257		0.03	0.0385								
				Zahra	5,374	6,561	7,109	8,513	0.2844		0.36	0.4257								
				Andalus	5,532	6,754	7,318	8,763	0.2928		0.37	0.4382								
				Al Sahel green	6,028	7,360	7,974	9,549	0.3190		0.40	0.4775								
				Al rouda	5,009	6,116	6,626	7,935	0.2651		0.33	0.3968								
				Al Eeman	4,982	6,083	6,591	7,892	0.2637		0.33	0.3946								
				Al Sena'a	796	972	1,053	1,261	0.0421		0.05	0.0631								
				Al Baiada	2,844	3,472	3,762	4,505	0.1505		0.19	0.2253								
				Al Baqa'a	2,413	2,946	3,192	3,822	0.1277		0.16	0.1911								
				Al Jamiah	9,644	11,775	12,758	15,277	0.5104		0.64	0.7639								
				Al Nouzha	6,896	8,420	9,123	10,924	0.3650		0.46	0.5463								
				Al Hekmah	6,784	8,283	8,975	10,747	0.3590		0.45	0.5374								
				Al Werud	6,153	7,513	8,140	9,747	0.3256		0.41	0.4874								
				No Name	372	454	492	589	0.0197		0.02	0.0295								
				No Name	2,381	2,907	3,150	3,772	0.1260		0.16	0.1886								
				Al Afraah	11,917	14,550	15,765	18,878	0.6307		0.79	0.9440								
				Al Ateba'a	5,730	6,996	7,580	9,077	0.3033		0.38	0.4539								
				No Name	10,105	12,338	13,368	16,008	0.5348		0.67	0.8005								
				Al Abrar	19,224	23,472	25,432	30,453	1.0174		1.27	1.5228								
				Al Nadeef	8,904	10,871	11,779	14,105	0.4712		0.59	0.7053								
				Al Qasela	10,212	12,468	13,510	16,177	0.5405		0.68	0.8089								
				Al Manara	21,481	26,227	28,417	34,028	1.1369		1.42	1.7016								
				Al Swaneh	5,191	6,338	6,867	8,223	0.2747		0.34	0.4112								
				Al Seha	13,147	16,052	17,392	20,826	0.6958		0.87	1.0414								
				Al Matla'a	12,990	15,860	17,185	20,578	0.6875		0.86	1.0290								
				Al Marj	1,610	1,966	2,130	2,550	0.0852		0.11	0.1275								
				Western El	158	193	209	250	0.0084		0.01	0.0125								
				Al Saadah	7,497	9,154	9,918	11,876	0.3968		0.50	0.5939								
				Al Ashrafeeh	2,196	2,681	2,905	3,479	0.1162		0.15	0.1740								
				Al Basaten	4,498	5,492	5,950	7,125	0.2381		0.30	0.3563								
				Total	**307,024**	**374,863**	**406,163**	**486,363**	**16.25**		**20.31**	**24.32**								
			Total		**383,112**	**467,751**	**506,807**	**606,879**	**19.30**	**22.27**	**24.13**	**28.90**		**0.84**	**1.79**	**0.47**	**18.83**	**21.80**	**23.66**	**28.42**
Badiah Sub-Transmission Zone																				
Mafraq	Badiah Shamaliyah	Salhiya	Safawi		2,306	2,844	3,094	3,738	0.09	0.11	0.12	0.14	F3903	0.23	0.17	0.12				
Mafraq	Badiah Shamaliyah	Salhiya	Manarah		2,149	2,650	2,883	3,483	0.09	0.10	0.11	0.13	F3946	0.48	0.49	0.31				
Mafraq	Badiah Shamaliyah	Salhiya	Salhiya		2,220	2,737	2,978	3,598	0.09	0.10	0.11	0.14								
Mafraq	Badiah Shamaliyah	Salhiya	Hamiediyyeh		1,609	1,984	2,158	2,608	0.06	0.08	0.08	0.10	F4264							
Mafraq	Badiah Shamaliyah	Salhiya	Ashrafiyyeh		1,154	1,423	1,548	1,871	0.05	0.05	0.06	0.07								
Mafraq	Badiah Shamaliyah	Salhiya	Beshriyyeh		1,596	1,968	2,141	2,587	0.06	0.07	0.08	0.10	F1125	0.32	0.26	0.43				
			Beshriyyeh										F1305	0.17	0.22	0.24				
			Beshriyyeh										F3935	0.19	0.21	0.12				
			Beshriyyeh										F1310	0.56	0.53	0.36				
			Beshriyyeh										F1333	0.54	0.60	0.63				
			Beshriyyeh										F1389	0.00	0.11	0.00				
			Beshriyyeh										F3930	0.16	0.00	0.00				
			Beshriyyeh										F4184	0.27	0.46	0.11				
			Beshriyyeh										F4229	0.56	0.00	0.38				
			Beshriyyeh										F4171	0.22	0.00	0.36				
			Beshriyyeh										M3	0.00	0.10	0.05				
			Beshriyyeh										M6	0.54	0.62	0.32				
			Beshriyyeh										M11	0.57	0.48	0.40				
			Beshriyyeh										AL3832	0.38	0.40	0.50				
			Beshriyyeh										AL3422	0.24	0.48	0.39				

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Mafraq	Badiah Shamaliyah	Salhiya	Bani Hashem (Hamra Esahim)		1,125	1,387	1,509	1,824	0.05	0.05	0.06	0.07								
Mafraq	Badiah Shamaliyah	Salhiya	Rahbet Rakkad		978	1,206	1,312	1,585	0.04	0.05	0.05	0.06								
Mafraq	Badiah Shamaliyah	Salhiya	Raudit Al-Amir Hamzeh (Hliut Masarah)		1,692	2,087	2,270	2,743	0.07	0.08	0.09	0.10								
Mafraq	Badiah Shamaliyah	Salhiya	Nayfeh		1,387	1,711	1,860	2,248	0.06	0.06	0.07	0.09	F4312							
Mafraq	Badiah Shamaliyah	Salhiya	Zamlet Al-Amir		1,157	1,427	1,552	1,875	0.05	0.05	0.06	0.07								
Mafraq	Badiah Shamaliyah	Salhiya	Sa'adah		1,280	1,578	1,717	2,075	0.05	0.06	0.07	0.08								
Mafraq	Badiah Shamaliyah	Salhiya	Bostaneh		961	1,185	1,290	1,558	0.04	0.04	0.05	0.06								
Mafraq	Badiah Shamaliyah	Salhiya	Aliet El-Shwa'ar		108	133	145	175	0.00	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Salhiya	Hashimiyyeh Sharqiyyeh		154	190	206	250	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Salhiya	Manshiyyet Kalefeh		121	149	162	196	0.00	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Salhiya	Kaidat Al-Amir Hassan Al Jauiah		450	555	603	729	0.02	0.02	0.02	0.03								
Mafraq	Badiah Shamaliyah	Salhiya	Badiat El-Safawi		503	620	675	815	0.02	0.02	0.03	0.03								
Mafraq	Badiah Shamaliyah	Sabha	Sabha		6,283	7,747	8,428	10,184	0.25	0.29	0.32	0.39	AL1493	0.27	0.05	0.05				
			Sabha										AL3643							
			Sabha										AL3889	0.17	0.00	0.00				
			Sabha										AL3956	0.00	0.27	0.35				
			Sabha										AL2709	0.00	0.00	0.00				
Mafraq	Badiah Shamaliyah	Sabha	Dafyaneh		2,126	2,622	2,852	3,446	0.09	0.10	0.11	0.13	AL3681							
			Dafyaneh										AL3518							
Mafraq	Badiah Shamaliyah	Sabha	Sab'e Aseyar		1,563	1,927	2,097	2,534	0.06	0.07	0.08	0.10								
Mafraq	Badiah Shamaliyah	Sabha	Koam Erraf		886	1,092	1,188	1,436	0.04	0.04	0.05	0.05								
Mafraq	Badiah Shamaliyah	Sabha	Manshiyyet Qoblan		437	539	586	708	0.02	0.02	0.02	0.03								
Mafraq	Badiah Shamaliyah	Sabha	Feisaliyyeh		670	827	898	1,086	0.03	0.03	0.03	0.04								
Mafraq	Badiah Shamaliyah	Sabha	Harara		205	253	275	332	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Um Al-Jemal		3,156	3,891	4,234	5,116	0.13	0.15	0.16	0.19	AL1485	0.47	0.49	0.73				
			Um Al-Jemal										AL3423	0.45	0.57	0.37				
			Um Al-Jemal										AL3452	0.67	0.62	0.64				
			Um Al-Jemal										AL3797	0.34	0.39	0.40				
			Um Al-Jemal										AL4000							
			Um Al-Jemal										AL1193	0.56	0.04	0.00				
			Um Al-Jemal										AL1225	0.45	0.59	0.59				
			Um Al-Jemal										AL1241	0.57	0.18	0.06				
			Um Al-Jemal										AL1244	0.63	0.63	0.40				
			Um Al-Jemal										AL1265	0.58	0.31	0.62				
			Um Al-Jemal										AL1273	0.53	0.57	0.45				
			Um Al-Jemal										AL1486	0.46	0.50	0.45				
			Um Al-Jemal										AL1558	0.35	0.29	0.55				
			Um Al-Jemal										AL2689	0.27	0.43	0.36				
			Um Al-Jemal										AL3004	0.48	0.21	0.01				
			Um Al-Jemal										AL3362	0.38	0.37	0.39				
			Um Al-Jemal										AL3513	0.48	0.60	0.28				
			Um Al-Jemal										AL3517	0.40	0.72	0.55				
			Um Al-Jemal										AL3518	0.40	0.21	0.47				
			Um Al-Jemal										AL1490	0.52	0.54	0.55				
			Um Al-Jemal										AL1491	0.68	0.49	0.48				
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Roadhet Basmah		5,579	6,880	7,484	9,043	0.22	0.26	0.28	0.34								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Koam El-Ahmar		2,808	3,463	3,766	4,552	0.11	0.13	0.14	0.17	AL3132	0.00	0.00	0.00				
			Koam El-Ahmar										AL3564	0.14	0.19	0.15				
			Koam El-Ahmar										AL3911	0.41	0.37	0.41				
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Aqeb		1,212	1,495	1,625	1,965	0.05	0.06	0.06	0.07								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Amra & Amiereh		3,113	3,838	4,176	5,046	0.12	0.15	0.16	0.19								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Sa'iediyyeh		1,458	1,798	1,956	2,363	0.06	0.07	0.07	0.09								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Rasm El-Hesan		302	372	405	490	0.01	0.01	0.02	0.02								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Zuhoor		109	134	146	177	0.00	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Um Al-Jemal	Rahmat		183	225	245	297	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Dair Al Kahf		1,584	1,954	2,125	2,568	0.06	0.07	0.08	0.10								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Rfa'iyyat		1,238	1,526	1,661	2,007	0.05	0.06	0.06	0.08								

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Roadhet Al-Amir Ali Bin Al-Hussein (Abu Frth)		1,233	1,521	1,654	1,999	0.05	0.06	0.06	0.08								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Jubbeiah		1,268	1,564	1,701	2,055	0.05	0.06	0.06	0.08	F4139	0.14	0.14	0.18				
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Dair El-Qenn		237	292	318	384	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Methnat Rajel		232	286	311	376	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Qasem		986	1,215	1,323	1,598	0.04	0.05	0.05	0.06	F3987	0.28	0.30	0.23				
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Jad'ah		84	103	112	136	0.00	0.00	0.00	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Tal Ermah		489	603	655	793	0.02	0.02	0.02	0.03								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Arainbet Enaimat		144	177	193	233	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Medwer El-Qenn		299	369	401	485	0.01	0.01	0.02	0.02								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Ethlag		167	206	224	271	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Khsha' El-Qenn		278	343	373	451	0.01	0.01	0.01	0.02								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Swailmeh		11	14	14	18	0.00	0.00	0.00	0.00								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Mansoorah		129	159	173	209	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Mrajeeb		70	87	94	113	0.00	0.00	0.00	0.00								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Um Hussein		245	302	329	397	0.01	0.01	0.01	0.02								
Mafraq	Badiah Shamaliyah	Dair Al Kahf	Menyasah		456	562	612	739	0.02	0.02	0.02	0.03								
Mafraq	Badiah Shamaliyah	Um Elqotain	Um Elqotain		5,349	6,597	7,176	8,670	0.21	0.25	0.27	0.33	AL3863							
			Um Elqotain			0							F3863	0.00	0.01	0.02				
Mafraq	Badiah Shamaliyah	Um Elqotain	Khsha' Slaiteen		1,457	1,797	1,954	2,362	0.06	0.07	0.07	0.09								
Mafraq	Badiah Shamaliyah	Um Elqotain	Mkaifteh		2,807	3,462	3,765	4,550	0.11	0.13	0.14	0.17	F3523	0.30	0.30	0.29				
			Mkaifteh										F3761	0.26	0.12	0.09				
			Mkaifteh										F4140	0.31	0.26	0.28				
Mafraq	Badiah Shamaliyah	Um Elqotain	Ma'zooleh		237	292	318	384	0.01	0.01	0.01	0.01								
Mafraq	Badiah Shamaliyah	Um Elqotain	Manshiyyet El-		441	544	591	715	0.02	0.02	0.02	0.03								
Mafraq	Badiah Shamaliyah	Um Elqotain	Ghadeer El-Naqah		26	32	35	42	0.00	0.00	0.00	0.00								
Mafraq	Badiah Shamaliyah	Um Elqotain	Husseiniyyeh		100	123	134	162	0.00	0.00	0.01	0.01	AL1522							
			Husseiniyyeh										AL3657							
Mafraq	Badiah Shamaliyah	Um Elqotain	Oudeh		363	447	487	588	0.01	0.02	0.02	0.02								
Mafraq	Badiah Sh. Gh.	Khaldiyah	Khaldiyah		12,710	15,673	17,051	20,602	0.51	0.59	0.65	0.78	AL1037	0.00	0.08	0.09				
			Khaldiyah										AL1748	0.10	0.00	0.00				
			Khaldiyah										AL2710	0.23	0.12	0.02				
			Khaldiyah										AL3002	0.16	0.13	0.04				
			Khaldiyah										AL3003	0.16	0.12	0.05				
			Khaldiyah										AL3375	0.25	0.30	0.12				
			Khaldiyah										AL3376	0.18	0.13	0.09				
			Khaldiyah										AL3377	0.12	0.08	0.05				
			Khaldiyah										AL3463	0.14	0.05	0.01				
			Khaldiyah										AL3475	0.00	0.00	0.29				
			Khaldiyah										AL3476	0.00	0.00	0.23				
			Khaldiyah										AL3468	0.00	0.00	0.19				
			Khaldiyah										AL3908	0.00	0.29	0.57				
			Khaldiyah										AL3909	0.00	0.23	0.32				
			Khaldiyah										AL3910	0.00	0.29	0.38				
			Khaldiyah										AL3914	0.00	0.29	0.53				
			Khaldiyah										AL3940	0.00	0.31	0.62				
Mafraq	Badiah Sh. Gh.	Khaldiyah	Mabrookah		5,246	6,469	7,038	8,503	0.21	0.25	0.27	0.32								
Mafraq	Badiah Sh. Gh.	Khaldiyah	Mshrfeh		4,249	5,239	5,700	6,887	0.17	0.20	0.22	0.26								
Mafraq	Badiah Sh. Gh.	Khaldiyah	Nasaryyah		263	324	353	426	0.01	0.01	0.01	0.02								
Mafraq	Badiah Sh. Gh.	Khaldiyah	Khaidiyah		3,302	4,072	4,429	5,352	0.13	0.15	0.17	0.20								
Mafraq	Rwaished	Rwaished	Rwaished		5,179	6,386	6,948	8,395	0.21	0.24	0.26	0.32								
Mafraq	Rwaished	Rwaished	Manshiyyet El-Gheiath		1,328	1,638	1,782	2,153	0.05	0.06	0.07	0.08	H1012	0.26	0.11	0.14				
			Manshiyyet El-Gheiath										H2015	0.27	0.35	0.42				
			Manshiyyet El-Gheiath										H3060	0.19	0.00	0.00				
			Manshiyyet El-Gheiath										H3069	0.17	0.26	0.28				
			Manshiyyet El-Gheiath										H3074	0.33	0.13	0.07				

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Mafraq	Rwaished	Rwaished	Salheiat Enneim		169	208	227	274	0.01	0.01	0.01	0.01								
Mafraq	Rwaished	Rwaished	Rodah (Roadhet Bndan)		49	60	65	79	0.00	0.00	0.00	0.00								
Mafraq	Rwaished	Rwaished	Reesheh		17	21	22	28	0.00	0.00	0.00	0.00								
Mafraq	Rwaished	Rwaished	Rokban		14	18	18	23	0.00	0.00	0.00	0.00								
Mafraq	Rwaished	Rwaished	Fhaidhah		77	95	103	125	0.00	0.00	0.00	0.00								
Mafraq	Rwaished	Rwaished	Reesheh Sharqiyyeh		4	5	5	6	0.00	0.00	0.00	0.00								
Mafraq	Rwaished	Rwaished	Karamah		3,533	4,356	4,739	5,727	0.14	0.17	0.18	0.22								
Mafraq	Rwaished	Rwaished	Jeser Rwaished		295	364	396	478	0.01	0.01	0.02	0.02								
Mafraq	Rwaished	Rwaished	Wassad		385	474	517	624	0.02	0.02	0.02	0.02								
Mafraq	Rwaished	Rwaished	Burqa'		279	344	375	452	0.01	0.01	0.01	0.02								
Mafraq	Rwaished	Rwaished	Anka		285	351	382	462	0.01	0.01	0.01	0.02								
Mafraq	Rwaished	Rwaished	Demathah		182	224	244	295	0.01	0.01	0.01	0.01								
Mafraq	Rwaished	Rwaished	Bostaneh		209	257	281	339	0.01	0.01	0.01	0.01								
Mafraq	Rwaished	Rwaished	Um Trfah		55	68	74	89	0.00	0.00	0.00	0.00								
Total					**108,800**	**134,160**	**145,946**	**176,357**	**4.37**	**5.09**	**5.54**	**6.69**		**19.96**	**19.18**	**19.64**	**-15.27**	**-14.54**	**-14.10**	**-12.94**
Mafraq Sub-Transmission Zone																				
Mafraq	Mafraq Qasabah	Mafraq	Aidoon		2,608	3,216	3,499	4,227	0.10	0.12	0.13	0.16								
Mafraq	Mafraq Qasabah	Mafraq	Um Enna'am Sharqiyyeh		1,591	1,962	2,134	2,579	0.06	0.07	0.08	0.10								
Mafraq	Mafraq Qasabah	Mafraq	Um Enna'am Gharbiyyeh		1,436	1,771	1,927	2,328	0.06	0.07	0.07	0.09								
Mafraq	Mafraq Qasabah	Mafraq	Hayayan El-		1,172	1,445	1,572	1,900	0.05	0.05	0.06	0.07								
Mafraq	Mafraq Qasabah	Mafraq	Mazzeh		1,091	1,346	1,463	1,768	0.04	0.05	0.06	0.07								
Mafraq	Mafraq Qasabah	Mafraq	Ghadier Abyadh		726	895	974	1,177	0.03	0.03	0.04	0.04								
Mafraq	Mafraq Qasabah	Mafraq	Bwaidhet El-Hwamdeh		1,724	2,126	2,313	2,794	0.07	0.08	0.09	0.11								
Mafraq	Mafraq Qasabah	Mafraq	Teeb Isem		500	616	671	810	0.02	0.02	0.03	0.03								
Mafraq	Mafraq Qasabah	Mafraq	Rojom Essabie El-Shamali		466	574	625	755	0.02	0.02	0.02	0.03								
Mafraq	Mafraq Qasabah	Mafraq	Mafraq		58,736	72,430	78,794	95,207	3.11	3.62	3.94	4.76								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Za'tary		6,218	7,667	8,342	10,079	0.25	0.29	0.32	0.38								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Ba'ej		4,833	5,960	6,483	7,834	0.19	0.23	0.25	0.30	AD3056	0.40	0.31	0.17				
			Ba'ej			0	0						AL4043							
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Um Essrab		2,953	3,641	3,961	4,787	0.12	0.14	0.15	0.18	AD3005	0.19	0.24	0.06				
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Mansoorah		3,195	3,939	4,286	5,179	0.13	0.15	0.16	0.20								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Thoghret El-Jobb		2,272	2,802	3,048	3,683	0.09	0.11	0.12	0.14	AL3705	0.04	0.06	0.06				
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Zubaidyyeh		1,273	1,570	1,708	2,063	0.05	0.06	0.06	0.08								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Nahdhah		1,370	1,690	1,838	2,221	0.06	0.06	0.07	0.08								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Manshiyyet		2,605	3,213	3,495	4,223	0.10	0.12	0.13	0.16								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Meferdat		1,095	1,350	1,469	1,775	0.04	0.05	0.06	0.07								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Hwaijeh		705	869	945	1,143	0.03	0.03	0.04	0.04								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Rodhet Errwai'i		401	494	538	650	0.02	0.02	0.02	0.02								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Fohayhileh		218	269	292	353	0.01	0.01	0.01	0.01								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Meshref		765	943	1,026	1,240	0.03	0.04	0.04	0.05								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Rodhet Abu Heyal		900	1,110	1,208	1,459	0.04	0.04	0.05	0.06								
Mafraq	Badiah Sh. Gh.	Badiah Sh. Gh.	Sorrah		77	95	103	125	0.00	0.00	0.00	0.00								
Mafraq	Badiah Sh. Gh.	Serhan	Sama Serhan		4,959	6,115	6,653	8,038	0.20	0.23	0.25	0.31	AD1122	0.19	0.05	0.00				
			Sama Serhan										AD1125	0.13	0.07	0.03				
			Sama Serhan										AD1126	0.16	0.05	0.00				
			Sama Serhan										AD1127	0.18	0.00	0.00				
			Sama Serhan										AD1278	0.16	0.19	0.03				
			Sama Serhan										AD3057	0.14	0.13	0.03				
			Sama Serhan										AD3078	0.29	0.22	0.12				
			Sama Serhan										AD3124							
			Sama Serhan										AD3140	0.00	1.14	0.71				
			Sama Serhan										AD1121	0.00	0.00	0.00				
			Sama Serhan										AD1124	0.65	0.00	0.00				
			Sama Serhan										AD3124	0.45	0.44	0.50				
			Sama Serhan										M7	0.25	0.25	0.12				
			Sama Serhan										M8	0.00	0.20	0.45				

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
			Sama Serhan										M9	0.23	0.48	0.62				
Mafraq	Badiah Sh. Gh.	Serhan	Mghayyer Serhan		7,385	9,107	9,907	11,971	0.30	0.35	0.38	0.45	AD3191							
Mafraq	Badiah Sh. Gh.	Serhan	Rba' Serhan		1,093	1,348	1,466	1,772	0.04	0.05	0.06	0.07								
Mafraq	Badiah Sh. Gh.	Serhan	Jaber Serhan		4,239	5,227	5,687	6,871	0.17	0.20	0.22	0.26	AD1327	0.00	0.00	0.00				
			Jaber Serhan										AD3004	0.13	0.24	0.17				
			Jaber Serhan										AD3077	0.00	0.14	0.05				
			Jaber Serhan										AD3118	0.00	0.29	0.33				
			Jaber Serhan										AD3132							
			Jaber Serhan										AD3136							
			Jaber Serhan										M1	0.41	0.37	0.18				
			Jaber Serhan										M10	0.04	0.00	0.00				
			Jaber Serhan										M12	0.38	0.63	0.57				
Mafraq	Badiah Sh. Gh.	Serhan	Manshiyyer K'aiber		593	731	795	961	0.02	0.03	0.03	0.04								
Mafraq	Badiah Sh. Gh.	Serhan	Somayya Serhan		279	344	375	452	0.01	0.01	0.01	0.02								
Mafraq	Badiah Sh. Gh.	Serhan	Zamlett Atterfi		516	636	692	836	0.02	0.02	0.03	0.03								
Mafraq	Badiah Sh. Gh.	Serhan	Matalleh		905	1,116	1,214	1,467	0.04	0.04	0.05	0.06								
Mafraq	Badiah Sh. Gh.	Serhan	Harfosheia		141	174	189	229	0.01	0.01	0.01	0.01								
Mafraq	Badiah Sh. Gh.	Hosha	Hosha		2,169	2,675	2,910	3,516	0.09	0.10	0.11	0.13								
Mafraq	Badiah Sh. Gh.	Hosha	Hamra		7,512	9,263	10,077	12,176	0.30	0.35	0.38	0.46								
Mafraq	Badiah Sh. Gh.	Hosha	Fa'		1,754	2,163	2,353	2,843	0.07	0.08	0.09	0.11								
Mafraq	Badiah Sh. Gh.	Hosha	Harsh		1,281	1,579	1,718	2,076	0.05	0.06	0.07	0.08								
Mafraq	Badiah Sh. Gh.	Hosha	Braiqa		977	1,205	1,311	1,584	0.04	0.05	0.05	0.06								
Mafraq	Badiah Sh. Gh.	Hosha	Akaidar		987	1,218	1,324	1,600	0.04	0.05	0.05	0.06								
Mafraq	Badiah Sh. Gh.	Hosha	Khanasri		859	1,059	1,153	1,392	0.03	0.04	0.04	0.05								
Mafraq	Badiah Sh. Gh.	Hosha	Swailmeh		1,327	1,637	1,781	2,151	0.05	0.06	0.07	0.08	AD1262	0.40	0.33	0.31				
			Swailmeh										AD3040	0.05	0.04	0.00				
			Swailmeh										M2	0.14	0.22	0.15				
Mafraq	Badiah Sh. Gh.	Hosha	Mshairfeh		192	237	257	311	0.01	0.01	0.01	0.01								
Mafraq	Badiah Sh. Gh.	Hosha	Dandania		293	362	393	475	0.01	0.01	0.01	0.02								
Mafraq	Badiah Sh. Gh.	Hosha	Darzeah		79	97	106	128	0.00	0.00	0.00	0.00								
			Total		**136,470**	**168,286**	**183,075**	**221,208**	**6.23**	**7.26**	**7.90**	**9.54**		**5.01**	**6.08**	**4.68**	**1.55**	**2.58**	**3.22**	**4.87**
Um Elulu Sub-Transmission Zone																				
Mafraq	Mafraq Qasabah	Irhab	Irhab		4,418	5,448	5,927	7,161	0.18	0.21	0.22	0.27								
Mafraq	Mafraq Qasabah	Irhab	Dajaniyyeh		4,110	5,068	5,513	6,662	0.17	0.19	0.21	0.25								
Mafraq	Mafraq Qasabah	Irhab	Hwaishan		266	328	356	431	0.01	0.01	0.01	0.02								
Mafraq	Mafraq Qasabah	Irhab	Mo'ammariyyeh		1,405	1,733	1,885	2,277	0.06	0.07	0.07	0.09								
Mafraq	Mafraq Qasabah	Irhab	Um Kheroba		109	134	146	177	0.00	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Bwaidhet Elaimat (Bwaidhah Sharqiyyeh)		995	1,227	1,334	1,613	0.04	0.05	0.05	0.06								
Mafraq	Mafraq Qasabah	Irhab	Bwaidhet		609	751	817	987	0.02	0.03	0.03	0.04								
Mafraq	Mafraq Qasabah	Irhab	Hamamet Elaimat		194	239	260	314	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Hamamet Omoosh		692	854	928	1,122	0.03	0.03	0.04	0.04	AL3660	0.06	0.09	0.00				
Mafraq	Mafraq Qasabah	Irhab	Doqomseh		662	816	888	1,073	0.03	0.03	0.03	0.04								
Mafraq	Mafraq Qasabah	Irhab	Nadreh		537	662	721	870	0.02	0.03	0.03	0.03	AL3382	0.10	0.04	0.08				
Mafraq	Mafraq Qasabah	Irhab	Medwar		363	447	487	588	0.01	0.02	0.02	0.02								
Mafraq	Mafraq Qasabah	Irhab	Um Btaimeh		1,050	1,295	1,409	1,702	0.04	0.05	0.05	0.06								
Mafraq	Mafraq Qasabah	Irhab	Dahal		615	759	825	997	0.02	0.03	0.03	0.04	AL3811							
Mafraq	Mafraq Qasabah	Irhab	Sahah		367	452	492	595	0.01	0.02	0.02	0.02								
Mafraq	Mafraq Qasabah	Irhab	Hamied		139	171	187	225	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Karm		433	534	581	702	0.02	0.02	0.02	0.03								
Mafraq	Mafraq Qasabah	Irhab	Ain Bani Hasan		1,359	1,676	1,824	2,203	0.05	0.06	0.07	0.08								
Mafraq	Mafraq Qasabah	Irhab	Zafaraneh		111	137	149	180	0.00	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Mnifa		225	277	302	365	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Abu El-Soos		57	70	77	92	0.00	0.00	0.00	0.00								
Mafraq	Mafraq Qasabah	Irhab	Um Hysmasa		188	231	252	305	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Khatlah		76	94	102	123	0.00	0.00	0.00	0.00								
Mafraq	Mafraq Qasabah	Irhab	Khrab El-Matwi		114	141	153	185	0.00	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Irhab	Ain Ennabi		857	1,057	1,150	1,389	0.03	0.04	0.04	0.05								
Mafraq	Mafraq Qasabah	Irhab	Qadam		419	517	563	679	0.02	0.02	0.02	0.03								

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Mafraq	Mafraq Qasabah	Manshiyah	Manshiyyet Bani Hasan		8,354	10,301	11,206	13,541	0.34	0.39	0.43	0.51								
Mafraq	Mafraq Qasabah	Manshiyah	Dair Waraq		397	490	533	644	0.02	0.02	0.02	0.02								
Mafraq	Mafraq Qasabah	Manshiyah	Um Elloolo		339	418	454	549	0.01	0.02	0.02	0.02								
Jarash	Jarash Qasabah	Jarash	Soof		14,574	18,609	20,531	25,604	0.59	0.71	0.78	0.97	AL1429	0.09	0.12	0.13				
			Soof							0.00			AL3472							
Jarash	Jarash Qasabah	Jarash	Sakeb		12,771	16,307	17,991	22,436	0.51	0.62	0.68	0.85								
Jarash	Jarash Qasabah	Jarash	Ketteh		7,294	9,313	10,276	12,814	0.29	0.35	0.39	0.49	AL3864							
			Ketteh										AL0758	0.28	0.34	0.37				
			Ketteh										AL0760	0.00	0.42	0.00				
Jarash	Jarash Qasabah	Jarash	Raimoon		7,839	10,009	11,043	13,772	0.31	0.38	0.42	0.52								
Jarash	Jarash Qasabah	Jarash	Baliela		6,195	7,910	8,728	10,883	0.25	0.30	0.33	0.41								
Jarash	Jarash Qasabah	Jarash	Qafqafa		4,550	5,810	6,410	7,993	0.18	0.22	0.24	0.30								
Jarash	Jarash Qasabah	Jarash	Nahleh		3,926	5,013	5,530	6,897	0.16	0.19	0.21	0.26								
Jarash	Jarash Qasabah	Jarash	Dair Elliyyat		3,029	3,868	4,267	5,321	0.12	0.15	0.16	0.20	J7	0.00	0.07	0.06				
Jarash	Jarash Qasabah	Jarash	Hadadeh		2,776	3,545	3,911	4,877	0.11	0.13	0.15	0.19								
Jarash	Jarash Qasabah	Jarash	Meqebleh		2,072	2,646	2,919	3,640	0.08	0.10	0.11	0.14	AL2716	0.24	0.25	0.26				
			Meqebleh										AL2717	0.08	0.05	0.02				
			Meqebleh										J2	0.12	0.14	0.13				
			Meqebleh										J5	0.05	0.02	0.00				
			Meqebleh										J6	0.00	0.00	0.00				
Jarash	Jarash Qasabah	Jarash	Kfair		2,203	2,813	3,103	3,870	0.09	0.11	0.12	0.15								
Jarash	Jarash Qasabah	Jarash	Zaqreet		417	532	587	733	0.02	0.02	0.02	0.03								
Jarash	Jarash Qasabah	Jarash	Ejbarat		2,229	2,847	3,140	3,916	0.09	0.11	0.12	0.15								
Jarash	Jarash Qasabah	Jarash	Asfoor		961	1,227	1,353	1,688	0.04	0.05	0.05	0.06								
Jarash	Jarash Qasabah	Jarash	Rashaydeh		1,872	2,390	2,637	3,289	0.08	0.09	0.10	0.12								
Jarash	Jarash Qasabah	Jarash	Um Rameh		130	166	183	228	0.01	0.01	0.01	0.01								
Jarash	Jarash Qasabah	Jarash	Enabeh		102	130	143	179	0.00	0.00	0.01	0.01								
Jarash	Jarash Qasabah	Jarash	Jabba		618	789	871	1,086	0.02	0.03	0.03	0.04	J3	0.25	1.26	0.02				
			Jabba										J4	0.61	0.00	1.75				
Jarash	Jarash Qasabah	Jarash	Um Ezzaitoon		661	844	931	1,161	0.03	0.03	0.04	0.04								
Jarash	Jarash Qasabah	Jarash	Nabi Hood		1,173	1,498	1,653	2,061	0.05	0.06	0.06	0.08	AL2360	0.18	0.22	0.18				
Jarash	Jarash Qasabah	Jarash	Hasainiyyat		398	508	560	699	0.02	0.02	0.02	0.03								
Jarash	Jarash Qasabah	Jarash	Um Qoatarah		658	840	927	1,156	0.03	0.03	0.04	0.04	AL3792	0.14	0.14	0.13				
			Um Qoatarah										AL3820	0.10	0.15	0.00				
			Um Qoatarah										AL3620	0.00	0.00	0.09				
Jarash	Jarash Qasabah	Jarash	Najdeh		321	410	452	564	0.01	0.02	0.02	0.02								
Jarash	Jarash Qasabah	Jarash	Majar		844	1,078	1,189	1,483	0.03	0.04	0.05	0.06								
Jarash	Jarash Qasabah	Jarash	Abarah		407	520	574	715	0.02	0.02	0.02	0.03	AL3549							
			Abarah										AL3859							
			Abarah										AL3872							
			Abarah										AL3979							
Jarash	Jarash Qasabah	Jarash	Jamla		935	1,193	1,318	1,643	0.04	0.05	0.05	0.06								
Jarash	Jarash Qasabah	Jarash	Qraia		302	385	425	531	0.01	0.01	0.02	0.02								
Jarash	Jarash Qasabah	Jarash	Dibbeen		49	63	69	86	0.00	0.00	0.00	0.00								
Jarash	Jarash Qasabah	Jarash	Ryashi		711	908	1,002	1,249	0.03	0.03	0.04	0.05								
Jarash	Jarash Qasabah	Jarash	Hazeah		323	412	455	567	0.01	0.02	0.02	0.02								
Jarash	Jarash Qasabah	Jarash	Amamah		190	242	267	334	0.01	0.01	0.01	0.01								
Jarash	Jarash Qasabah	Jarash	Shak Mfarre		102	130	143	179	0.00	0.00	0.01	0.01								
Jarash	Jarash Qasabah	Jarash	Jnaideyyeh (Mshairfeh Sharqiyyeh)		877	1,120	1,236	1,541	0.04	0.04	0.05	0.06								
Jarash	Jarash Qasabah	Jarash	Fayha' (Mshairfeh El-Westa)		532	679	750	935	0.02	0.03	0.03	0.04								
Jarash	Jarash Qasabah	Jarash	Mshairfeh		2,180	2,784	3,071	3,830	0.09	0.11	0.12	0.15								
Jarash	Jarash Qasabah	Jarash	Mukhayyam Soof		13,299	16,981	18,735	23,364	0.53	0.64	0.71	0.89								
Jarash	Jarash Qasabah	Jarash	Mukhayyam		17,750	22,664	25,005	31,183	0.71	0.86	0.95	1.18								
Jarash	Jarash Qasabah	Jarash	Mashtal Faisal		422	538	594	741	0.02	0.02	0.02	0.03								
Jarash	Jarash Qasabah	Jarash	Mansheiat Hashem		2,947	3,763	4,151	5,177	0.12	0.14	0.16	0.20								
Jarash	Jarash Qasabah	Jarash	Jarash		39,504	50,442	55,652	69,401	2.09	2.52	2.78	3.47	AL0672	0.67	0.57	0.60				
			Jarash										AL3352	0.28	0.31	0.30				
			Jarash										AL0748	0.21	0.00	0.54				

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					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Jarash	Jarash Qasabah	Mestabah	Mastabah		4,325	5,522	6,093	7,598	0.17	0.21	0.23	0.29	AL3546	0.09	0.03	0.00				
Jarash	Jarash Qasabah	Mestabah	Mersie		3,900	4,979	5,494	6,852	0.16	0.19	0.21	0.26								
Jarash	Jarash Qasabah	Mestabah	Jebbah		4,097	5,231	5,772	7,198	0.16	0.20	0.22	0.27								
Jarash	Jarash Qasabah	Mestabah	Tal'et Erroz		1,004	1,282	1,415	1,764	0.04	0.05	0.05	0.07								
Jarash	Jarash Qasabah	Mestabah	Rahmaniyyeh		682	871	961	1,198	0.03	0.03	0.04	0.05								
Jarash	Jarash Qasabah	Mestabah	Raieh		682	871	961	1,198	0.03	0.03	0.04	0.05								
Jarash	Jarash Qasabah	Borma	Borma		5,575	7,118	7,854	9,794	0.22	0.27	0.30	0.37	AL3854	0.10	0.10	0.00				
Jarash	Jarash Qasabah	Borma	Mansorah (Khshaibeh)		1,308	1,670	1,843	2,298	0.05	0.06	0.07	0.09								
Jarash	Jarash Qasabah	Borma	Jazzazeh		1,470	1,877	2,071	2,583	0.06	0.07	0.08	0.10								
Jarash	Jarash Qasabah	Borma	Majdal		769	982	1,083	1,351	0.03	0.04	0.04	0.05								
Jarash	Jarash Qasabah	Borma	Alaymoon		655	837	923	1,151	0.03	0.03	0.04	0.04								
Jarash	Jarash Qasabah	Borma	Hamta		1,133	1,446	1,596	1,990	0.05	0.05	0.06	0.08								
Jarash	Jarash Qasabah	Borma	Fawara		825	1,054	1,162	1,449	0.03	0.04	0.04	0.06								
Jarash	Jarash Qasabah	Borma	Hooneh		125	160	176	220	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Bal'ama	Bal'ama		10,551	13,011	14,154	17,102	0.42	0.49	0.54	0.65	AL3713	0.18	0.19	0.17				
Mafraq	Mafraq Qasabah	Bal'ama	Zaniyyeh		2,612	3,221	3,504	4,234	0.10	0.12	0.13	0.16								
Mafraq	Mafraq Qasabah	Bal'ama	Hayyan Rwaibedh Gharbi		1,278	1,576	1,714	2,072	0.05	0.06	0.07	0.08								
Mafraq	Mafraq Qasabah	Bal'ama	Kherbeh Samra (Raudit Al-Amir		3,295	4,063	4,420	5,341	0.13	0.15	0.17	0.20								
Mafraq	Mafraq Qasabah	Bal'ama	Mazra'ah		2,504	3,088	3,359	4,059	0.10	0.12	0.13	0.15								
Mafraq	Mafraq Qasabah	Bal'ama	Nozhah		891	1,099	1,196	1,444	0.04	0.04	0.05	0.05								
Mafraq	Mafraq Qasabah	Bal'ama	Bostan		497	613	667	806	0.02	0.02	0.03	0.03								
Mafraq	Mafraq Qasabah	Bal'ama	Khraisan		197	243	264	319	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Bal'ama	Manshiyyet Alaian (Alkhan)		32	40	43	52	0.00	0.00	0.00	0.00								
Mafraq	Mafraq Qasabah	Bal'ama	Nemreh		379	467	508	614	0.02	0.02	0.02	0.02								
Mafraq	Mafraq Qasabah	Bal'ama	Marajem		237	292	318	384	0.01	0.01	0.01	0.01								
Mafraq	Mafraq Qasabah	Bal'ama	Um Swaiweeneh		293	362	393	475	0.01	0.01	0.01	0.02								
Mafraq	Mafraq Qasabah	Bal'ama	Hamaneh El-Qadiemeh		6	7	8	10	0.00	0.00	0.00	0.00								
Mafraq	Mafraq Qasabah	Bal'ama	Hamaneh El-		616	760	826	998	0.02	0.03	0.03	0.04								
Mafraq	Mafraq Qasabah	Bal'ama	Dahreiah		499	615	670	809	0.02	0.02	0.03	0.03								
Mafraq	Mafraq Qasabah	Bal'ama	Shraifiyyeh		18	22	25	29	0.00	0.00	0.00	0.00								
Mafraq	Mafraq Qasabah	Bal'ama	Hayyan Rwaibedh Sharqi		1,665	2,054	2,234	2,699	0.07	0.08	0.08	0.10	AL3483	0.61	0.80	0.64				
			Hayyan Rwaibedh Sharqi										AL3484	0.14	0.13	0.13				
			Hayyan Rwaibedh Sharqi										AL3485	0.12	0.18	0.21				
			Hayyan Rwaibedh Sharqi										AL3791	0.37	0.47	0.57				
			Total		**239,723**	**303,686**	**334,010**	**413,668**	**10.13**	**12.14**	**13.35**	**16.54**		**5.06**	**6.08**	**6.39**	**3.74**	**5.74**	**6.96**	**10.15**
Ramtha Sub-Transmission Zone																				
Irbid	Ramtha	Ramtha	Ramtha		87,499	106,829	115,750	138,605	4.63	5.34	5.79	6.93	AD3112	0.00	0.00	0.00				
			Ramtha										AD3113	0.00	0.00	0.00				
			Ramtha										AD1296	0.20	0.18	0.18				
			Ramtha										AD3135							
			Ramtha										AD3114							
			Ramtha										AD3137							
			Ramtha										AD1281	0.19	0.08	0.00				
			Ramtha										AD3025	0.29	0.20	0.17				
			Ramtha										AD3076							
			Ramtha										AD3121	0.50	0.51	0.50				
			Ramtha										AD3022	0.28	0.37	0.24				
			Ramtha										AD3047	0.10	0.02	0.00				
			Ramtha										AD3023	0.08	0.10	0.09				
			Ramtha										AD3167							
			Ramtha										AD3024	0.34	0.35	0.44				
			Ramtha										AD3021	0.20	0.02	0.00				

Governorate	District	Sub- District	Locality	Neighbourhood	Population (Persons)				Total Average Demand (MCM/year)				Existing Well ID	Internal Production from Wells (MCM/year)			Water to be Supplied from External Sources (MCM/year)			
					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
			Ramtha										AD3044	0.00	0.00	0.00				
			Ramtha										AD3058	0.21	0.37	0.37				
Irbid	Ramtha	Ramtha	Torrah		18,183	22,200	24,054	28,803	0.73	0.84	0.91	1.09	AD3008	0.00	0.00	0.00				
			Torrah										AD3045	0.00	0.00	0.00				
Irbid	Ramtha	Ramtha	Shajarah		14,115	17,233	18,672	22,359	0.57	0.65	0.71	0.85								
Irbid	Ramtha	Ramtha	Emrawah		4,622	5,643	6,114	7,322	0.19	0.21	0.23	0.28								
Irbid	Ramtha	Ramtha	Bwaidhah		6,677	8,153	8,833	10,577	0.27	0.31	0.34	0.40								
Irbid	Ramtha	Ramtha	Dnaibeh		2,594	3,167	3,431	4,109	0.10	0.12	0.13	0.16								
			Total		**133,690**	**163,225**	**176,854**	**211,775**	**6.49**	**7.48**	**8.11**	**9.71**		**2.41**	**2.21**	**1.99**	**4.50**	**5.49**	**6.12**	**7.72**
Hofa Sub-Transmission Zone																				
Irbid	Bani Obeid	Bani Obeid	Hoson		25,093	30,637	33,195	39,749	1.01	1.16	1.26	1.51								
Irbid	Bani Obeid	Bani Obeid	No'ayymeh		15,240	18,607	20,160	24,141	0.61	0.71	0.77	0.92	AD1219	0.12	0.06	0.13				
			No'ayymeh										AD1220	0.16	0.13	0.16				
			No'ayymeh										AD3011	0.23	0.14	0.06				
			No'ayymeh										AD3127	0.29	0.62	0.56				
			No'ayymeh										AD3139	0.00	0.07	0.13				
			No'ayymeh										AD3144							
Irbid	Bani Obeid	Bani Obeid	Sarieh		23,532	28,731	31,129	37,276	0.94	1.09	1.18	1.41								
Irbid	Bani Obeid	Bani Obeid	Aidoon		22,767	27,796	30,118	36,065	0.91	1.06	1.14	1.37								
Irbid	Bani Obeid	Bani Obeid	Ketem		6,752	8,244	8,932	10,696	0.27	0.31	0.34	0.41								
Irbid	Bani Obeid	Bani Obeid	Shatna		341	416	451	540	0.01	0.02	0.02	0.02								
Irbid	Bani Obeid	Bani Obeid	Aliah		532	649	704	843	0.02	0.02	0.03	0.03								
Irbid	Bani Obeid	Bani Obeid	Mukhayyam Shahed Azmi		20,353	24,849	26,924	32,241	0.82	0.94	1.02	1.22								
Irbid	Bani Obeid	Bani Obeid	El Mufti (Hoson)		0	0	0	0	0.00	0.00	0.00	0.00								
Irbid	Mazar Shamali	Mazar Shamali	Habka		2,805	3,425	3,711	4,443	0.11	0.13	0.14	0.17								
Irbid	Mazar Shamali	Mazar Shamali	Zoobya		3,416	4,171	4,519	5,411	0.14	0.16	0.17	0.21								
Irbid	Mazar Shamali	Mazar Shamali	Samad		1,297	1,583	1,716	2,055	0.05	0.06	0.07	0.08								
Irbid	Mazar Shamali	Mazar Shamali	Houfa El-Mazar		2,810	3,431	3,717	4,451	0.11	0.13	0.14	0.17								
Irbid	Mazar Shamali	Mazar Shamali	Za'atara		750	916	992	1,188	0.03	0.03	0.04	0.05								
Irbid	Mazar Shamali	Mazar Shamali	Ibrahimia (Sarras)		763	931	1,010	1,209	0.03	0.04	0.04	0.05								
Irbid	Mazar Shamali	Mazar Shamali	Rahme		336	410	445	532	0.01	0.02	0.02	0.02								
Jarash	Jarash Qasabah	Jarash	Kofor Khall		7,007	8,947	9,871	12,310	0.28	0.34	0.37	0.47								
Ajlun	Ajlun Qasabah	Ajlun	Anjarah		21,794	27,009	29,442	35,735	0.88	1.03	1.12	1.36	AK1016	0.07	0.07	0.08				
Ajlun	Ajlun Qasabah	Ajlun	Ain Janna		10,841	13,436	14,645	17,776	0.44	0.51	0.56	0.67	AJ0582	0.08	0.10	0.09				
Ajlun	Ajlun Qasabah	Ajlun	Hashemiyyeh		8,056	9,984	10,883	13,209	0.32	0.38	0.41	0.50								
Ajlun	Ajlun Qasabah	Ajlun	Wahadneh		5,842	7,240	7,892	9,579	0.23	0.27	0.30	0.36								
Ajlun	Ajlun Qasabah	Ajlun	Halawah		7,042	8,728	9,513	11,547	0.28	0.33	0.36	0.44	AB3152	0.58	0.74	0.48				
			Halawah										AB4797							
			Halawah										AH3003							
			Halawah										AH3007	0.00	0.00	0.32				
			Halawah										AJ0580	0.57	0.64	0.44				
Ajlun	Ajlun Qasabah	Ajlun	Dair Smadiyyeh Shamali		171	212	231	280	0.01	0.01	0.01	0.01								
Ajlun	Ajlun Qasabah	Ajlun	Keshiebeh El-Foqa		489	606	661	802	0.02	0.02	0.03	0.03								
Ajlun	Ajlun Qasabah	Ajlun	Gobal Aghder		718	890	970	1,177	0.03	0.03	0.04	0.04								
Ajlun	Ajlun Qasabah	Ajlun	Shkarah		1,229	1,523	1,660	2,015	0.05	0.06	0.06	0.08								
Ajlun	Ajlun Qasabah	Ajlun	Fakhreh		162	200	219	266	0.01	0.01	0.01	0.01								
Ajlun	Ajlun Qasabah	Ajlun	Mehnah		1,062	1,316	1,434	1,741	0.04	0.05	0.05	0.07								
Ajlun	Ajlun Qasabah	Ajlun	Shtafaina		739	916	998	1,212	0.03	0.03	0.04	0.05								
Ajlun	Ajlun Qasabah	Ajlun	Tayyarah		275	341	372	451	0.01	0.01	0.01	0.02								
Ajlun	Ajlun Qasabah	Ajlun	Um El-Yanabie'		273	338	369	448	0.01	0.01	0.01	0.02								
Ajlun	Ajlun Qasabah	Ajlun	Sakhneh		239	296	323	392	0.01	0.01	0.01	0.01								
Ajlun	Ajlun Qasabah	Ajlun	Hanash		9	11	12	15	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Kerbet Essooq		118	146	159	193	0.00	0.01	0.01	0.01								
Ajlun	Ajlun Qasabah	Ajlun	Zarra'ah		327	405	441	536	0.01	0.02	0.02	0.02								
Ajlun	Ajlun Qasabah	Ajlun	Kofor Eddorrah		2	2	3	3	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Sarabees		9	11	12	15	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Um El-Khashab		45	55	61	74	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Khelet Salem		56	70	76	92	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Za'tarah		78	97	105	128	0.00	0.00	0.00	0.00								

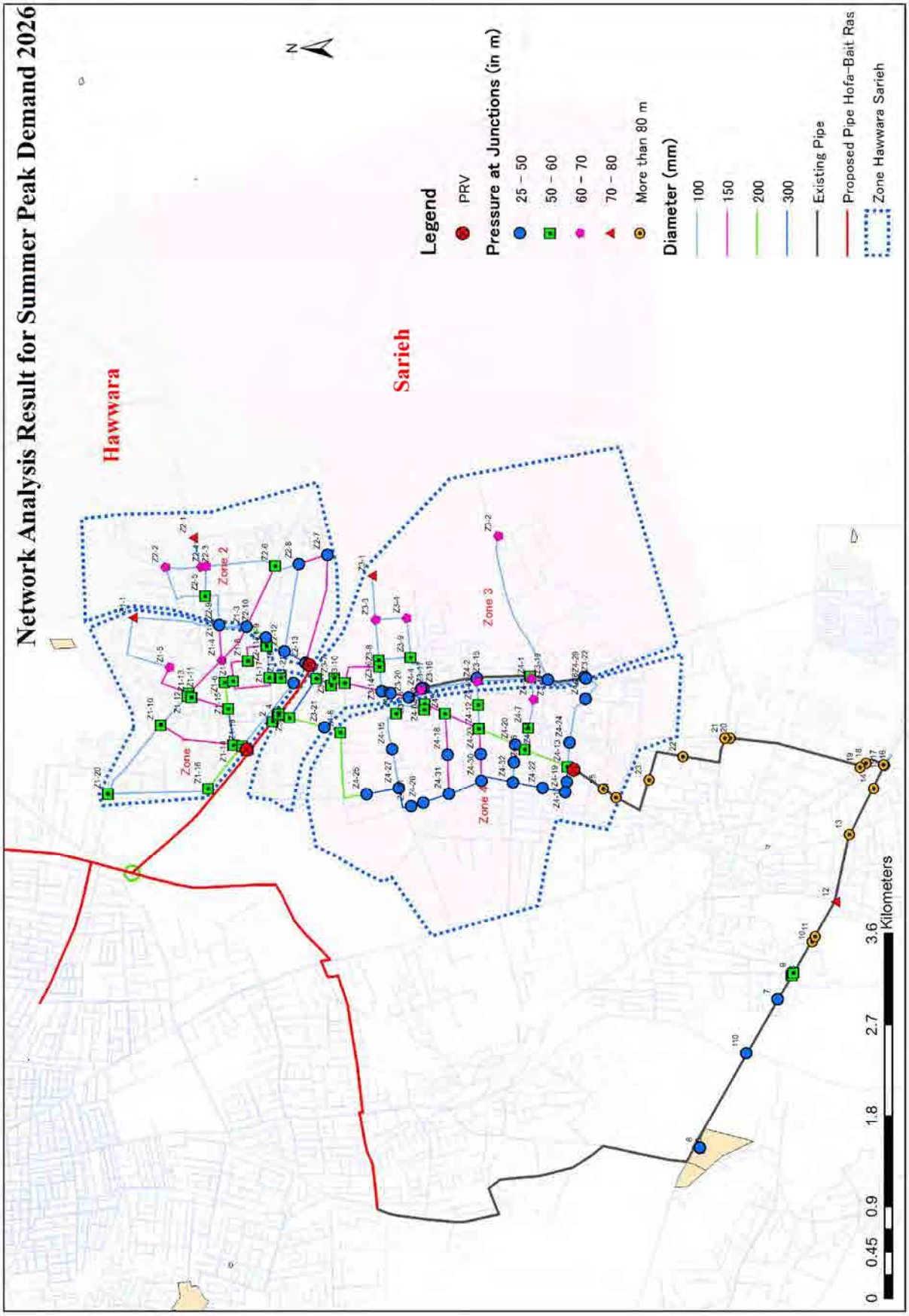
Governorate	District	Sub- District	Locality	Neighbourhood	Population (Persons)				Total Average Demand (MCM/year)				Existing Well ID	Internal Production from Wells (MCM/year)			Water to be Supplied from External Sources (MCM/year)			
					2012	2022	2026	2035	2012	2022	2026	2035		2011	2012	2013	2012	2022	2026	2035
Ajlun	Ajlun Qasabah	Ajlun	Abu Ezzaitoon		2	2	3	3	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Lasteb		24	30	33	39	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Sofsafah		408	506	552	669	0.02	0.02	0.02	0.03								
Ajlun	Ajlun Qasabah	Ajlun	Dair Smadiyyeh		74	92	100	121	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Sowwan		41	51	55	67	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Ajlun	Khelet Wardeh		137	170	185	225	0.01	0.01	0.01	0.01								
Ajlun	Ajlun Qasabah	Ajlun	Ajlun		9,018	11,175	12,182	14,787	0.48	0.56	0.61	0.74	AJ0520	0.26	0.53	0.61				
Ajlun	Ajlun Qasabah	Sakhrah	Sakhrah		12,736	15,783	17,205	20,883	0.51	0.60	0.65	0.79								
Ajlun	Ajlun Qasabah	Sakhrah	Ebbien		8,686	10,764	11,734	14,242	0.35	0.41	0.45	0.54								
Ajlun	Ajlun Qasabah	Sakhrah	Ebellien		1,470	1,822	1,986	2,410	0.06	0.07	0.08	0.09								
Ajlun	Ajlun Qasabah	Sakhrah	Samta		716	887	967	1,174	0.03	0.03	0.04	0.04								
Ajlun	Ajlun Qasabah	Sakhrah	Ras Moneef		1,828	2,265	2,469	2,997	0.07	0.09	0.09	0.11								
Ajlun	Ajlun Qasabah	Sakhrah	Dair El-Barak		74	92	100	121	0.00	0.00	0.00	0.00								
Ajlun	Ajlun Qasabah	Orjan	Orjan		6,266	7,765	8,465	10,274	0.25	0.29	0.32	0.39	AH0510	0.85	1.00	1.20				
Ajlun	Ajlun Qasabah	Orjan	Ba'oon		4,585	5,683	6,194	7,518	0.18	0.22	0.24	0.29	AH1000							
Ajlun	Ajlun Qasabah	Orjan	Rasoon		2,569	3,184	3,470	4,212	0.10	0.12	0.13	0.16	AH0506	0.09	0.10	0.16				
Ajlun	Ajlun Qasabah	Orjan	Oasarah		2,054	2,545	2,774	3,368	0.08	0.10	0.11	0.13								
Ajlun	Ajlun Qasabah	Orjan	Sena'ar		864	1,071	1,168	1,417	0.03	0.04	0.04	0.05								
Ajlun	Ajlun Qasabah	Orjan	Merjam		1,368	1,696	1,848	2,243	0.05	0.06	0.07	0.09								
Ajlun	Ajlun Qasabah	Orjan	Asiem		598	741	808	981	0.02	0.03	0.03	0.04								
Ajlun	Ajlun Qasabah	Orjan	Bier-Eddalyeh		266	330	360	436	0.01	0.01	0.01	0.02								
Ajlun	Kufranjah	Kufranjah	Kufranja		26,891	33,326	36,327	44,093	1.08	1.27	1.38	1.67								
Ajlun	Kufranjah	Kufranjah	Rajeb		2,254	2,793	3,045	3,696	0.09	0.11	0.12	0.14	AK0521	0.04	0.09	0.11				
Ajlun	Kufranjah	Kufranjah	Ballas		1,609	1,994	2,174	2,638	0.06	0.08	0.08	0.10								
Ajlun	Kufranjah	Kufranjah	Safienh		1,417	1,756	1,914	2,323	0.06	0.07	0.07	0.09								
Ajlun	Kufranjah	Kufranjah	Harth		694	860	938	1,138	0.03	0.03	0.04	0.04								
Ajlun	Kufranjah	Kufranjah	Thagret Zebaid		339	421	458	556	0.01	0.02	0.02	0.02								
Ajlun	Kufranjah	Kufranjah	Berkeh		98	121	133	161	0.00	0.00	0.01	0.01								
Ajlun	Kufranjah	Kufranjah	Um Erramel		43	53	58	71	0.00	0.00	0.00	0.00								
Ajlun	Kufranjah	Kufranjah	Oqdeh		25	31	34	41	0.00	0.00	0.00	0.00								
Ajlun	Kufranjah	Kufranjah	Ka'b El-Malol		170	211	230	279	0.01	0.01	0.01	0.01								
Ajlun	Kufranjah	Kufranjah	Noabah		0	0	0	0	0.00	0.00	0.00	0.00								
Total					**280,694**	**345,795**	**376,044**	**454,019**	**11.39**	**13.26**	**14.42**	**17.41**		**3.32**	**4.30**	**4.54**	**6.85**	**8.73**	**9.89**	**12.88**
Total 4 Governorates					**1,776,000**	**2,185,447**	**2,375,590**	**2,865,668**	**77.72**	**90.38**	**98.23**	**118.47**		**70.13**	**73.08**	**72.18**	**5.53**	**18.19**	**26.05**	**46.28**

Notes:

1. Population has been estimated considering average annual growth rate of 2.00% in Irbid Governorate, 2.10% in Mafraq Governorate, 2.45% in Jerash Governorate, and 2.15% in Ajloun Governorate.
2. Daily average per capita consumption and leakage ratio has been used considering MWI guidelines as given below, to calculate per capit demand in city and rural parts.
3. Demand has been estimated for each locality under Sub-Transmission Zones using daily average per capita demand and population of respective locality.
4. Amount from Internal sources has been calculated using well production data given in Appendix 6.
5. -ve sign in column of water to be supplied from External Sources indicates the amount from wells located in a Zone is not sufficient and water needs to be supplied from external sources to meet the demand. +ve sign indicates that water from wells located in a Zone is sufficient to fulfil the demand and there is surplus water.

	City	Rural
Basic Demand (lpcd)	100	80
Others Demand (of Basic)	0.16	0.10
Daily Average (lpcd)	116	88

	2,015	**2020～**	
Leakage (ratio)	0.20	0.15	
City (lpcd)	**145.00**	136.47	**137.00**
Rural (lpcd)	**110.00**	103.53	**104.00**


Network Analysis Result for Summer Peak Demand 2026
Hawwara
Sarieh
Zone 2
Zone 3
Zone
Legend
PRV
Pressure at Junctions (in m)
25 - 50
50 - 60
60 - 70
70 - 80
More than 80 m
Diameter (mm)
100
150
200
300
Existing Pipe
Proposed Pipe Hofa-Bait Ras
Zone Hawwara Sarieh
N
0 0.45 0.9 1.8 2.7 3.6
Kilometers

Network Analysis Result for Hawwara and Sarieh for Summer Peak 2026

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (bars)
1	566.68	0.000	631.74	6.367
2	574.40	0.000	631.64	5.602
3	574.34	0.000	631.61	5.605
4	574.14	0.000	631.61	5.624
5	779.74	0.000	781.72	0.193
6	779.51	0.000	781.72	0.216
7	744.27	0.000	780.41	3.537
8	727.89	0.000	780.20	5.119
9	723.96	0.000	780.18	5.502
10	688.24	0.000	779.91	8.971
11	686.18	0.000	779.87	9.169
12	700.00	0.000	779.56	7.787
13	657.53	0.000	779.05	11.893
14	674.14	0.000	778.66	10.230
15	683.32	0.000	778.47	9.312
16	683.27	0.000	778.47	9.317
17	683.12	0.000	778.45	9.330
18	678.17	0.000	777.83	9.754
19	674.62	0.000	777.61	10.080
20	650.95	0.000	773.57	12.001
21	648.64	0.000	773.40	12.210
22	634.22	0.000	771.51	13.436
23	616.48	0.000	769.84	15.009
24	611.29	0.000	768.02	15.339
25	609.73	0.000	767.54	15.445
110	746.35	0.000	780.88	3.379
Z1-1	536.36	1.771	615.66	7.761
Z1-2	549.59	0.716	615.82	6.481
Z1-3	551.33	0.771	615.82	6.312
Z1-4	552.05	1.203	615.84	6.243
Z1-5	553.53	2.265	615.86	6.100
Z1-6	556.23	0.579	616.83	5.931
Z1-7	557.48	0.605	616.82	5.808
Z1-8	557.58	0.722	616.81	5.797
Z1-9	558.26	0.387	616.80	5.729
Z1-10	558.55	2.702	616.36	5.657
Z1-11	559.70	0.529	616.01	5.511
Z1-12	560.07	2.166	616.05	5.478
Z1-13	560.51	0.856	616.11	5.442
Z1-14	563.50	1.557	616.91	5.227
Z1-15	563.52	1.572	616.85	5.220
Z1-16	564.02	3.062	616.86	5.171
Z1-17	564.09	0.895	616.80	5.158
Z1-18	564.70	1.726	616.94	5.113
Z1-19	565.02	0.406	616.80	5.067
Z1-20	565.10	1.931	616.31	5.011
Z1-21	566.40	0.645	616.80	4.932
Z2-1	521.24	0.098	595.04	7.223
Z2-2	523.65	0.495	595.04	6.987
Z2-3	530.72	0.494	595.04	6.295
Z2-4	531.26	0.787	595.05	6.243
Z2-5	540.20	1.220	595.05	5.368
Z2-6	542.51	1.835	595.47	5.184
Z2-7	545.47	0.930	595.54	4.900
Z2-8	547.12	1.726	595.51	4.736
Z2-9	549.49	0.716	595.30	4.483
Z2-10	551.31	0.771	595.62	4.336

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (bars)
Z2-11	555.00	1.176	595.66	3.980
Z2-12	557.42	1.313	595.74	3.750
Z2-13	563.68	1.794	595.75	3.139
Z2-14	566.22	0.000	631.59	6.398
Z3-1	555.47	0.437	629.95	7.289
Z3-2	560.00	1.909	628.69	6.723
Z3-3	566.04	1.346	629.98	6.258
Z3-4	567.74	1.165	629.97	6.091
Z3-5	570.41	0.567	631.40	5.969
Z3-6	571.11	1.317	630.41	5.804
Z3-7	572.68	0.780	631.33	5.740
Z3-8	572.89	1.691	630.47	5.636
Z3-9	573.23	1.823	630.04	5.560
Z3-10	574.46	0.256	631.30	5.563
Z3-11	574.96	0.563	631.35	5.519
Z3-12	575.45	0.000	630.05	5.344
Z3-13	575.75	2.407	631.55	5.461
Z3-14	581.60	3.578	630.44	4.780
Z3-15	581.76	1.010	630.05	4.727
Z3-16	582.65	0.404	630.06	4.641
Z3-17	582.87	0.623	630.06	4.619
Z3-18	583.04	0.927	630.33	4.628
Z3-19	584.93	0.000	630.05	4.415
Z3-20	586.10	0.865	630.16	4.312
Z3-21	586.58	4.504	631.51	4.397
Z3-22	604.89	0.367	630.05	2.462
Z4-1	576.13	0.927	647.10	6.946
Z4-2	582.80	1.010	647.30	6.312
Z4-3	582.95	3.234	647.05	6.273
Z4-4	583.40	0.477	647.46	6.270
Z4-5	587.43	2.379	647.80	5.909
Z4-6	588.39	1.014	647.59	5.793
Z4-7	588.79	2.487	647.41	5.737
Z4-8	589.09	2.699	648.05	5.770
Z4-9	589.58	1.120	647.45	5.664
Z4-10	589.87	1.873	647.05	5.595
Z4-11	590.43	2.667	647.38	5.574
Z4-12	593.60	2.322	648.15	5.339
Z4-13	595.53	1.235	649.20	5.252
Z4-14	595.73	1.490	648.45	5.159
Z4-15	597.08	3.884	647.03	4.888
Z4-16	598.49	1.349	648.39	4.883
Z4-17	599.50	0.541	649.06	4.851
Z4-18	599.69	2.843	647.89	4.717
Z4-19	600.00	0.541	648.97	4.793
Z4-20	600.65	1.348	648.37	4.671
Z4-21	600.85	0.677	648.14	4.628
Z4-22	600.96	1.590	648.78	4.680
Z4-23	600.98	1.992	648.20	4.621
Z4-24	601.37	2.259	647.99	4.563
Z4-25	602.23	3.391	648.10	4.489
Z4-26	602.92	2.791	648.16	4.427
Z4-27	604.39	2.240	648.11	4.278
Z4-28	604.84	1.939	647.21	4.147
Z4-29	604.89	0.000	647.17	4.138
Z4-30	605.00	1.650	648.35	4.243
Z4-31	605.00	1.667	648.21	4.229
Z4-32	605.06	1.277	648.56	4.257

Network Analysis Result for Hawwara and Sarieh for Summer Peak 2026

Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss Gradient (m/km)
R-3	1	1669	400	Ductile Iron	130	66.960	0.53	0.75
5	6	3	600	Steel	100	56.912	0.20	0.13
R-1	5	27	600	Steel	100	56.912	0.20	0.12
25	PRV-5	330	300	Ductile Iron	110	56.912	0.81	3.08
PRV-5	Z4-13	81	300	Ductile Iron	110	56.912	0.81	3.08
1	2	375	400	Ductile Iron	130	39.892	0.32	0.29
2	3	78	400	Ductile Iron	130	39.892	0.32	0.29
1	PRV-1	35	300	Ductile Iron	130	27.067	0.38	0.57
PRV-1	Z1-18	50	300	Ductile Iron	130	27.067	0.38	0.57
3	Z3-13	119	300	Ductile Iron	130	26.539	0.38	0.55
Z1-18	Z1-14	89	300	Ductile Iron	130	20.016	0.28	0.33
Z3-13	Z3-5	468	300	Ductile Iron	130	19.628	0.28	0.32
Z3-5	Z3-11	159	300	Ductile Iron	130	19.060	0.27	0.30
Z3-11	Z3-7	78	300	Ductile Iron	130	18.497	0.26	0.28
Z3-7	Z3-10	114	300	Ductile Iron	130	17.717	0.25	0.26
Z4-31	Z4-26	267	300	Ductile Iron	130	15.326	0.22	0.20
Z1-14	Z1-15	362	300	Ductile Iron	130	13.490	0.19	0.16
PRV-2	Z2-13	43	300	Ductile Iron	130	13.354	0.19	0.15
4	Z2-14	569	400	Ductile Iron	130	13.354	0.11	0.04
3	4	19	400	Ductile Iron	130	13.354	0.11	0.04
Z2-14	PRV-2	34	300	Ductile Iron	130	13.354	0.19	0.16
Z4-26	Z4-21	124	300	Ductile Iron	130	12.535	0.18	0.14
Z4-21	Z4-27	286	300	Ductile Iron	130	11.858	0.17	0.12
Z3-10	Z3-14	369	150	Ductile Iron	130	9.375	0.53	2.35
Z1-15	Z1-13	379	150	Ductile Iron	130	8.471	0.48	1.94
Z3-10	Z3-8	464	150	Ductile Iron	130	8.087	0.46	1.78
Z1-12	Z1-11	29	150	Ductile Iron	130	7.256	0.40	1.35
Z3-14	Z3-18	88	150	Ductile Iron	130	6.534	0.37	1.20
Z3-8	Z3-6	68	150	Ductile Iron	130	5.659	0.32	0.92
Z3-18	Z3-20	186	150	Ductile Iron	130	5.607	0.32	0.91
Z1-14	Z1-10	759	150	Ductile Iron	130	4.969	0.28	0.72
Z4-13	Z4-24	239	100	HDPE	130	4.877	0.62	5.04
Z4-14	Z4-7	213	100	Ductile Iron	130	4.783	0.61	4.86
Z3-20	Z3-17	148	150	Ductile Iron	130	4.742	0.27	0.66
Z3-13	Z3-21	357	200	Ductile Iron	130	4.504	0.14	0.15
Z4-30	Z4-23	263	150	Ductile Iron	130	4.442	0.25	0.59
Z4-12	Z4-11	239	100	Ductile Iron	130	3.824	0.49	3.21
Z4-27	Z4-15	391	100	Ductile Iron	130	3.528	0.45	2.77
Z1-11	Z1-4	454	150	Ductile Iron	130	3.506	0.20	0.38
Z1-15	Z1-6	261	200	Ductile Iron	130	3.448	0.11	0.09
Z3-16	Z3-15	533	300	Ductile Iron	110	3.286	0.05	0.02
Z1-11	Z1-5	465	150	Ductile Iron	130	3.221	0.18	0.32
Z1-6	Z1-7	87	200	Ductile Iron	130	2.868	0.09	0.06
Z4-24	Z4-28	488	100	HDPE	130	2.618	0.33	1.59
Z2-10	Z2-6	663	150	Ductile Iron	130	2.603	0.15	0.22
Z2-13	Z2-7	1098	150	Ductile Iron	130	2.462	0.14	0.20
Z4-23	Z4-12	250	150	Ductile Iron	130	2.450	0.14	0.20
Z4-7	Z4-3	286	100	Ductile Iron	130	2.296	0.29	1.25
Z3-15	Z3-12	530	300	Ductile Iron	110	2.277	0.03	0.01
Z3-12	Z3-19	175	300	Ductile Iron	110	2.277	0.03	0.01
Z3-6	Z3-9	313	100	Ductile Iron	130	2.222	0.28	1.18
Z3-6	Z3-3	400	100	Ductile Iron	130	2.120	0.27	1.08
Z3-19	Z3-2	1529	100	HDPE	130	1.909	0.24	0.89
Z4-32	Z4-16	198	100	Ductile Iron	130	1.867	0.24	0.85
Z1-10	Z1-12	392	100	Ductile Iron	130	1.807	0.23	0.80
Z2-6	Z2-4	697	100	Ductile Iron	130	1.550	0.20	0.60

Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss Gradient (m/km)
Z2-9	Z2-5	421	100	HDPE	130	1.544	0.20	0.60
Z2-7	Z2-8	296	150	Ductile Iron	130	1.533	0.09	0.08
Z4-6	Z4-4	219	100	Ductile Iron	130	1.516	0.19	0.58
Z1-4	Z1-2	334	150	Ductile Iron	130	1.299	0.07	0.06
Z1-7	Z1-8	351	150	Ductile Iron	130	1.189	0.07	0.05
Z4-2	Z4-1	533	100	HDPE	130	1.186	0.15	0.37
Z4-11	Z4-2	230	100	Ductile Iron	130	1.157	0.15	0.35
Z1-7	Z1-17	513	150	Ductile Iron	130	1.075	0.06	0.04
Z4-4	Z4-2	559	100	HDPE	130	1.039	0.13	0.29
Z1-4	Z1-3	409	150	Ductile Iron	130	1.004	0.06	0.04
Z2-12	Z2-8	872	100	Ductile Iron	130	0.976	0.12	0.26
Z1-5	Z1-1	809	100	Ductile Iron	130	0.956	0.12	0.25
Z2-4	Z2-3	52	100	Ductile Iron	130	0.811	0.10	0.18
Z2-8	Z2-6	247	100	Ductile Iron	130	0.783	0.10	0.17
Z4-28	Z4-29	303	100	HDPE	130	0.679	0.09	0.13
Z4-16	Z4-20	175	100	Ductile Iron	130	0.519	0.07	0.08
Z1-8	Z1-9	333	150	Ductile Iron	130	0.466	0.03	0.01
Z3-3	Z3-1	435	100	Ductile Iron	130	0.437	0.06	0.06
Z3-19	Z3-22	368	300	Ductile Iron	110	0.367	0.01	0.00
Z3-3	Z3-4	307	100	Ductile Iron	130	0.337	0.04	0.04
Z2-5	Z2-2	630	100	Ductile Iron	130	0.275	0.04	0.03
Z1-17	Z1-19	114	100	Ductile Iron	130	0.259	0.03	0.02
Z2-3	Z2-2	352	100	Ductile Iron	130	0.220	0.03	0.02
Z2-3	Z2-1	297	100	Ductile Iron	130	0.098	0.01	0.00
Z2-5	Z2-4	296	100	HDPE	130	0.048	0.01	0.00
Z1-17	Z1-9	315	100	Ductile Iron	130	-0.079	0.01	0.00
Z1-19	Z1-21	132	100	Ductile Iron	130	-0.147	0.02	0.01
Z1-2	Z1-3	267	100	HDPE	130	-0.233	0.03	0.02
Z4-15	Z4-10	448	100	Ductile Iron	130	-0.356	0.05	0.04
Z3-9	Z3-17	381	100	Ductile Iron	130	-0.429	0.05	0.06
Z1-20	Z1-10	864	100	Ductile Iron	130	-0.460	0.06	0.06
Z4-1	Z4-29	555	100	HDPE	130	-0.679	0.09	0.13
Z3-14	Z3-8	241	100	Ductile Iron	130	-0.737	0.09	0.15
Z1-21	Z1-18	796	100	Ductile Iron	130	-0.792	0.10	0.17
Z1-1	Z1-2	860	100	HDPE	130	-0.815	0.10	0.18
Z3-4	Z3-9	393	100	Ductile Iron	130	-0.828	0.11	0.19
Z4-3	Z4-1	208	100	Ductile Iron	130	-0.938	0.12	0.24
Z1-20	Z1-16	992	100	Ductile Iron	130	-1.471	0.19	0.55
Z4-10	Z4-9	345	100	Ductile Iron	130	-2.228	0.28	1.18
Z2-9	Z2-10	270	100	HDPE	130	-2.260	0.29	1.21
Z4-5	Z4-18	410	150	Ductile Iron	130	-2.538	0.14	0.21
Z4-8	Z4-25	877	200	Ductile Iron	130	-2.699	0.09	0.06
Z4-9	Z4-6	53	100	Ductile Iron	130	-3.348	0.43	2.51
Z3-16	Z3-17	23	300	Ductile Iron	110	-3.690	0.05	0.02
Z1-16	Z1-18	539	200	Ductile Iron	130	-4.533	0.14	0.15
Z4-18	Z4-31	387	150	Ductile Iron	130	-5.380	0.30	0.84
Z2-10	Z2-11	223	200	Ductile Iron	130	-5.634	0.18	0.23
Z4-5	Z4-12	367	150	Ductile Iron	130	-5.720	0.32	0.94
Z4-6	Z4-5	220	150	Ductile Iron	130	-5.878	0.33	0.99
Z4-25	Z4-27	322	300	Ductile Iron	130	-6.090	0.09	0.04
Z2-11	Z2-12	228	200	Ductile Iron	130	-6.809	0.22	0.32
Z1-12	Z1-13	39	150	Ductile Iron	130	-7.615	0.43	1.60
Z2-12	Z2-13	235	300	Ductile Iron	130	-9.098	0.13	0.08
Z4-12	Z4-20	388	200	Ductile Iron	130	-9.416	0.30	0.58
Z4-20	Z4-14	107	200	Ductile Iron	130	-10.246	0.33	0.68
Z4-14	Z4-13	454	200	Ductile Iron	130	-16.519	0.53	1.65
Z4-31	Z4-30	345	300	Ductile Iron	130	-22.373	0.32	0.40
Z4-30	Z4-32	326	300	Ductile Iron	130	-28.466	0.40	0.63

Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss Gradient (m/km)
Z4-32	Z4-22	297	300	Ductile Iron	130	-31.610	0.45	0.76
Z4-22	Z4-19	231	300	Ductile Iron	130	-33.200	0.47	0.83
Z4-19	Z4-17	106	300	Ductile Iron	130	-33.740	0.48	0.86
Z4-17	Z4-13	149	300	Ductile Iron	130	-34.281	0.48	0.88
11	10	58	400	Ductile Iron	110	-56.912	0.45	0.76
8	7	278	400	Ductile Iron	110	-56.912	0.45	0.76
22	21	613	300	Ductile Iron	110	-56.912	0.81	3.08
16	15	4	400	Ductile Iron	110	-56.912	0.45	0.74
20	19	1311	300	Ductile Iron	110	-56.912	0.81	3.08
14	13	515	400	Ductile Iron	110	-56.912	0.45	0.76
17	16	7	300	Ductile Iron	110	-56.912	0.81	3.08
9	8	29	400	Ductile Iron	110	-56.912	0.45	0.76
7	110	613	400	Ductile Iron	110	-56.912	0.45	0.76
13	12	671	400	Ductile Iron	110	-56.912	0.45	0.76
10	9	356	400	Ductile Iron	110	-56.912	0.45	0.76
12	11	399	400	Ductile Iron	110	-56.912	0.45	0.76
21	20	55	300	Ductile Iron	110	-56.912	0.81	3.08
19	18	72	300	Ductile Iron	110	-56.912	0.81	3.08
15	14	251	400	Ductile Iron	110	-56.912	0.45	0.76
110	6	1106	400	Ductile Iron	110	-56.912	0.45	0.76
18	17	198	300	Ductile Iron	110	-56.912	0.81	3.08
24	23	591	300	Ductile Iron	110	-56.912	0.81	3.08
25	24	153	300	Ductile Iron	110	-56.912	0.81	3.08
23	22	543	300	Ductile Iron	110	-56.912	0.81	3.08

Monthly Production of Water (in m^3) from Wells in the Northern Governorate in 2011

(1) Western Wells

Wadi Al Arab

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Wadi Al Arab Well 1	AE1007	M	84,805	70,792	75,513	66,611	97,558	107,738	100,439	94,489	71,079	67,247	65,565	50,267	952,103
Wadi Al Arab Well 2	AE1008	M	175,031	142,567	141,330	186,136	179,762	154,542	135,669	215,532	137,571	181,374	155,027	152,365	1,956,906
Wadi Al Arab Well 3	AE1009	M	160,728	162,194	173,002	167,749	178,297	170,744	180,241	180,805	166,160	173,893	173,851	175,395	2,063,059
Wadi Al Arab Well 4	AE1010	M	166,471	159,258	178,324	156,444	178,410	172,566	178,514	177,370	169,967	160,204	171,458	170,206	2,039,192
Wadi Al Arab Well 5	AE1011	M	91,764	74,954	88,082	97,580	121,592	118,003	116,271	156,111	139,796	164,492	128,150	161,609	1,458,404
Wadi Al Arab Well 6	AE3001	L	118,001	117,898	126,514	122,400	156,000	129,780	130,032	130,000	129,965	120,116	119,968	120,032	1,520,706
Wadi Al Arab Well 8	AE3005	M	57,893	48,582	62,702	59,287	58,724	50,339	51,621	38,849	48,204	56,519	57,665	99,906	690,291
Wadi Al Arab Well 9	AE3006	M	102,857	84,192	101,557	109,599	135,018	124,874	126,960	122,394	119,669	118,037	118,329	107,114	1,370,600
Wadi Al Arab Well 10	AE3016	M	51,451	100,841	149,695	146,028	168,089	163,918	167,562	167,580	163,283	160,576	161,821	126,729	1,727,573
Wadi Al Arab Well 11	AE3017	M	72,376	61,863	67,010	66,107	64,418	59,744	57,648	59,029	53,288	50,263	53,521	49,062	714,329
Wadi Al Arab Well 12	AE3018	M	59,260	54,449	57,886	57,436	59,085	73,819	90,827	90,154	89,310	93,085	91,316	94,727	911,354
Wadi Al Arab Well 13	AE3019	M	62,887	48,736	64,386	63,867	68,966	64,988	62,952	72,021	72,232	70,289	70,463	60,726	782,513
Wadi Al Arab Well 14	AE3020	M	164,778	133,574	144,563	118,020	154,968	123,996	155,936	149,916	150,193	142,568	121,329	103,395	1,663,236
Tabaget Fahel Well 5	AG3002	L	70,618	72,815	75,540	65,042	131,431	65,370	66,600	79,810	77,223	123,049	83,785	80,058	991,341
Tabaget Fahel Well 1	AG3000	M	123,999	109,347	110,915	95,390	85,752	77,408	79,920	119,967	111,615	80,317	131,805	130,610	1,257,045
Tabaget Fahel Well 3	AG3004	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabaget Fahel Well 6	AG3005	M	84,785	66,974	71,066	69,186	88,270	81,683	84,360	72,491	11,907	70,546	68,418	70,534	840,220
Tabaget Fahel Well 8	AB3157	M	62,639	64,270	65,851	60,612	61,664	60,119	62,164	61,988	60,064	62,468	59,868	61,716	743,423
Mansheya Well 1	AB3003	M	22,320	20,160	22,320	21,600	22,320	21,600	22,320	22,320	21,600	22,320	21,600	19,225	259,705
Mansheya Well 2	AB1355	M	22,320	20,160	22,320	21,600	22,320	21,600	22,320	22,320	21,600	22,320	21,600	19,225	259,705
Tabaget Fahel Well 9	AB0542	M	130,261	112,567	111,128	99,641	110,946	98,907	102,115	75,390	79,192	76,088	85,453	74,216	1,155,904
Wadi Al Arab Well 7	AE1012	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Arab Total Local			188,619	190,713	202,054	187,442	287,431	195,150	196,632	209,810	207,188	243,165	203,753	200,090	2,512,047
Wadi Arab Total Main			1,696,625	1,535,480	1,707,650	1,662,893	1,856,159	1,746,588	1,797,839	1,898,726	1,686,730	1,772,606	1,757,239	1,727,027	20,845,562
Wadi Arab Total			1,885,244	1,726,193	1,909,704	1,850,335	2,143,590	1,941,738	1,994,471	2,108,536	1,893,918	2,015,771	1,960,992	1,927,117	23,357,609

Irbid Qasaba

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Taybeh Beer Well	AB1174	L	499	162	0	0	0	11,424	11,999	17,809	13,234	12,965	24,857	12,587	105,536
Gehfah Well 1	AB1375	L	0	0	13,966	63,481	74,332	72,000	74,400	74,400	72,000	74,400	72,000	74,400	665,379
Gehfah Well 2	AB1441	L	135,786	113,987	75,918	74,409	83,645	87,634	87,079	78,311	76,850	78,388	66,826	64,090	1,022,923
Rahob Spring Station	AD0536	L	25,687	23,010	29,938	28,717	27,177	24,697	27,265	28,674	27,319	27,010	27,984	29,103	326,581
Hakama Well 3	AD1268	L	22,320	20,160	14,642	25,822	21,749	25,879	26,784	26,046	25,914	26,784	25,920	22,356	284,376
Hakama Well 4	AD3002	L	12,320	2,556	9,784	20,857	23,419	18,035	17,871	17,171	12,199	16,572	15,030	15,011	180,825
Hakama Well 5	AD3015	L	28,417	24,732	27,269	26,388	25,072	24,790	23,912	23,165	22,618	23,148	22,492	22,809	294,812
Hakama Well 6	AD3018	L	29,760	26,214	29,595	28,799	24,165	33,753	34,968	34,968	28,842	29,760	28,800	28,284	357,908
Hakama Well 7+8	AD3037	L	222	25,308	26,653	25,919	21,749	25,879	26,784	26,784	25,920	26,784	25,920	26,784	284,706
Kufr Youba Well	AE1001	L	17,431	15,726	17,140	18,777	16,745	19,004	18,838	18,257	16,736	17,068	16,207	17,048	208,977
Fo'raa Well	AE1004	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Doukrh Well	AE1016	L	12,244	9,035	18,552	16,173	12,509	20,125	23,793	17,571	19,758	18,508	12,986	10,359	191,613
Kufr Asad Well 1	AE3008	L	23	0	0	0	0	40,019	26,601	27,679	26,173	8,379	66	0	128,940
Kufr Asad Well 3	AB3010	L	9,335	6,569	6,484	15,068	14,812	22,038	22,145	22,636	28,296	41,739	21,971	40,177	251,270
As'Arah Well	AE3007	L	22,019	17,564	24,097	26,964	27,832	30,109	37,487	36,188	31,893	16,210	27,427	29,457	327,247
Mandah Well 1	AB4278	L	61,005	43,782	48,360	46,800	48,360	46,800	48,360	48,360	46,800	48,360	46,800	48,360	582,147
Mandah Well 3	AB4286	L	47,339	42,661	47,260	45,185	47,255	45,442	45,046	48,194	44,240	46,057	44,183	46,949	549,811

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Mandah Well 4	AB3194	L	8,755	8,379	13,535	13,130	15,544	31,125	32,816	33,266	32,904	61,516	15,075	22,987	289,032
Kufr asad Well 5	AE3014	L	61,156	52,108	50,969	37,234	58,744	61,760	61,683	62,637	58,919	63,221	60,863	85,496	714,790
Kufr asad Well 6	AE3015	L	0	0	0	0	0	0	19,918	58,584	5,796	6,601	26,109	80,209	197,217
Irbid Qasaba Total Local			494,318	431,953	454,162	513,723	543,109	640,513	667,749	700,700	616,411	643,470	581,516	676,466	6,964,090
Irbid Qasaba Total Main															0
Irbid Qasaba Total			494,318	431,953	454,162	513,723	543,109	640,513	667,749	700,700	616,411	643,470	581,516	676,466	6,964,090

North Shouna

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sulaikhat Well 3	AB1369	L	3,783	3,777	5,215	6,999	8,280	7,995	6,520	5,847	1,105	1,039	7,936	3,905	62,401
Sulaikhat Well 8	AB1362	L	7,214	7,192	8,240	8,476	7,851	8,744	13,484	16,461	4,311	3,222	11,411	4,406	101,012
Al Kraymeh Well 4	AB4503	L	23,275	19,450	22,619	21,692	19,820	21,252	21,148	31,765	34,612	34,653	31,832	15,544	297,662
Al Kraymeh Well 5	AB4506	L	23,275	19,450	22,619	21,692	19,820	21,252	21,148	31,765	34,612	34,653	31,832	31,398	313,516
Al Kraymeh Well 1	AB1380	A (L)	Admission from 2013												
Al Kraymeh Well 3a	AB1382	A (L)	Admission from 2013												
Sbarh Well	AB3007	L	21,134	23,437	24,016	21,017	23,836	22,205	22,145	25,004	24,441	31,354	31,396	31,398	301,383
Sulaikhat Well 4	AB1350	N (L)	New Installation in 2012												
Sulaikhat Well 5	AB1351	N (L)	New Installation in 2012												
Sulaikhat Well 6	AB1377	N (L)	New Installation in 2012												
North Shouna Total Local			78,681	73,306	82,709	79,876	79,607	81,448	84,445	110,842	99,081	104,921	114,407	86,651	1,075,974
North Shouna Total Main															
North Shouna Total			78,681	73,306	82,709	79,876	79,607	81,448	84,445	110,842	99,081	104,921	114,407	86,651	1,075,974

Bani Kinana

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Harima Well 1	AD3012	L	33,536	26,053	29,709	29,349	36,668	40,040	40,732	40,697	38,012	38,210	38,500	38,324	429,830
Harima Well 2	AD3016	L	27,273	19,733	20,332	17,007	27,137	25,936	26,024	21,293	21,366	28,407	26,794	26,823	288,125
Harima Well 3	AD3037	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Kufr Asad Well 3	AB3010	S (L)	Shift from Irbid in 2012												
Kufr Asad Well 4	AE3011	L	0	0	0	0	0	0	12,384	40,309	38,124	40,908	39,382	27,825	198,932
Kufr Asad Well 5	AE3014	S (L)	Shift from Irbid in 2012												
Kufr Asad Well 6	AE3015	S (L)	Shift from Irbid in 2012												
Ein Qoalbh Well	AD3129	L	0	0	0	0	0	0	0	0	0	48,000	44,000	59,520	151,520
Bani Kinana Total Local			60,809	45,786	50,041	46,356	63,805	65,976	79,140	102,299	97,502	155,525	148,676	152,492	1,068,407
Bani Kinana Total Main															
Bani Kinana Total			60,809	45,786	50,041	46,356	63,805	65,976	79,140	102,299	97,502	155,525	148,676	152,492	1,068,407

Al Koura

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jdita Well 1	AB1363	L	43,381	40,053	49,532	48,328	55,223	55,517	55,666	42,404	46,011	2,505	45,524	48,070	532,214
Jdita Well 2	AB3005	L	16,056	7,740	21,120	16,990	9,676	27,351	27,631	27,545	29,209	28,261	342	0	211,921
Ein Al Hamam Well 1	AF1001	L	37,246	30,077	42,505	38,133	43,134	40,121	40,511	54,868	38,504	38,395	39,261	45,055	487,810
Hamam Well 2	AF1002	L	49,096	49,246	43,272	51,824	51,991	58,263	58,472	58,450	59,180	59,481	59,436	59,484	658,195
Hamam Well 4	AF1003	L	18,444	12,160	24,858	28,644	33,454	39,141	33,881	29,153	30,870	31,911	19,110	25,359	326,985
Hamam Well 5	AF1004	L	55,540	51,458	51,470	23,755	43,188	43,402	43,635	43,620	43,602	48,432	48,469	34,667	531,238
Bait Idis Well	AG3006	L	1,345	28,337	28,055	26,899	34,419	34,807	34,834	41,355	35,921	31,261	31,177	32,081	360,491
Al Koura Total Local			221,108	219,071	260,812	234,573	271,085	298,602	294,630	297,395	283,297	240,246	243,319	244,716	3,108,854
Al Koura Total Main															
Al Koura Total			221,108	219,071	260,812	234,573	271,085	298,602	294,630	297,395	283,297	240,246	243,319	244,716	3,108,854

Total of Local Sources in West			1,043,535	960,829	1,049,778	1,061,970	1,245,037	1,281,689	1,322,596	1,421,046	1,303,479	1,387,327	1,291,671	1,360,415	14,729,372
Total of Main Sources in West			1,696,625	1,535,480	1,707,650	1,662,893	1,856,159	1,746,588	1,797,839	1,898,726	1,686,730	1,772,606	1,757,239	1,727,027	20,845,562

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Total of Western Sources			2,740,160	2,496,309	2,757,428	2,724,863	3,101,196	3,028,277	3,120,435	3,319,772	2,990,209	3,159,933	3,048,910	3,087,442	35,574,934

(2) Eastern Wells

Ramtha

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Border Deep Well	AD1281	L	15,315	19,687	3,326	6,256	52	21,271	20,957	54,577	13,281	11,710	13,580	13,489	193,501
Almhace Well 6	AD1295	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Almhace Well 6 a	AD3112	N (L)	New Installation in 2012												
Almhace Well 6 b	AD3113	N (L)	New Installation in 2012												
AlmhaceWell 5	AD1296	L	15,280	13,234	17,837	13,305	17,911	21,416	20,957	19,422	17,731	17,156	13,705	14,441	202,395
Turrah Well 1	AD3008	L	0	0	0	0				0	0	0	0	0	0
Jaber Well 1	AD3021	L	14,429	14,388	3,278	17,876	18,005	17,995	18,005	14,429	20,845	23,125	20,678	17,432	200,485
Jaber Well 2	AD3022	L	145	0	0	35,700	36,010	35,990	36,010	290	34,548	39,452	37,639	27,889	283,673
Jaber Well 3	AD3023	L	8,715	8,633	8,647	70	0	0	0	10,713	20,816	11,763	10,589	3,387	83,333
Jaber Well 4	AD3024	L	32,139	32,372	32,428	32,391	32,409	32,391	32,409	28,829	27,871	26,945	22,708	9,712	342,604
Jaber Well 5	AD3025	L	32,139	261	32,139	35,961	36,010	35,990	36,010	290	0	24,546	28,310	28,218	289,874
Jaber Well 7	AD3044	L	0	0	3,149	26	0	0	0	0	0	0	0	0	3,175
Turrah Well 3	AD3045	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 6	AD3047	L	10,974	10,791	10,809	17,937	18,005	17,995	150	0	0	0	0	12,329	98,990
Jaber Well 8	AD3058	L	28,710	28,775	28,825	35,932	300	0	0	32,139	27,900	5,969	245	22,500	211,295
West Ramtha Well 2	AD3121	L	40,590	36,960	39,611	39,589	40,920	39,600	40,920	40,920	46,740	44,670	36,060	51,960	498,540
Ramtha Total Local			198,436	165,101	180,049	235,043	199,622	222,648	205,418	201,609	209,732	205,336	183,514	201,357	2,407,865
Ramtha Total Main															
Ramtha Total			198,436	165,101	180,049	235,043	199,622	222,648	205,418	201,609	209,732	205,336	183,514	201,357	2,407,865

Bani Ubaid - Al Mazar

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
No'aymeh Well 1	AD1219	L	10,792	6,747	7,440	10,056	8,940	8,640	8,928	9,666	8,646	8,982	18,636	9,750	117,223
No'aymeh Well 2	AD1220	L	16,162	12,119	13,392	12,960	11,178	12,942	11,178	13,374	12,996	13,392	12,960	13,392	156,045
No'aymeh Well 3	AD3011	L	17,420	19,454	21,576	19,392	19,385	20,981	19,825	19,007	16,615	18,985	19,679	19,606	231,925
No'aymeh Well 4	AD3127	L	0	0	0	0	0	0	34,718	39,960	51,216	55,113	59,758	45,818	286,583
No'aymeh Well 5	AD3139	L	New Installation in 2012												
Bani Ubaid Total Local			44,374	38,320	42,408	42,408	39,503	42,563	74,649	82,007	89,473	96,472	111,033	88,566	791,776
Bani Ubaid Total Main															
Bani Ubaid Total			44,374	38,320	42,408	42,408	39,503	42,563	74,649	82,007	89,473	96,472	111,033	88,566	791,776

Jerash

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Kufr Khal Well	AD3060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Qairawan Spring	AL0672	L	44,989	56,072	64,428	60,669	46,885	57,560	59,458	50,098	58,134	71,090	48,431	52,537	670,351
Sakib Booster Station	AL0740	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Umm Mararh Spring	AL0993	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Ghadeer Spring	AL0748	L	22,766	13,195	17,460	21,573	25,709	16,511	12,266	17,446	16,150	13,970	11,747	21,113	209,906
Ein Al Teis Spring	AL0758	L	15,263	19,639	26,190	32,359	38,563	24,766	18,400	26,168	24,226	20,955	17,620	14,155	278,304
Ain Al Deek Spring	AL0760	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Burma Tank Well	AL0931	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Souf Al Gharbi West Well	AL1429	L	5,902	5,597	5,714	4,628	7,319	8,211	10,206	10,528	9,456	8,133	6,333	5,736	87,763
Suof Esh Sharqi East Well	AL2358	L	0	0	0	0	0	0	0	0		0	0	0	0
Al Rayashi Well	AL2360	L	0	0	0	6,734	20,490	17,044	17,997	19,731	12,344	25,209	25,143	36,017	180,709
AL Shawahed Al Shargi Well	AL2716	L	21,452	18,402	19,641	18,855	18,832	15,135	20,847	24,039	19,746	21,885	18,791	20,511	238,136
AL Shawahed Al Gharbi Well	AL2717	L	7,157	5,685	5,979	5,070	5,868	8,846	8,626	8,410	7,071	8,167	6,601	5,936	83,416

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jerash Al Maleh Well 2	AL3120	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Ed Dear Al Shargi Well	AL3352	L	23,570	23,722	24,821	25,257	21,363	28,102	23,602	24,897	20,934	23,569	21,144	21,461	282,442
Bab Amman Well	AL3378	L	0	0	0	0	2,390	3,264	4,495	4,747	2,694	3,006	24	0	20,620
Al Majar Well 2	AL3380	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Talat Aruz Well 1	AL3546	L	8,618	6,085	7,674	7,329	7,787	7,273	7,510	6,079	6,371	7,471	7,409	7,888	87,494
Debbein Well	AL3548	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Riyashi Well 3	AL3792	L	8,791	6,116	54	13,883	17,487	15,312	14,411	16,022	16,031	12,513	12,851	10,714	144,185
Said Jacob Heirs Well	-	L	9,300	10,400	13,950	13,130	15,500	12,990	10,075	7,780	6,845	7,130	6,900	8,000	122,000
Um Qantarah Well	AL3820	L	3,081	3,902	3,447	6,521	5,560	11,441	14,380	13,448	14,547	12,025	10,807	90	99,249
Rumman Well	AL3620	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Faisal Nursery of Jabh Well	-	L	0	14,630	10,210	13,400	12,000	26,960	26,300	27,680	29,750	33,400	25,200	27,000	246,530
Faisal Nursery of Jerash Well	-	L	32,899	27,527	36,830	36,250	28,231	44,249	57,523	58,845	68,552	78,157	64,188	80,072	613,323
Gharaibeh Well	-	L	6,203	1,187	685	326	9,792	4,871	5,457	5,690	5,727	6,679	2,589	2,335	51,541
Burma Well 3	AL3854	L	5,000	4,797	3,019	347	9,716	12,167	9,035	11,127	11,076	11,670	8,957	9,403	96,314
AL Shawahed Al Shargi Well 3	-	L	0	0	0	0	0	0	0	1,055	0	0	0	0	1,055
Maleh (farmers) Well (maintenance)	-	L	New Contract in 2012												
Jerash Total Local			214,991	216,956	240,102	266,331	293,492	314,702	320,588	333,790	329,654	365,029	294,735	322,968	3,513,338
Jerash Total Main															
Jerash Total			214,991	216,956	240,102	266,331	293,492	314,702	320,588	333,790	329,654	365,029	294,735	322,968	3,513,338

Ajloun

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Halawa / Zuqaiq Well 2	AB3152	L	44,152	34,379	40,729	41,793	41,569	41,065	40,989	71,912	42,445	50,472	74,819	59,185	583,509
Ain Rason Spring	AH0506	L	5,531	4,924	6,190	4,026	7,649	10,404	10,008	9,063	9,366	7,856	6,268	5,501	86,786
Ain Al Tanour Spring	AH0510	L	48,144	21,483	80,959	113,022	102,503	78,526	77,523	71,653	62,754	68,226	59,151	65,917	849,861
Faouar Spring	AJ0510	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Qantara Spring	AJ0520	L	23,735	35,032	35,240	38,647	41,300	31,996	24,547	7,469	2,540	1,265	3,352	14,160	259,283
Zuqaiq Spring 1	AJ0580	L	50,878	43,310	47,868	52,765	56,774	57,788	55,400	47,836	40,769	41,510	35,053	35,882	565,833
Ain Jana Spring	AJ0582	L	7,151	1,327	9,648	7,434	8,541	1,430	8,898	7,821	6,275	7,441	6,733	4,554	77,253
Ein Umm Qasem Spring	AK0521	L	5,058	3,673	4,563	3,853	3,228	3,281	3,157	1,750	2,503	2,673	2,277	2,786	38,802
Safsafa Well 2	AK1016	L	5,000	4,782	5,933	5,776	7,426	6,942	6,525	6,850	6,244	6,431	4,695	4,130	70,734
Zuqaiq PS 3	AH3007	N (L)	New Installation in 2013												
Total Ajloun Local			189,649	148,910	231,130	267,316	268,990	231,432	227,047	224,354	172,896	185,874	192,348	192,115	2,532,061
Total Ajloun Main															
Total Ajloun			189,649	148,910	231,130	267,316	268,990	231,432	227,047	224,354	172,896	185,874	192,348	192,115	2,532,061

Mafraq (1)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sumaya Well 3	AD1121	L	679	0	0	0	0	0	0	0	0	0	0	0	679
Sumaya Well 4	AD1122	L	26,108	210	24,702	9,855	28,669	10,774	595	293	24,992	27,428	26,504	10,696	190,826
Sumaya Well 5	AD1123	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 6	AD1124	L	0	0	0	0	0	0	103,320	145,311	96,747	101,292	101,410	104,621	652,701
Sumaya Well 7	AD1125	L	12,016	13,408	11,199	15,572	17,972	10,633	8,756	7,534	8,042	7,818	4,007	9,390	126,347
Sumaya Well 8	AD1126	L	20,575	20,055	22,493	20,999	19,460	11,705	8,515	5,496	9,262	5,409	4,515	8,800	157,284
Sumaya Well 9	AD1127	L	18,411	15,875	16,308	35,076	24,698	24,301	23,402	18,639	4,910	40	0	0	181,660
Sumaya Well 11	AD1278	L	18,337	23,878	21,217	14,179	1,260	19,194	19,966	13,774	4,261	7,125	781	13,968	157,940
Jaber El Sarhan Well	AD1327	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Hudud (Jaber Custom) Well 7	AD3004	L	21,928	729	345	18,274	556	14,297	15,837	18,085	211	18,495	202	18,687	127,646
Um Es Serb Well	AD3005	L	0	5,311	17,513	8,791	13,933	24,080	26,911	22,605	20,723	18,746	12,659	14,229	185,501
Suwelmeh Well 3a	AD3040	L	8,385	3,965	2,883	3,144	11,069	90	1,793	1,793	4,002	5,813	5,830	6,057	54,824
AL Zubaideyeh Well	AD3056	L	34,838	29,177	39,854	38,164	39,185	35,329	37,089	36,607	36,372	34,644	23,391	18,835	403,485
Sumaya Well 12	AD3057	L	15,559	14,492	15,892	12,772	14,986	13,686	12,452	10,224	10,071	6,073	50	12,963	139,220
Suwelmeh Well 4	AD3061	L	0	0	0	0	0	0	0	0	0	0	0	0	0

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Khaldyeh Well 17	AL1023	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 30	AL1037	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 21	AL1748	L	6,957	6,717	556	7,167	7,832	18,530	8,564	8,477	8,410	8,582	7,262	7,512	96,566
AL Za'atary Well 3	AL2710	M	22,992	20,007	21,384	21,399	21,612	21,604	21,010	18,024	17,217	18,646	7,267	20,062	231,224
AL Za'atary Well 4	AL3002	M	19,895	11,164	22,036	14,287	13,779	8,784	9,298	9,002	8,998	19,340	20,556	5,557	162,696
AL Za'atary Well 5	AL3003	M	14,898	15,032	17,959	15,953	16,084	16,078	15,508	10,044	9,997	8,019	7,998	8,002	155,572
AL Kum Al Ahmer Well	AL3132	L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Za'atary Well 7	AL3375	M	22,900	21,955	20,629	18,441	20,076	19,994	19,013	29,911	28,201	18,738	150	32,238	252,246
AL Za'atary Well 9	AL3376	M	15,884	15,955	18,051	17,914	18,588	18,497	18,351	13,044	12,997	11,020	10,997	11,003	182,301
AL Za'atary Well 10	AL3377	M	19,872	14,811	7,614	17,163	17,028	16,797	16,507	12,532	101	0	0	0	122,425
Dogmusseh Well	AL3382	L	8,782	7,551	8,606	8,305	8,652	8,372	8,580	11,240	4,872	8,233	6,828	6,122	96,143
AL Za'atary Well 6	AL3463	M	21,904	17,032	18,563	16,449	18,067	17,993	18,000	9,920	847	815	662	2,981	143,233
Znaieh Well 3	AL3483	L	41,234	52,297	50,487	52,187	17,353	38,288	37,019	36,996	52,881	74,925	78,501	77,804	609,972
Mafraq (1) Total Local			233,809	193,665	232,055	244,485	205,625	229,279	312,799	337,074	285,756	324,623	271,940	309,684	3,180,794
Mafraq (1) Total Main			138,345	115,956	126,236	121,606	125,234	119,747	117,687	102,477	78,358	76,578	47,630	79,843	1,249,697
Mafraq (1) Total			372,154	309,621	358,291	366,091	330,859	349,026	430,486	439,551	364,114	401,201	319,570	389,527	4,430,491

Mafraq (2)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Znaieh Well 4	AL3484	L	10,827	8,297	9,876	9,392	9,656	9,649	11,003	13,696	12,478	11,207	15,769	14,870	136,720
Znaieh Well 5	AL3485	L	12,153	4,875	11,253	17,028	11,233	1,774	15,633	170	2,388	20	15,449	29,176	121,152
AL Kum Al Ahmer Well 2a	AL3564	L	16,274	5,243	13,249	16,426	15,898	14,286	13,999	13,734	8,848	8,804	8,130	9,080	143,971
Irhab (Hamamit Alamoush) Well	AL3660	L	5,225	4,748	5,370	5,063	5,435	4,397	4,638	4,512	4,292	3,722	3,047	5,531	55,980
Al Aqeb Well 96-2	AL1193	M	60,707	56,704	17,319	51,165	66,904	33,021	39,001	59,622	48,245	41,013	38,699	43,435	555,835
Al Aqeb Well K 104	AL1225	M	69,907	63,244	15,955	37,919	54,985	38,703	0	47,613	3,585	58,418	8,926	51,652	450,907
Al Aqeb Well K 95	AL1241	M/L	59,557	54,245	66,348	58,641	44,988	45,949	46,879	14,551	40,079	40,691	43,679	50,464	566,071
Al Aqeb Well K 101-1	AL1244	M	50,391	49,450	57,206	46,946	54,373	53,679	54,397	53,534	51,594	52,423	51,250	53,045	628,288
Al Aqeb Well K 102	AL1265	M	18,964	22,748	25,329	61,985	62,347	65,705	74,804	71,845	61,577	61,725	11,356	44,728	583,113
Al Aqeb Well K 102.5	AL1273	M	33,353	10,543	29,193	37,395	45,190	38,412	57,091	56,963	52,840	54,982	54,239	56,055	526,256
Al Aqeb Well K 106	AL1274	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 93-1	AL1485	M/L	68,834	61,017	71,076	64,120	66,970	58,969	47,278	18,233	11,346	5,907	47	0	473,797
Al Aqeb Well K 94	AL1486	M	54,264	46,080	1,971	50,981	5,241	44,803	43,437	43,003	42,988	43,012	42,988	43,012	461,780
Um AL Jemal Well 41	AL1490	M	35,882	32,676	41,945	36,078	40,222	39,019	33,523	51,992	49,797	52,408	51,163	50,881	515,586
Rawdah Ameera Basma Well	AL1491	M	53,240	54,847	68,485	58,013	65,438	58,349	60,827	57,390	54,569	58,257	52,637	41,650	683,702
Sabha and Sobheya/El Balad Well	AL1493	L	22,362	20,725	24,007	24,434	30,824	25,644	28,463	31,612	29,496	17,790	7,511	2,823	265,691
Al Aqeb Well K 103-1	AL1495	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 90	AL1558	M	31,454	17,135	30,933	30,947	31,756	31,355	30,216	30,200	30,192	30,208	29,994	30,008	354,398
Al Aqeb Well K 107	AL2689	M	0	0	19,883	37,570	39,358	25,162	31,951	30,016	29,992	21,216	10,179	27,748	273,075
Alharrara Well	AL2709	L	227	0	0	0	0	0	0	0	0	0	0	0	227
Al Aqeb Well K 94.5	AL3004	M	52,275	57,379	70,189	64,024	66,059	41,836	26,625	20,176	19,129	20,286	19,265	20,802	478,045
Am'ra and A'meira Well 1	AL3018	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Am'ra and A'meira Well 2	AL3019	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 96-1	AL3362	M	30,659	27,365	32,843	29,936	30,156	29,994	29,758	30,000	42,546	30,114	29,595	40,401	383,367
AL Zamlah (Zamlehet Al Ameer Gazi) Well	AL3422	M	0	0	5,506	7,312	3,555	6,968	50,043	47,476	47,647	45,841	20,839	172	235,359
Al Aqeb Well K 93.5	AL3423	M/L	34,296	33,921	36,296	30,041	16,441	45,438	42,050	40,033	42,250	43,015	42,735	43,710	450,226
Al Aqeb Well K 91.5	AL3452	L	52,637	63,058	48,740	67,590	60,320	60,483	60,020	52,065	61,719	73,632	15,985	50,589	666,838
Al Aqeb Well K 101-2	AL3513	M	36,174	34,761	40,328	32,095	17,034	30,390	39,108	35,707	46,880	55,801	54,115	57,048	479,441
Al Aqeb Well K 106	AL3517	M	47,849	43,527	44,072	45,747	46,772	45,063	47,715	47,775	25,088	208	0	6,189	400,005
Al Aqeb Well K 103-2	AL3518	M/L	41,861	29,657	13,115	34,884	37,799	36,348	37,027	36,199	34,287	34,503	33,839	26,325	395,844
Station Khcaa Slitin Well	AL3557	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Mafraq (2) Total Local			192,448	171,262	180,915	206,609	192,413	184,171	195,661	155,053	163,090	157,266	105,992	152,365	2,057,245
Mafraq (2) Total Main			706,924	630,983	619,572	749,123	736,541	701,225	729,825	753,064	690,762	707,937	555,444	647,029	8,228,429
Mafraq (2) Total			899,372	802,245	800,487	955,732	928,954	885,396	925,486	908,117	853,852	865,203	661,436	799,394	10,285,674

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total

Mafraq (3)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Um AL Jemal Well 3	AL3563	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Daba'an DP5A Well	AL3647	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K111p	F1079	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K124	F1124	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K136	F1125	L	33,510	29,674	30,390	27,839	30,539	29,476	32,743	34,181	28,479	31,516	11,861	98	320,306
Al Aqeb Well K134	F1305	L	0	7,971	5,238	17,064	20,556	17,688	16,412	12,984	14,844	23,086	23,021	14,255	173,119
Al Aqeb Well K114	F1310	M	65,460	51,320	57,214	56,040	59,894	51,051	49,597	50,000	54,624	51,249	17,271	142	563,862
Al Aqeb Well K 112	F1312	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Abu Karza Well	F1316	L	2,367	2,001	18	0	0	0	0	0	0	0	0	0	4,386
Al Aqeb Well K110	F1333	M	41,794	25,201	49,775	49,735	50,289	49,984	48,605	35,113	34,991	51,872	50,003	51,005	538,367
Al Aqeb Well K109	F1389	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukefteh Well 1	F3523	L	23,487	15,497	18,061	18,603	29,167	28,328	27,664	29,891	27,183	30,136	24,265	24,525	296,807
Mukefteh Well 2	F3524	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K133	F3530	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukefteh Well 3	F3761	L	20,740	16,179	22,822	22,088	22,220	21,570	22,478	22,245	20,120	20,503	22,746	24,780	258,491
Safawi Well	F3903	L	16,067	28,240	12,451	16,359	29,558	26,290	25,076	10,700	25,076	17,640	14,401	12,007	233,865
Al Aqeb Well K111a	F3930	M	46,980	33,752	43,206	38,750	751	0	0	0	0	0	0	0	163,439
Al Aqeb Well K140	F3935	L	8,519	8,441	12,264	12,285	13,053	19,145	19,967	23,777	13,139	19,154	19,956	19,973	189,673
Al Aqeb Well K124	F3946	L	22,329	29,396	29,312	44,753	52,291	49,398	47,065	50,750	46,440	49,193	33,994	29,440	484,361
Al Rafayyat Well 1	F3987	L	10,972	9,995	23,936	21,712	26,473	24,720	25,576	27,526	26,081	28,721	18,963	32,900	277,575
Sumaya Well 3b	AD 3124	L	56,694	5,150	42	44,882	64,346	56,592	51,566	0	48,109	46,514	46,593	31,433	451,921
Al Harara /Thermal Well 1b	AL3889	L	0	23,104	19,374	19,850	20,012	21,182	20,250	20,455	19,820	9,301	74	0	173,422
Rwashed Well 3	H1060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 1	H2015	L	32,790	264	10,403	29,910	32,242	33,203	25,768	19,655	33,866	38,068	18,266	151	274,586
Rwashed Well 4	H3060	L	26,332	19,242	11,100	2,081	17	0	0	74,332	21,098	34,697	3,007	23	191,929
Rwashed Well 5	H3064	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 6	H3069	L	10,569	11,276	20,186	17,326	16,744	17,269	12,742	13,737	3,660	3,503	15,963	25,131	168,106
Al salheh Na'aem Well	H3070	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 24	AL1030	L	8,699	8,615	8,851	8,830	8,884	6,361	6,105	6,418	6,500	6,861	6,523	6,621	89,268
Suwelmeh Well 1	AD1262	L	14,868	27,547	22,690	45,138	44,656	35,374	40,141	35,404	31,437	30,308	33,976	38,584	400,123
Mafraq (3) Total Local			287,943	242,592	247,138	348,720	410,758	386,596	373,553	382,055	365,852	389,201	293,609	259,921	3,987,938
Mafraq (3) Total Main			154,234	110,273	150,195	144,525	110,934	101,035	98,202	85,113	89,615	103,121	67,274	51,147	1,265,668
Mafraq (3) Total			442,177	352,865	397,333	493,245	521,692	487,631	471,755	467,168	455,467	492,322	360,883	311,068	5,253,606

Mafraq (4)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jaber Well (Rent) Well	-	L	41,740	37,851	41,283	37,722	44,201	27,026	41,377	35,320	46,750	6,421	23,902	27,146	410,739
Suwelmeh Well 1	-	L	0	0	2,243	7,069	1,502	12,526	10,855	18,280	45,760	30,967	7,921	2,042	139,165
Mfaradat Well (New)	AL3705	L	2,355	2,504	3,785	4,151	5,198	5,311	4,694	5,660	2,688	4,725	0	1,260	42,331
Al jama'a Well	-	M	0	0	0	0	0	0	0	0		0	0	0	0
Mukefteh Well 4 (New)	F4140	L	27,086	21,489	18,516	26,869	27,640	27,230	28,041	27,789	25,108	20,254	27,563	27,727	305,312
Al jbbea Well	F4139	L	11,566	11,142	740	26,689	7,039	17,112	17,637	15,926	14,113	16,259	3,124	3,118	144,465
Al Aqeb Well K112 (New)	F4184	M	32,063	23,401	1,386	697	0	0	14,453	37,611	36,792	37,348	39,190	43,585	266,526
Al Aqeb Well K113	F4229	M	56,072	50,957	55,178	54,725	55,323	50,055	48,605	49,000	48,987	50,997	36,111	300	556,310
Al Aqeb Well K109	F4171	M	0	0	0	22,064	31,705	39,625	41,005	40,051	39,096	7,798	61	0	221,405
Znaieh Well 6 (New)	AL3713	L	5,024	10,402	17,190	16,957	16,184	16,251	17,186	14,909	14,556	11,219	20,757	16,212	176,847
Khaldyeh Well 17	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldye Wellh 20	AL1026	L	9,524	8,543	1,070	9,455	9,537	4,285	10,976	0	11,318	11,494	11,132	11,316	98,650
Sumaya Well 5 (New)	AD3078	L	35,617	31,485	35,818	33,486	33,755	25,806	25,436	0	21,819	22,982	1,001	26,591	293,796
Rwashed Well 2	H1012	L	14,143	8,174	8,859	21,419	28,150	27,112	30,143	30,223	20,133	29,513	23,929	20,625	262,423

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Rwashed Well7	H3074	L	21,730	270	33,180	59,813	45,668	22,150	24,003	29,935	28,802	27,320	20,053	20,093	333,017
Arabe Al Qedah Well	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Bedor Well	-	L	54,580	48,980	52,220	50,380	5,103	46,320	55,510	55,100	5,294	55,400	53,170	55,380	537,437
Ali Salamah Well	-	L	0	0	0	0	13,683	33,966	32,457	31,114	29,756	36,429	33,571	35,963	246,939
Noaf Ali Well	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Lafe Al Sa'aed Well	-	L	0	31,317	30,931	19,925	14,830	11,514	13,879	18,086	18,349	18,055	20,423	34,371	231,680
Znaieh Well 7	AL3791	L	29,394	30,433	45,664	41,194	39,095	39,084	42,804	59,581	46,686	388	0	0	374,323
Naser Ata Allah Well	-	L	0	36,304	0	0	0	0	0	0	0	0	0	0	36,304
Abd Allh Abo A'alem Well	-	L	28,085	1,012	28,922	64,724	73,559	68,912	13,879	53,877	103,690	41,043	52,945	38,039	568,687
Al Aqeb Well K103b	AL3832	M	978	45,397	40,821	32,799	35,721	33,325	32,238	32,500	32,491	32,509	32,491	32,509	383,779
Am'ra and A'meira Well 2a (New)	AL3797	L	21,773	8,468	75	19,422	10,780	25,225	47,007	47,176	54,424	55,720	31,650	21,449	343,169
Alkum Alhmar Well 3 (New)	AL3911	L	32,368	32,753	36,634	35,806	34,987	33,638	34,791	32,552	24,599	39,205	35,025	36,497	408,855
Taleb Al Zatary Well	-	L	0	0	0	0	0	0	22,337	60,603	62,993	63,895	69,350	103,606	382,784
Jaber Well 9	AD3077	L	New Installation in 2012												
Jaber Bridge Well	AD3118	L	New Installation in 2012												
Economic Well 1	AL3908	M	New Installation in 2012												
Economic Well 2	AL3909	M	New Installation in 2012												
Economic Well 3	AL3910	M	New Installation in 2012												
Economic Well 4	AL3914	M	New Installation in 2012												
Economic Well 5	AL4240	M	New Installation in 2012												
Um Qutain Well	AL3863	L	New Installation in 2012												
Sabha Well 1b (New)	AL3956	L	New Installation in 2012												
Sumaya Well 6b	AD3140	L	New Installation in 2012												
Mafraq (4) Total Local			334,985	321,127	357,130	475,081	410,911	443,468	473,012	536,131	576,838	491,289	435,516	481,435	5,336,923
Mafraq (4) Total Main			89,113	119,755	97,385	110,285	122,749	123,005	136,301	159,162	157,366	128,652	107,853	76,394	1,428,020
Mafraq (4) Total			424,098	440,882	454,515	585,366	533,660	566,473	609,313	695,293	734,204	619,941	543,369	557,829	6,764,943
Total of Local Sources in East			1,696,635	1,497,933	1,710,927	2,085,993	2,021,314	2,054,859	2,182,727	2,252,073	2,193,291	2,215,090	1,888,687	2,008,411	23,807,940
Total of Main Sources in East			1,088,616	976,967	993,388	1,125,539	1,095,458	1,045,012	1,082,015	1,099,816	1,016,101	1,016,288	778,201	854,413	12,171,814
Total of Eastern Sources			2,785,251	2,474,900	2,704,315	3,211,532	3,116,772	3,099,871	3,264,742	3,351,889	3,209,392	3,231,378	2,666,888	2,862,824	35,979,754

(3) Total of Eastern and Western Wells

Total of Local Sources			2,740,170	2,458,762	2,760,705	3,147,963	3,266,351	3,336,548	3,505,323	3,673,119	3,496,770	3,602,417	3,180,358	3,368,826	38,537,312
Total of Main Sources			2,785,241	2,512,447	2,701,038	2,788,432	2,951,617	2,791,600	2,879,854	2,998,542	2,702,831	2,788,894	2,535,440	2,581,440	33,017,376
Total of Northern Governorate			5,525,411	4,971,209	5,461,743	5,936,395	6,217,968	6,128,148	6,385,177	6,671,661	6,199,601	6,391,311	5,715,798	5,950,266	71,554,688

Note:

In the Classification column, L indicates the wells, water of which is used in the locality in which it is located or in surrounding localities

M indicates the wells, that contribute its water to the main transmission line either coming from wadi al-arab in west to Zebdat PS or coming from Zata'ary PS in the east to Hofa Reservoir

Monthly Production of Water (in m^3) from Wells in the Northern Governorate in 2012

(1) Western Wells

Wadi Al Arab

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Wadi Al Arab Well 1	AE1007	M	69,702	65,006	55,613	52,186	51,044	55,088	44,745	44,590	38,332	66,019	63,887	66,952	673,164
Wadi Al Arab Well 2	AE1008	M	154,798	118,492	154,892	210,139	195,238	213,376	169,160	160,546	176,853	185,567	173,123	194,691	2,106,875
Wadi Al Arab Well 3	AE1009	M	183,140	105,181	164,161	109,295	174,906	141,819	132,602	133,717	127,478	123,900	106,834	46,496	1,549,529
Wadi Al Arab Well 4	AE1010	M	177,992	155,861	154,442	149,994	156,808	154,167	134,161	133,721	125,294	128,809	117,481	127,493	1,716,223
Wadi Al Arab Well 5	AE1011	M	155,888	124,533	147,718	149,434	152,478	149,945	142,913	142,657	172,514	174,021	170,342	152,634	1,835,077
Wadi Al Arab Well 6	AE3001	L	155,948	156,153	119,427	129,480	126,540	129,540	129,635	129,600	126,471	126,514	126,446	126,514	1,582,268
Wadi Al Arab Well 8	AE3005	M	57,947	54,668	57,345	53,147	51,090	49,577	49,676	47,435	50,557	49,223	47,238	47,392	615,295
Wadi Al Arab Well 9	AE3006	M	117,190	85,518	102,607	107,306	95,910	93,463	87,918	108,252	104,048	108,500	105,649	90,373	1,206,734
Wadi Al Arab Well 10	AE3016	M	71,375	102,353	84,339	121,122	120,696	112,185	115,059	108,357	104,051	126,179	136,555	136,413	1,338,684
Wadi Al Arab Well 11	AE3017	M	52,356	44,310	47,270	44,231	48,040	43,858	46,734	45,109	41,468	42,424	22,107	27,091	504,998
Wadi Al Arab Well 12	AE3018	M	95,531	82,754	86,408	88,804	88,469	84,979	90,387	89,217	84,728	84,406	75,076	72,663	1,023,422
Wadi Al Arab Well 13	AE3019	M	71,246	57,783	70,688	66,021	67,745	67,442	68,657	69,059	63,075	57,276	62,947	74,819	796,758
Wadi Al Arab Well 14	AE3020	M	100,837	91,089	136,563	123,279	155,834	149,763	142,906	126,433	147,065	151,860	147,673	146,764	1,620,066
Tabaget Fahel Well 5	AG3002	L	73,183	63,474	79,699	94,036	89,859	98,566	105,073	105,024	101,650	94,954	91,320	74,373	1,071,211
Tabaget Fahel Well 1	AG3000	M	115,749	97,735	108,068	108,186	101,146	105,729	109,448	109,332	109,999	109,937	102,475	102,453	1,280,257
Tabaget Fahel Well 3	AG3004	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabaget Fahel Well 6	AG3005	M	71,045	66,053	71,560	69,149	70,573	69,095	69,372	71,362	69,153	71,311	68,284	70,961	837,918
Tabaget Fahel Well 8	AB3157	M	62,163	57,801	62,612	60,504	61,747	60,389	60,700	62,449	60,527	62,385	59,738	66,461	737,476
Mansheya Well 1	AB3003	M	6,225	10,399	18,540	6,790	6,678	9,693	9,723	9,720	12,689	14,479	10,267	11,155	126,358
Mansheya Well 2	AB1355	M	6,225	10,399	18,540	6,790	6,678	9,693	9,723	9,720	12,689	14,479	10,267	11,155	126,358
Tabaget Fahel Well 9	AB0542	M	92,879	104,693	111,521	102,405	96,336	93,149	91,675	91,537	87,778	80,167	76,814	88,553	1,117,507
Wadi Al Arab Well 7	AE1012	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Arab Total Local			229,131	219,627	199,126	223,516	216,399	228,106	234,708	234,624	228,121	221,468	217,766	200,887	2,653,479
Wadi Arab Total Main			1,662,288	1,434,628	1,652,887	1,628,782	1,701,416	1,663,410	1,575,559	1,563,213	1,588,298	1,650,942	1,556,757	1,534,519	19,212,699
Wadi Arab Total			1,891,419	1,654,255	1,852,013	1,852,298	1,917,815	1,891,516	1,810,267	1,797,837	1,816,419	1,872,410	1,774,523	1,735,406	21,866,178

Irbid Qasaba

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Taybeh Beer Well	AB1174	L	6,290	5,999	6,241	13,378	12,967	12,005	12,955	12,484	12,477	12,959	10,021	10,261	128,037
Gehfah Well 1	AB1375	L	56,367	41,368	86,327	56,877	68,360	66,488	68,710	68,710	63,872	68,450	61,331	58,856	765,716
Gehfah Well 2	AB1441	L	56,491	65,024	73,865	77,708	82,433	78,937	83,841	80,606	77,266	82,846	78,921	77,463	915,401
Rahob Spring Station	AD0536	L	30,741	21,974	30,176	29,879	30,885	35,021	24,550	29,293	28,003	28,414	28,987	23,830	341,753
Hakama Well 3	AD1268	L	22,320	20,880	22,320	21,600	22,320	21,600	22,320	22,320	20,172	16,404	15,840	25,962	254,058
Hakama Well 4	AD3002	L	25,951	36,273	26,147	21,219	26,007	26,033	24,571	25,290	25,194	26,040	25,200	18,660	306,585
Hakama Well 5	AD3015	L	19,285	27,280	26,990	24,945	24,180	22,664	23,549	23,297	22,063	22,913	22,698	26,019	285,883
Hakama Well 6	AD3018	L	32,700	30,624	32,736	28,824	29,760	31,656	32,736	32,736	31,680	32,736	31,680	33,474	381,342
Hakama Well 7+8	AD3037	L	18,666	17,400	18,600	21,570	22,320	21,600	22,320	22,320	23,742	24,552	23,760	26,028	262,878
Kufr Youba Well	AE1001	L	15,333	14,945	19,856	20,579	20,627	19,443	19,671	20,730	18,720	19,653	18,502	18,779	226,838
Fo'raa Well	AE1004	L	0	0	0	0	0	5,950	6,349	5,527	5,281	4,238	4,227	4,320	35,892
Doukrh Well	AE1016	L	9,396	8,344	10,194	14,774	20,807	20,002	20,234	17,878	15,275	19,824	10,260	85	167,073
Kufr Asad Well 1	AE3008	L	0	0	0	0	30,996	29,760	32,720	30,564	31,621	32,736	264	0	188,661
Kufr Asad Well 3	AB3010	S	Shift to Beni Kanana in 2012												
As'Arah Well	AE3007	L	27,687	20,271	26,621	19,082	28,080	26,767	25,216	25,480	23,799	21,127	19,085	17,468	280,683
Mandah Well 1	AB4278	L	48,360	45,240	48,360	46,800	48,360	46,800	48,360	48,360	46,800	45,596	46,800	48,360	568,196
Mandah Well 3	AB4286	L	45,998	43,367	46,062	44,947	46,490	44,772	45,824	45,860	44,806	48,360	44,417	45,840	546,743
Mandah Well 4	AB3194	L	8,042	9,894	11,651	23,150	37,094	36,000	40,890	40,920	36,030	37,200	27,273	28,323	336,467
Kufr asad Well 5	AE3014	S	Shift to Beni Kanana in 2012												
Kufr asad Well 6	AE3015	S	Shift to Beni Kanana in 2012												
Irbid Qasaba Total Local			423,627	408,883	486,146	465,332	551,686	545,498	554,816	552,375	526,801	544,048	469,266	463,728	5,992,206
Irbid Qasaba Total Main															

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Irbid Qasaba Total			423,627	408,883	486,146	465,332	551,686	545,498	554,816	552,375	526,801	544,048	469,266	463,728	5,992,206

North Shouna

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sulaikhat Well 3	AB1369	L	1,036	840	4,677	5,054	3,488	3,649	4,560	3,536	4,132	4,139	3,378	787	39,276
Sulaikhat Well 8	AB1362	L	7,513	6,864	8,121	5,492	8,332	9,184	8,504	8,467	9,085	9,094	2,376	2,323	85,355
Al Kraymeh Well 4	AB4503	L	31,892	28,659	23,100	24,076	19,159	19,204	36,316	29,871	27,744	27,776	24,024	24,834	316,655
Al Kraymeh Well 5	AB4506	L	31,892	28,659	23,100	24,076	19,159	19,204	36,316	29,871	27,744	27,776	24,024	24,834	316,655
Al Kraymeh Well 1	AB1380	A (L)	Admissin from 2013												
Al Kraymeh Well 3a	AB1382	A (L)	Admissin from 2013												
Sbarh Well	AB3007	L	33,525	9,793	23,089	20,731	30,376	26,148	23,523	20,223	22,587	22,619	25,974	27,300	285,888
Sulaikhat Well 4	AB1350	N (L)	0	0	0	0	0	29,014	61,571	26,329	25,914	25,927	25,913	9,581	204,249
Sulaikhat Well 5	AB1351	N (L)	0	0	0	0	0	4,616	17,894	18,000	17,995	18,005	17,995	10,365	104,870
Sulaikhat Well 6	AB1377	N (L)	0	0	0	0	0	8,568	14,356	14,400	8,684	8,642	8,638	8,642	71,930
North Shouna Total Local			105,858	74,815	82,087	79,429	80,514	119,587	203,040	150,697	143,885	143,978	132,322	108,666	1,424,878
North Shouna Total Main															
North Shouna Total			105,858	74,815	82,087	79,429	80,514	119,587	203,040	150,697	143,885	143,978	132,322	108,666	1,424,878

Bani Kinana

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Harima Well 1	AD3012	L	28,043	34,655	36,309	37,986	38,900	38,371	39,197	39,159	37,820	38,598	38,449	39,213	446,700
Harima Well 2	AD3016	L	23,223	27,388	30,475	34,540	35,326	33,491	31,464	29,324	25,612	22,810	21,881	22,995	338,529
Harima Well 3	AD3037	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Kufr Asad Well 3	AB3010	L	24,518	22,007	27,201	10,072	28,996	15,070	9,300	10,862	3,975	6,867	6,214	45,617	210,699
Kufr Asad Well 4	AE3011	L	30,180	29,985	32,992	33,491	34,275	33,787	29,603	29,282	28,122	27,969	28,587	238	338,511
Kufr Asad Well 5	AE3014	L	54,999	50,010	50,028	52,466	50,014	53,061	51,227	50,962	49,489	49,374	50,239	51,384	613,253
Kufr Asad Well 6	AE3015	L	58,103	55,707	47,101	18,376	55,223	55,346	58,025	54,851	53,025	50,287	52,542	52,589	611,175
Ein Qoalbh Well	AD3129	L	56,243	29,009	19,045	55,391	59,187	50,672	52,746	51,391	47,895	47,964	35,372	38,860	543,775
Bani Kinana Total Local			275,309	248,761	243,151	242,322	301,921	279,798	271,562	265,831	245,938	243,869	233,284	250,896	3,102,642
Bani Kinana Total Main															
Bani Kinana Total			275,309	248,761	243,151	242,322	301,921	279,798	271,562	265,831	245,938	243,869	233,284	250,896	3,102,642

Al Koura

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jdita Well 1	AB1363	L	585	46,919	51,242	51,321	48,555	51,807	47,099	48,729	48,093	43,979	32,636	49,328	520,293
Jdita Well 2	AB3005	L	0	25,585	25,942	25,910	25,930	25,910	27,393	27,598	27,100	27,116	27,094	27,116	292,694
Ein Al Hamam Well 1	AF1001	L	38,129	41,143	41,801	49,690	49,623	49,629	50,411	51,190	51,248	50,036	47,785	47,796	568,481
Hamam Well 2	AF1002	L	60,019	58,791	58,998	33,008	72,123	67,349	68,859	67,943	67,700	68,360	69,823	68,164	761,137
Hamam Well 4	AF1003	L	25,430	25,409	25,451	25,420	23,079	14,499	25,668	25,405	25,735	25,622	25,600	25,620	292,938
Hamam Well 5	AF1004	L	36,723	45,435	45,727	40,281	39,935	39,907	39,225	8,645	76,122	43,205	38,727	43,227	497,159
Bait Idis Well	AG3006	L	27,552	333	0	0	28,056	32,200	32,648	30,225	30,237	30,173	30,237	27,600	269,261
Al Koura Total Local			188,438	243,615	249,161	225,630	287,301	281,301	291,303	259,735	326,235	288,491	271,902	288,851	3,201,963
Al Koura Total Main															
Al Koura Total			188,438	243,615	249,161	225,630	287,301	281,301	291,303	259,735	326,235	288,491	271,902	288,851	3,201,963

Total of Local Sources in West			1,222,363	1,195,701	1,259,671	1,236,229	1,437,821	1,454,290	1,555,429	1,463,262	1,470,980	1,441,854	1,324,540	1,313,028	16,375,168
Total of Main Sources in West			1,662,288	1,434,628	1,652,887	1,628,782	1,701,416	1,663,410	1,575,559	1,563,213	1,588,298	1,650,942	1,556,757	1,534,519	19,212,699
Total of Western Sources			2,884,651	2,630,329	2,912,558	2,865,011	3,139,237	3,117,700	3,130,988	3,026,475	3,059,278	3,092,796	2,881,297	2,847,547	35,587,867

(2) Eastern Wells

Ramtha

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Border Deep Well	AD1281	L	10,897	8,461	10,105	9,053	9,143	6,626	5,956	17,409	141	0	0	0	77,791
Almhace Well 6	AD1295	L	0	0	0	0	0	0	0	0	0	0	0	0	0

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Almhace Well 6 a	AD3112	N (L)	New Installation in 2012 (High TDS, NO3)												
Almhace Well 6 b	AD3113	N (L)	New Installation in 2012 (High S, Fe, Turbidity)												
AlmhaceWell 5	AD1296	L	13,014	8,379	7,398	16,249	16,499	18,171	19,826	20,114	17,787	14,661	14,260	17,200	183,558
Turrah Well 1	AD3008	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 1	AD3021	L	16,829	3,675	31	0	0	0	0	0	0	0	0	0	20,535
Jaber Well 2	AD3022	L	18,490	18,003	21,064	36,122	36,209	31,035	33,342	65,939	30,810	16,644	17,409	49,057	374,124
Jaber Well 3	AD3023	L	27	0	0	0	0	5,024	12,865	40,409	12,508	1,540	12,428	11,103	95,904
Jaber Well 4	AD3024	L	25,907	24,366	23,624	44,572	35,742	27,658	24,984	19,832	28,214	37,870	31,048	30,483	354,300
Jaber Well 5	AD3025	L	11,831	94	0	7,914	16,127	19,111	24,188	46,750	20,846	19,585	18,786	19,187	204,419
Jaber Well 7	AD3044	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Turrah Well 3	AD3045	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 6	AD3047	L	7,114	2,730	7,780	315	0	0	0	0	3,854	32	0	0	21,825
Jaber Well 8	AD3058	L	35,779	21,670	21,202	36,050	34,884	24,749	46,627	56,934	19,638	36,619	28,962	6,722	369,836
West Ramtha Well 2	AD3121	L	44,700	45,210	46,861	44,717	35,685	44,763	40,965	40,388	42,438	44,952	40,459	39,874	511,012
Ramtha Total Local			184,588	132,588	138,065	194,992	184,289	177,137	208,753	307,775	176,236	171,903	163,352	173,626	2,213,304
Ramtha Total Main															
Ramtha Total			184,588	132,588	138,065	194,992	184,289	177,137	208,753	307,775	176,236	171,903	163,352	173,626	2,213,304

Bani Ubaid - Al Mazar

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
No'aymeh Well 1	AD1219	L	7,458	6,960	7,440	7,200	7,440	5,772	5,952	5,952	48	0	5,454	5,006	64,682
No'aymeh Well 2	AD1220	L	13,392	12,528	13,392	11,532	11,166	10,800	11,160	11,160	10,552	11,247	8,520	7,510	132,959
No'aymeh Well 3	AD3011	L	17,077	9,204	1,725	14,293	14,880	18,684	19,344	18,606	150	0	14,379	8,056	136,398
No'aymeh Well 4	AD3127	L	52,378	50,059	49,691	51,114	54,189	52,331	53,872	52,920	51,200	53,098	50,507	52,497	623,856
No'aymeh Well 5	AD3139	L	0	0	0	0	0	0	0	15,236	17,549	16,410	10,605	7,340	67,140
Bani Ubaid Total Local			90,305	78,751	72,248	84,139	87,675	87,587	90,328	103,874	79,499	80,755	89,465	80,409	1,025,035
Bani Ubaid Total Main															
Bani Ubaid Total			90,305	78,751	72,248	84,139	87,675	87,587	90,328	103,874	79,499	80,755	89,465	80,409	1,025,035

Jerash

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Kufr Khal Well	AD3060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Qairawan Spring	AL0672	L	43,056	42,956	51,320	56,283	56,794	41,608	51,373	50,393	49,146	43,362	34,229	48,431	568,951
Sakib Booster Station	AL0740	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Umm Mararh Spring	AL0993	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Ghadeer Spring	AL0748	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Ein Al Teis Spring	AL0758	L	8,904	34,190	23,262	30,932	45,840	38,205	20,188	27,380	24,148	21,270	29,814	31,547	335,680
Ain Al Deek Spring	AL0760	L	35,046	8,814	34,522	46,399	68,760	57,307	30,283	41,070	36,222	31,905	20,019	7,990	418,337
Burma Tank Well	AL0931	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Souf Al Gharbi West Well	AL1429	L	5,343	6,061	8,474	12,811	13,617	13,527	14,218	14,319	11,768	9,184	6,887	7,665	123,874
Suof Esh Sharqi East Well	AL2358	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Rayashi Well	AL2360	L	15,438	15,271	12,799	18,791	19,236	21,576	18,035	24,269	19,856	18,749	20,827	14,282	219,129
AL Shawahed Al Shargi Well	AL2716	L	19,830	17,807	22,904	21,659	23,691	17,073	24,133	24,299	21,697	23,924	20,179	15,617	252,813
AL Shawahed Al Gharbi Well	AL2717	L	5,189	4,781	7,800	7,226	8,633	7,174	4,342	35	1,544	653	129	1,947	49,453
Jerash Al Maleh Well 2	AL3120	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Ed Dear Al Shargi Well	AL3352	L	17,213	22,512	27,951	30,444	30,480	31,619	33,922	26,858	24,047	26,574	17,818	16,263	305,701
Bab Amman Well	AL3378	L	0	0	0	0	2,075	322	2,135	3,931	2,470	1,189	10	0	12,132
Al Majar Well 2	AL3380	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Talat Aruz Well 1	AL3546	L	5,478	5,106	5,500	5,003	4,505	4,995	4,009	32	0	0	0	0	34,628
Debbein Well	AL3548	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Riyashi Well 3	AL3792	L	11,176	11,174	2,080	4,618	13,679	13,775	16,978	14,300	13,377	12,444	14,947	12,052	140,600
Said Jacob Heirs Well	-	L	7,440	4,350	0	16,025	9,900	16,100	24,800	18,600	12,000	9,300	7,980	10,647	137,142
Um Qantarah Well	AL3820	L	0	0	7,539	22,667	27,970	38,638	18,178	14,391	1,667	7,022	7,776	996	146,844
Rumman Well	AL3620	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Faisal Nursery of Jabh Well	-	L	105,378	105,379	105,380	105,381	105,382	105,383	105,384	105,385	105,386	105,387	105,388	105,389	1,264,602
Faisal Nursery of Jerash Well	-	L													0

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Gharaibeh Well	-	L	1,710	1,177	711	3,197	4,559	4,028	2,705	0	0	0	0	0	18,087
Burma Well 3	AL3854	L	7,512	7,494	6,057	4,627	7,950	8,909	11,036	10,331	7,907	13,097	8,777	8,356	102,053
AL Shawahed Al Shargi Well 3	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Maleh (farmers) Well (maintenance)	-	L	0	0	0	0	0	0	18,490	29,749	6,252	12,177	2,799	1,251	70,718
Jerash Total Local			288,713	287,072	316,299	386,063	443,071	420,239	400,209	405,342	337,487	336,237	297,579	282,433	4,200,744
Jerash Total Main															
Jerash Total			288,713	287,072	316,299	386,063	443,071	420,239	400,209	405,342	337,487	336,237	297,579	282,433	4,200,744

Ajloun

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Halawa / Zuqaiq Well 2	AB3152	L	62,825	47,738	44,629	57,980	54,338	53,726	62,414	53,428	71,476	78,951	75,470	75,268	738,243
Ain Rason Spring	AH0506	L	8,350	5,057	5,754	4,617	10,938	12,893	13,880	10,998	8,661	8,786	4,707	5,850	100,491
Ain Al Tanour Spring	AH0510	L	61,767	55,396	68,585	112,599	141,494	132,251	102,194	101,642	88,995	75,893	34,890	24,479	1,000,185
Faouar Spring	AJ0510	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Qantara Spring	AJ0520	L	50,335	733	50,984	66,378	61,643	60,798	40,423	34,990	32,338	33,416	32,289	64,280	528,607
Zuqaiq Spring 1	AJ0580	L	38,729	29,060	34,400	58,543	68,051	69,432	68,461	67,222	59,510	55,127	48,769	46,965	644,269
Ain Jana Spring	AJ0582	L	5,228	6,867	9,344	10,053	10,500	11,753	9,783	9,284	8,696	8,781	7,780	6,347	104,416
Ein Umm Qasem Spring	AK0521	L	6,381	5,756	7,686	6,727	6,912	7,189	6,200	8,400	7,574	8,043	7,069	7,313	85,250
Safsafa Well 2	AK1016	L	2,545	4,093	5,506	4,254	3,310	5,287	9,239	9,192	7,515	7,148	6,975	4,841	69,905
Zuqaiq PS 3	AH3007	N (L)	New Installation in 2013												
Total Ajloun Local			236,160	154,700	226,888	321,151	357,186	353,329	312,594	295,156	284,765	276,145	217,949	235,343	3,271,366
Total Ajloun Main															
Total Ajloun			236,160	154,700	226,888	321,151	357,186	353,329	312,594	295,156	284,765	276,145	217,949	235,343	3,271,366

Mafraq (1)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sumaya Well 3	AD1121	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 4	AD1122	L	10,560	85	11,967	9,653	3,193	8,128	2,899	1,562	5,849	49	0	0	53,945
Sumaya Well 5	AD1123	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 6	AD1124	L													
Sumaya Well 7	AD1125	L	8,551	17,364	3,729	11,907	5,020	6,506	4,896	4,213	3,531	3,228	1,782	3,458	74,185
Sumaya Well 8	AD1126	L	10,457	7,419	11,303	9,398	5,876	2,100	17	0	0	0	0	0	46,570
Sumaya Well 9	AD1127	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 11	AD1278	L	21,031	14,140	18,725	21,012	18,447	11,925	12,491	15,629	14,565	12,077	12,557	19,116	191,715
Jaber El Sarhan Well	AD1327	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Hudud (Jaber Custom) Well 7	AD3004	L	18,825	152	8	25,058	21,312	24,528	25,420	24,550	23,970	24,369	24,126	24,691	237,009
Um Es Serb Well	AD3005	L	11,510	8,834	16,408	21,280	24,509	26,299	22,835	26,669	25,614	27,629	16,387	11,905	239,879
Suwelmeh Well 3a	AD3040	L	5,827	5,515	5,922	5,893	1,733	2,623	5,817	4,473	36	0	0	0	37,839
AL Zubaideyeh Well	AD3056	L	16,555	14,178	18,902	25,236	29,648	29,888	30,654	31,831	28,230	26,235	30,065	27,735	309,157
Sumaya Well 12	AD3057	L	20,946	12,830	11,239	13,910	10,709	9,316	8,080	7,636	6,756	6,965	8,559	8,936	125,882
Suwelmeh Well 4	AD3061	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 17	AL1023	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 30	AL1037	L	7,601	6,726	6,449	6,876	6,896	6,850	5,862	6,704	6,601	6,863	6,809	6,965	81,202
Khaldyeh Well 21	AL1748	L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Za'atary Well 3	AL2710	M	20,150	19,494	12,575	20,093	18,023	16,012	15,012	121	0	0	0	0	121,480
AL Za'atary Well 4	AL3002	M	11,451	4,554	28,328	10,293	5,996	12,900	12,507	8,532	8,994	9,002	8,998	9,002	130,557
AL Za'atary Well 5	AL3003	M	10,976	10,003	10,006	9,997	10,003	9,997	10,003	10,000	9,997	10,003	9,997	10,003	120,985
AL Kum Al Ahmer Well	AL3132	L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Za'atary Well 7	AL3375	M	32,500	31,491	29,534	29,492	29,508	21,559	20,514	20,500	20,494	20,506	20,494	20,506	297,098
AL Za'atary Well 9	AL3376	M	12,984	11,010	11,006	10,997	11,003	10,997	10,011	10,000	9,997	10,003	9,997	10,003	128,008
AL Za'atary Well 10	AL3377	M	0	0	0	2,142	13,905	113	0	11,506	12,589	12,603	12,597	12,603	78,058
Dogmusseh Well	AL3382	L	7,498	61	0	2,009	8,095	3,360	8,776	2,731	1,192	5,240	43	1,158	40,163
AL Za'atary Well 6	AL3463	M	9,944	6,525	6,504	7,490	7,502	7,498	7,502	60	0	0	0	0	53,025
Znaieh Well 3	AL3483	L	83,788	85,649	66,617	64,903	69,806	66,834	60,819	37,935	55,511	73,271	73,044	65,187	803,364
Mafraq (1) Total Local			223,149	172,953	171,269	217,135	205,244	198,357	188,566	163,933	171,855	185,926	173,372	169,151	2,240,910
Mafraq (1) Total Main			98,005	83,077	97,953	90,504	95,940	79,076	75,549	60,719	62,071	62,117	62,083	62,117	929,211

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Mafraq (1) Total			321,154	256,030	269,222	307,639	301,184	277,433	264,115	224,652	233,926	248,043	235,455	231,268	3,170,121

Mafraq (2)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Znaieh Well 4	AL3484	L	15,290	14,555	12,582	13,730	12,697	12,422	12,245	11,846	4,533	10,301	9,170	1,614	130,985
Znaieh Well 5	AL3485	L	31,880	32,017	16,532	13,221	21,770	12,175	9,045	4,850	12,200	16,697	3,841	3,999	178,227
AL Kum Al Ahmer Well 2a	AL3564	L	9,420	8,533	9,197	15,157	12,073	97	16,720	25,986	25,106	22,598	22,344	23,305	190,536
Irhab (Hamamit Alamoush) Well	AL3660	L	5,362	4,624	5,616	7,591	2,006	5,178	4,029	2,393	49,603	417	0	0	86,819
Al Aqeb Well 96-2	AL1193	M	8,388	65	0	0	22,496	12,379	102	0	0	0	0	0	43,430
Al Aqeb Well K 104	AL1225	M	52,000	50,484	51,520	39,726	52,797	46,539	47,008	47,000	46,987	48,005	55,920	57,007	594,993
Al Aqeb Well K 95	AL1241	M/L	30,908	15,807	21,439	5,945	48	0	0	14,885	26,377	28,378	27,729	13,343	184,859
Al Aqeb Well K 101-1	AL1244	M	56,635	53,115	55,966	53,662	56,513	53,420	27,764	81,530	52,405	53,732	41,231	43,005	628,978
Al Aqeb Well K 102	AL1265	M	522	0	0	0	3,506	34,333	38,190	39,202	39,199	40,004	59,823	60,016	314,795
Al Aqeb Well K 102.5	AL1273	M	56,206	100,583	48,992	47,508	45,696	40,181	35,052	33,597	33,111	44,940	44,052	44,697	574,615
Al Aqeb Well K 106	AL1274	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 93-1	AL1485	M/L	0	0	0	0	37,445	60,646	67,196	67,673	61,706	63,499	62,750	67,417	488,332
Al Aqeb Well K 94	AL1486	M	43,000	40,993	42,015	41,989	42,011	41,493	41,511	42,492	41,497	41,511	45,951	34,605	499,068
Um AL Jemal Well 41	AL1490	M	53,087	49,564	52,605	51,355	50,827	44,324	48,977	49,546	48,164	49,616	37,334	310	535,709
Rawdah Ameera Basma Well	AL1491	M	42,096	41,028	40,513	40,985	41,015	39,997	44,970	45,000	39,038	40,002	38,998	40,002	493,644
Sabha and Sobheya/El Balad Well	AL1493	L	1,993	18	27,764	2,244	17	4,450	8,994	73	3,053	1,052	403	178	50,239
Al Aqeb Well K 103-1	AL1495	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 90	AL1558	M	30,000	28,992	29,512	29,492	28,516	27,005	27,503	26,012	32,324	270	0	28,701	288,327
Al Aqeb Well K 107	AL2689	M	24,442	29,938	38,014	34,027	40,830	33,623	40,258	27,107	46,329	44,512	38,512	30,996	428,588
Alharrara Well	AL2709	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 94.5	AL3004	M	21,252	20,065	23,770	22,529	21,478	19,311	15,792	14,550	16,452	17,453	8,403	7,638	208,693
Am'ra and A'meira Well 1	AL3018	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Am'ra and A'meira Well 2	AL3019	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 96-1	AL3362	M	29,688	29,584	34,324	30,382	31,003	22,067	31,040	35,988	29,049	29,504	32,963	33,505	369,097
AL Zamlah (Zamlehet Al Ameer Gazi) Well	AL3422	M	50,739	59,010	47,163	36,406	41,035	30,815	35,568	35,005	34,991	35,895	35,043	35,506	477,176
Al Aqeb Well K 93.5	AL3423	M/L	29,042	36,596	33,401	34,669	42,039	25,451	45,302	62,392	49,030	48,504	114,136	47,664	568,226
Al Aqeb Well K 91.5	AL3452	L	51,000	48,989	50,019	51,474	50,522	50,486	50,514	52,484	53,478	54,506	53,990	54,015	621,477
Al Aqeb Well K 101-2	AL3513	M	52,421	49,374	52,437	51,115	53,208	49,916	51,019	49,112	26,545	54,707	54,179	53,203	597,236
Al Aqeb Well K 106	AL3517	M	69,783	59,603	62,637	59,007	61,594	57,752	59,713	59,178	57,358	58,362	57,813	58,658	721,458
Al Aqeb Well K 103-2	AL3518	M/L	212	0	0	0	0	0	27,620	48,893	46,756	25,694	32,435	32,509	214,119
Station Khcaa Slitin Well	AL3557	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Mafraq (2) Total Local			136,147	128,898	142,075	119,989	133,277	121,830	157,655	171,418	216,067	168,872	182,655	145,434	1,824,317
Mafraq (2) Total Main			629,219	644,639	613,943	562,225	637,865	602,230	628,477	705,376	659,224	661,287	694,365	626,459	7,665,309
Mafraq (2) Total			765,366	773,537	756,018	682,214	771,142	724,060	786,132	876,794	875,291	830,159	877,020	771,893	9,489,626

Mafraq (3)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Um AL Jemal Well 3	AL3563	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Daba'an DP5A Well	AL3647	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K111p	F1079	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K124	F1124	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K136	F1125	L	0	0	2,039	30,805	33,052	26,222	34,109	34,370	24,221	34,545	25,465	13,808	258,636
Al Aqeb Well K134	F1305	L	24,377	17,021	21,468	20,473	26,789	11,369	24,105	19,772	16,890	21,946	9,032	3,624	216,866
Al Aqeb Well K114	F1310	M	27,317	46,200	48,844	46,660	48,748	46,286	47,602	48,006	46,389	40,732	35,907	46,267	528,958
Al Aqeb Well K 112	F1312	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Abu Karza Well	F1316	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K110	F1333	M	51,000	49,980	51,020	49,003	49,013	48,987	49,013	49,000	48,987	49,509	49,487	55,465	600,464
Al Aqeb Well K109	F1389	M	110,674	893	0	0	0	0	0	0	0	0	0	0	111,567
Mukefteh Well 1	F3523	L	25,196	20,089	32,156	28,512	30,180	25,004	18,511	21,307	24,508	25,148	26,800	26,157	303,568
Mukefteh Well 2	F3524	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K133	F3530	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukefteh Well 3	F3761	L	25,439	3,565	29	10,163	22,041	17,470	15,416	11,660	159	1,514	3,364	8,054	118,874

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Safawi Well	F3903	L	13,181	12,936	5,356	13,879	18,527	16,218	19,098	19,477	17,342	7,362	14,285	16,731	174,392
Al Aqeb Well K111a	F3930	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K140	F3935	L	17,222	17,587	16,085	17,646	20,716	17,648	12,335	22,192	19,981	20,735	8,545	15,307	205,999
Al Aqeb Well K124	F3946	L	31,091	27,172	30,334	48,341	55,953	51,260	55,891	48,476	48,123	56,110	20,942	15,240	488,933
Al Rafayyat Well 1	F3987	L	31,998	29,510	28,614	26,910	24,834	17,029	25,257	25,822	24,462	24,207	21,270	20,890	300,803
Sumaya Well 3b	AD 3124	L	47,197	15,478	9,026	39,382	59,233	59,056	10,737	38,468	40,162	42,088	37,389	44,063	442,279
Al Harara /Thermal Well 1b	AL3889	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 3	H1060	L	0	0	191	2	0	0	0	0	0	0	0	0	193
Rwashed Well 1	H2015	L	0	0	33,536	29,238	35,417	31,973	39,526	37,850	35,056	35,511	34,584	36,604	349,295
Rwashed Well 4	H3060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 5	H3064	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 6	H3069	L	19,805	22,346	14,715	23,950	16,170	18,034	26,285	19,409	21,102	23,042	27,378	25,035	257,271
Al salheh Na'aem Well	H3070	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 24	AL1030	L	6,515	3,138	6,494	8,642	8,717	8,746	8,718	8,987	8,926	9,400	8,440	8,672	95,395
Suwelmeh Well 1	AD1262	L	36,837	36,257	34,868	26,870	32,967	32,114	29,449	7,842	25,791	19,881	27,528	16,322	326,726
Mafraq (3) Total Local			278,858	205,099	234,911	324,813	384,596	332,143	319,437	315,632	306,723	321,489	265,022	250,507	3,539,230
Mafraq (3) Total Main			188,991	97,073	99,864	95,663	97,761	95,273	96,615	97,006	95,376	90,241	85,394	101,732	1,240,989
Mafraq (3) Total			467,849	302,172	334,775	420,476	482,357	427,416	416,052	412,638	402,099	411,730	350,416	352,239	4,780,219

Mafraq (4)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jaber Well (Rent) Well	-	L	40,222	47,771	51,847	14,626	24,144	12,380	21,608	13,578	14,446	24,580	87,640	13,703	366,545
Suwelmeh Well 1	-	L	0	0	0	29,097	20,752	24,189	19,591	26,723	23,284	28,283	17,469	27,544	216,932
Mfaradat Well (New)	AL3705	L	1,599	1,181	1,336	3,592	6,615	6,451	7,269	6,595	5,362	6,296	5,302	4,619	56,217
Al jama'a Well	-	M	0	0	5,475	12,238	12,000	12,000	10,000	10,000	10,000	10,000	10,000	10,000	101,713
Mukefteh Well 4 (New)	F4140	L	24,129	236	23,878	23,732	26,677	25,095	25,694	24,001	24,216	16,869	21,842	25,570	261,939
Al jbbea Well	F4139	L	0	0	8,193	14,664	14,519	17,015	18,751	9,253	74	13,094	36,258	9,319	141,140
Al Aqeb Well K112 (New)	F4184	M	42,412	39,226	41,945	39,779	41,107	38,174	40,113	40,415	38,869	39,646	39,557	16,983	458,226
Al Aqeb Well K113	F4229	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K109	F4171	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Znaieh Well 6 (New)	AL3713	L	17,181	19,073	14,499	16,882	17,556	17,322	13,800	16,445	12,909	16,693	12,257	14,506	189,123
Khaldyeh Well 17	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldye Wellh 20	AL1026	L	11,301	10,455	5,275	8,205	8,829	8,878	8,944	8,993	8,930	8,902	8,752	4,287	101,751
Sumaya Well 5 (New)	AD3078	L	22,241	24,329	27,526	25,391	20,344	16,510	13,018	19,048	14,727	14,887	11,044	14,971	224,036
Rwashed Well 2	H1012	L	19,518	13,435	15,180	12,967	24,925	4,000	32	0	0	13,671	3,401	2,507	109,636
Rwashed Well7	H3074	L	30,218	30,283	24,812	31,784	265	0	0	0	15,172	128	0	0	132,662
Arabe Al Qedah Well	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Bedor Well	-	L	53,450	50,840	54,080	49,140	50,400	50,590	53,100	53,850	50,000	50,500	51,350	53,250	620,550
Ali Salamah Well	-	L	34,563	12,828	0	24,751	28,166	19,662	25,974	25,663	24,328	30,007	21,480	0	247,422
Noaf Ali Well	-	L	0	0	0	0	0	0	0	12,940	31,307	54,135	59,997	44,456	202,835
Lafe Al Sa'aed Well	-	L	27,580	20,686	30,054	61,380	58,634	54,121	55,386	55,310	49,458	54,194	11,527	0	478,330
Znaieh Well 7	AL3791	L	0	0	21,312	60,933	61,500	38,402	75,955	66,232	49,959	61,728	498	29,222	465,741
Naser Ata Allah Well	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Abd Allh Abo A'alem Well	-	L	52,559	30,965	9,693	68,732	61,318	45,782	43,118	49,998	54,447	57,547	3,831	0	477,990
Al Aqeb Well K103b	AL3832	M	32,500	30,499	30,517	30,492	30,508	29,996	30,008	31,984	31,991	32,009	41,908	43,003	395,415
Am'ra and A'meira Well 2a (New)	AL3797	L	24,306	25,567	26,120	30,532	25,786	50,782	11,336	27,978	49,818	53,209	39,210	29,381	394,025
Alkum Alhmar Well 3 (New)	AL3911	L	23,542	35,482	35,520	38,233	30,475	11,044	21,589	35,405	34,611	31,825	38,385	33,582	369,693
Taleb Al Zatary Well	-	L	17,380	0	16,692	94,021	89,321	83,647	93,546	92,617	83,511	61,447	0	0	632,182
Jaber Well 9	AD3077	L	9,457	14,754	10,825	10,017	10,853	11,770	18,562	15,484	8,387	8,857	6,772	11,428	137,166
Jaber Bridge Well	AD3118	L	0	0	16,983	37,426	27,875	18,039	23,593	34,574	32,275	32,823	30,764	33,084	287,436
Economic Well 1	AL3908	M	0	0	0	0	0	34,034	44,923	22,185	44,802	46,004	45,988	49,980	287,916
Economic Well 2	AL3909	M	0	0	0	0	0	33,489	46,391	45,012	25,155	25,999	28,472	28,508	233,026
Economic Well 3	AL3910	M	0	0	0	0	0	37,495	40,573	36,739	43,766	41,479	40,890	46,561	287,503
Economic Well 4	AL3914	M	0	0	0	0	0	0	52,981	52,162	50,559	53,820	41,092	41,011	291,625
Economic Well 5	AL4240	M	0	0	0	0	0	0	48,654	44,041	42,997	57,494	59,965	61,008	314,159
Um Qutain Well	AL3863	L	0	0	0	0	0	1,700	1,346	2,251	2,507	2,532	2,040	1,286	13,662

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sabha Well 1b (New)	AL3956	L	0	0	0	32,844	34,951	31,237	260	46,893	38,438	29,289	30,196	22,223	266,331
Sumaya Well 6b	AD3140	L	120,558	84,209	106,309	100,491	98,298	91,082	93,320	92,257	87,085	92,667	83,661	94,733	1,144,670
Mafraq (4) Total Local			529,804	422,094	500,134	789,440	742,203	639,698	645,792	736,088	715,251	764,163	583,676	469,671	7,538,014
Mafraq (4) Total Main			74,912	69,725	77,937	82,509	83,615	185,188	313,643	282,538	288,139	306,451	307,872	297,054	2,369,583
Mafraq (4) Total			604,716	491,819	578,071	871,949	825,818	824,886	959,435	1,018,626	1,003,390	1,070,614	891,548	766,725	9,907,597
Total of Local Sources in East			1,967,724	1,582,155	1,801,889	2,437,722	2,537,541	2,330,320	2,323,334	2,499,218	2,287,883	2,305,490	1,973,070	1,806,574	25,852,920
Total of Main Sources in East			991,127	894,514	889,697	830,901	915,181	961,767	1,114,284	1,145,639	1,104,810	1,120,096	1,149,714	1,087,362	12,205,092
Total of Eastern Sources			2,958,851	2,476,669	2,691,586	3,268,623	3,452,722	3,292,087	3,437,618	3,644,857	3,392,693	3,425,586	3,122,784	2,893,936	38,058,012

(3) Total of Eastern and Western Wells

Total of Local Sources		3,190,087	2,777,856	3,061,560	3,673,951	3,975,362	3,784,610	3,878,763	3,962,480	3,758,863	3,747,344	3,297,610	3,119,602	42,228,088
Total of Main Sources		2,653,415	2,329,142	2,542,584	2,459,683	2,616,597	2,625,177	2,689,843	2,708,852	2,693,108	2,771,038	2,706,471	2,621,881	31,417,791
Total of Northern Governorate		5,843,502	5,106,998	5,604,144	6,133,634	6,591,959	6,409,787	6,568,606	6,671,332	6,451,971	6,518,382	6,004,081	5,741,483	73,645,879

Note:

In the Classification column, L indicates the wells, water of which is used in the locality in which it is located or in surrounding localities

M indicates the wells, that contribute its water to the main transmission line either coming from wadi al-arab in west to Zebdat PS or coming from Zata'ary PS in the east to Hofa Reservoir

Monthly Production of Water (in m^3) from Wells in the Northern Governorate in 2013

(1) Western Wells

Wadi El Arab

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Wadi Al Arab Well 1	AE1007	M	64,565	58,501	61,643	64,756	63,301	64,137	66,337	66,509	64,796	66,928	64,792	63,568	769,833
Wadi Al Arab Well 2	AE1008	M	177,392	182,130	138,940	139,042	168,200	148,768	157,569	160,019	161,655	161,455	172,649	175,877	1,943,696
Wadi Al Arab Well 3	AE1009	M	57,498	77,783	117,001	124,508	121,154	112,941	114,273	120,954	161,316	125,827	123,098	122,883	1,379,236
Wadi Al Arab Well 4	AE1010	M	127,191	114,018	128,025	125,087	129,118	125,093	111,473	110,554	142,698	116,020	117,349	108,069	1,454,695
Wadi Al Arab Well 5	AE1011	M	150,316	131,256	144,332	145,230	148,768	144,934	150,323	149,376	143,109	147,546	143,787	139,630	1,738,607
Wadi Al Arab Well 6	AE3001	L	126,480	126,371	126,589	126,446	126,514	126,446	126,514	126,480	126,446	126,514	126,446	126,514	1,517,760
Wadi Al Arab Well 8	AE3005	M	95,398	41,846	45,010	45,976	43,723	41,812	42,029	40,582	37,278	38,113	35,708	25,232	532,707
Wadi Al Arab Well 9	AE3006	M	221,848	112,682	131,297	126,953	130,197	124,489	126,726	124,661	117,548	121,708	112,041	112,892	1,563,042
Wadi Al Arab Well 10	AE3016	M	136,228	125,663	139,358	135,630	137,813	129,510	133,584	131,770	125,938	125,149	117,645	126,050	1,564,338
Wadi Al Arab Well 11	AE3017	M	52,220	35,601	34,820	27,330	32,440	35,968	36,013	35,172	33,208	33,106	31,800	32,291	419,969
Wadi Al Arab Well 12	AE3018	M	155,145	81,091	85,140	78,924	76,737	71,082	71,434	75,370	75,813	77,297	73,920	74,833	996,786
Wadi Al Arab Well 13	AE3019	M	149,735	69,611	70,773	70,814	74,681	73,204	73,789	75,817	67,975	73,929	73,491	72,814	946,633
Wadi Al Arab Well 14	AE3020	M	287,544	118,255	147,490	130,614	139,763	130,300	136,816	138,208	135,275	140,332	132,811	136,399	1,773,807
Tabaget Fahel Well 5	AG3002	L	89,747	80,093	92,546	94,352	110,306	114,073	116,122	116,571	106,383	109,233	106,094	104,743	1,240,263
Tabaget Fahel Well 1	AG3000	M	188,277	103,479	96,675	95,047	110,770	125,027	128,628	128,781	125,436	118,665	97,088	110,819	1,428,692
Tabaget Fahel Well 3	AG3004	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabaget Fahel Well 6	AG3005	M	866	0	91,027	105,925	108,636	105,586	105,852	105,773	102,568	73,826	71,167	78,644	949,870
Tabaget Fahel Well 8	AB3157	M	53,040	72,030	78,364	76,106	87,526	78,292	79,335	79,654	79,867	73,088	63,454	66,258	887,014
Mansheya Well 1	AB3003	M	10,288	7,515	13,250	8,026	9,282	9,579	8,120	11,359	7,948	13,609	5,131	42	104,149
Mansheya Well 2	AB1355	M	10,288	7,515	13,250	8,026	9,282	9,579	8,120	11,359	7,948	13,609	5,131	42	104,149
Tabaget Fahel Well 9	AB0542	M	148,006	71,264	97,290	90,526	86,774	64,408	66,078	65,340	82,163	80,826	92,819	60,576	1,006,070
Wadi Al Arab Well 7	AE1012	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Arab Total Local			216,227	206,464	219,135	220,798	236,820	240,519	242,636	243,051	232,829	235,747	232,540	231,257	2,758,023
Wadi Arab Total Main			2,085,845	1,410,240	1,633,685	1,598,520	1,678,165	1,594,709	1,616,499	1,631,258	1,672,539	1,601,033	1,533,881	1,506,919	19,563,293
Wadi Arab Total			2,302,072	1,616,704	1,852,820	1,819,318	1,914,985	1,835,228	1,859,135	1,874,309	1,905,368	1,836,780	1,766,421	1,738,176	22,321,316

Irbid Qasaba

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Taybeh Beer Well	AB1174	L	6,491	52	992	5,085	5,538	1,512	181	0	0	0	4,919	9,987	34,757
Gehfah Well 1	AB1375	L	57,312	49,054	80,140	76,520	82,700	65,473	83,203	75,097	75,297	80,350	80,557	58,958	864,661
Gehfah Well 2	AB1441	L	72,818	70,299	80,330	76,520	82,700	83,068	80,947	82,160	83,030	80,503	80,557	71,873	944,805
Rahob Spring Station	AD0536	L	16,053	16,700	20,524	15,576	18,679	17,098	17,313	16,626	15,416	15,732	16,013	13,882	199,612
Hakama Well 3	AD1268	L	26,040	18,644	25,996	23,772	24,552	23,760	24,552	26,028	25,200	6,042	5,157	2,268	232,011
Hakama Well 4	AD3002	L	18,600	16,800	18,600	22,284	23,064	22,320	23,064	10,518	10,080	24,046	23,518	21,299	234,193
Hakama Well 5	AD3015	L	45,530	20,922	22,176	35,879	36,285	29,356	27,100	38,700	38,580	37,831	39,708	40,544	412,611
Hakama Well 6	AD3018	L	26,100	23,520	31,277	30,994	31,813	31,942	21,767	25,988	25,852	25,613	25,598	23,881	324,345
Hakama Well 7+8	AD3037	L	26,040	23,520	26,040	25,200	26,040	25,200	29,532	33,448	32,400	33,480	32,400	18,720	332,020
Kufr Youba Well	AE1001	L	19,229	20,837	23,672	22,537	22,706	22,018	22,521	22,389	19,697	22,024	20,908	20,131	258,669
Fo'raa Well	AE1004	L	2,320	8,546	2,362	3,827	4,952	3,808	4,952	4,992	4,800	4,446	4,300	4,232	53,537
Doukrh Well	AE1016	L	0	0	0	12,483	19,069	18,457	19,400	19,210	18,815	18,090	15,600	5,600	146,724
Kufr Asad Well 1	AE3008	L	0	0	0	29,988	31,984	27,888	32,131	27,848	28,010	29,436	29,333	14,652	251,270
As'Arah Well	AE3007	L	10,485	84	22,213	22,758	22,719	10,043	10,274	38,409	20,535	17,755	16,743	14,025	206,043
Mandah Well 1	AB4278	L	48,360	43,680	48,360	46,800	48,360	46,800	48,360	48,360	46,800	48,360	46,800	48,360	569,400
Mandah Well 3	AB4286	L	42,864	41,544	45,653	45,241	45,976	43,984	45,688	43,984	46,338	42,683	43,987	37,277	525,219
Mandah Well 4	AB3194	L	23,985	12,126	26,741	35,917	36,010	37,478	36,642	37,562	35,858	37,199	36,000	23,362	378,880
Irbid Qasaba Total Local			442,227	366,328	475,076	531,381	563,147	510,205	527,627	551,319	526,708	523,590	522,098	429,051	5,968,757
Irbid Qasaba Total Main															

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Irbid Qasaba Total			442,227	366,328	475,076	531,381	563,147	510,205	527,627	551,319	526,708	523,590	522,098	429,051	5,968,757

North Shouna

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sulaikhat Well 3	AB1369	L	863	2,414	2,432	4,791	4,822	5,029	7,415	4,378	3,220	3,214	2,218	2,759	43,555
Sulaikhat Well 8	AB1362	L	15,245	2,425	2,324	10,729	10,803	10,797	23,288	5,621	8,075	8,100	9,422	8,848	115,677
Al Kraymeh Well 4	AB4503	L	24,834	23,820	25,160	28,330	37,300	26,405	23,442	23,008	14,371	14,309	27,571	29,739	298,289
Al Kraymeh Well 5	AB4506	L	24,834	23,820	25,160	28,330	37,300	26,405	23,442	23,008	14,371	14,309	27,571	29,739	298,289
Al Kraymeh Well 1	AB1380	L	26,425	26,617	26,663	26,633	26,647	26,633	26,647	26,640	26,633	26,647	26,633	26,647	319,465
Al Kraymeh Well 3a	AB1382	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sbarh Well	AB3007	L	22,402	20,944	20,970	29,527	28,965	21,102	31,473	20,679	24,081	24,122	23,570	19,275	287,110
Sulaikhat Well 4	AB1350	L	12,012	12,678	12,705	30,394	12,191	9,088	21,362	21,417	28,057	28,127	22,157	10,036	220,224
Sulaikhat Well 5	AB1351	L	10,299	7,114	7,100	7,714	7,101	9,196	11,633	7,414	8,434	8,447	7,987	4,473	96,912
Sulaikhat Well 6	AB1377	L	8,640	8,633	8,647	8,638	8,642	8,638	8,642	8,640	8,638	8,642	8,638	8,642	103,680
North Shouna Total Local			145,554	128,465	131,161	175,086	173,771	143,293	177,344	140,805	135,880	135,917	155,767	140,158	1,783,201
North Shouna Total Main															
North Shouna Total			145,554	128,465	131,161	175,086	173,771	143,293	177,344	140,805	135,880	135,917	155,767	140,158	1,783,201

Bani Kinana

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Harima Well 1	AD3012	L	35,008	35,789	39,934	38,123	40,707	40,242	41,809	40,291	38,455	40,899	39,022	38,856	469,135
Harima Well 2	AD3016	L	15,512	15,438	22,036	21,572	24,222	23,628	23,736	22,246	20,825	20,499	19,266	19,304	248,284
Harima Well 3	AD3037	L	0	0	0	0	0	0	0	0	0	0			0
Kufr Asad Well 3	AB3010	L	46,890	38,869	38,872	45,047	47,475	47,469	46,247	559	45,991	47,518	46,020	43,870	494,827
Kufr Asad Well 4	AE3011	L	0	0	0	27,529	29,216	28,399	28,566	29,354	28,539	29,242	28,320	26,998	256,163
Kufr Asad Well 5	AE3014	L	50,512	41,859	44,824	48,537	51,127	49,698	49,991	51,369	49,943	51,174	49,560	47,247	585,841
Kufr Asad Well 6	AE3015	L	54,101	44,848	44,851	51,978	54,780	53,248	53,562	55,038	53,510	54,829	53,100	50,622	624,467
Ein Qoalbh Well	AD3129	L	46,008	39,737	39,754	57,440	59,282	57,241	59,358	52,543	51,581	53,102	45,839	46,947	608,832
Bani Kinana Total Local			248,031	216,540	230,271	290,226	306,809	299,925	303,269	251,400	288,844	297,263	281,127	273,844	3,287,549
Bani Kinana Total Main															
Bani Kinana Total			248,031	216,540	230,271	290,226	306,809	299,925	303,269	251,400	288,844	297,263	281,127	273,844	3,287,549

Al Koura

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Jdita Well 1	AB1363	L	40,471	41,575	50,490	42,004	41,838	45,753	41,887	46,760	48,796	55,380	54,703	54,212	563,869
Jdita Well 2	AB3005	L	26,117	14,775	26,973	27,094	27,318	28,286	27,334	26,322	48,548	34,644	34,436	33,575	355,422
Ein Al Hamam Well 1	AF1001	L	3,463	2,916	49,214	53,043	53,270	53,130	53,369	51,177	53,104	40,891	45,991	28,911	488,479
Hamam Well 2	AF1002	L	38,485	54,712	69,761	67,649	67,781	69,703	67,807	64,791	68,773	69,866	56,570	50,571	746,469
Hamam Well 4	AF1003	L	310	0	0	0	0	0	0	25,606	25,396	25,924	25,603	25,620	128,459
Hamam Well 5	AF1004	L	39,046	32,757	40,640	38,225	38,324	46,195	38,425	36,334	48,145	48,329	36,529	26,117	469,066
Bait Idis Well	AG3006	L	30,119	30,836	30,298	29,220	29,350	29,861	29,359	30,328	30,861	31,327	30,907	31,135	363,601
Al Koura Total Local			178,011	177,571	267,376	257,235	257,881	272,928	258,181	281,318	323,623	306,361	284,739	250,141	3,115,365
Al Koura Total Main															
Al Koura Total			178,011	177,571	267,376	257,235	257,881	272,928	258,181	281,318	323,623	306,361	284,739	250,141	3,115,365

Total of Local Sources in West			1,230,050	1,095,368	1,323,019	1,474,726	1,538,428	1,466,870	1,509,057	1,467,893	1,507,884	1,498,878	1,476,271	1,324,451	16,912,895
Total of Main Sources in West			2,085,845	1,410,240	1,633,685	1,598,520	1,678,165	1,594,709	1,616,499	1,631,258	1,672,539	1,601,033	1,533,881	1,506,919	19,563,293
Total of Western Sources			3,315,895	2,505,608	2,956,704	3,073,246	3,216,593	3,061,579	3,125,556	3,099,151	3,180,423	3,099,911	3,010,152	2,831,370	36,476,188

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
(2) Eastern Wells															
Ramtha															
Border Deep Well	AD1281	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Almhace Well 6	AD1295	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Almhace Well 6 a	AD3112	N (L)	New Installation in 2012 (High TDS, NC				0	0	0	0	0	0	0	0	0
Almhace Well 6 b	AD3113	N (L)	New Installation in 2012 (High S, Fe, Turbidity)					0	0	0	0	0	0	0	0
AlmhaceWell 5	AD1296	L	12,568	11,322	13,043	12,091	16,070	14,938	17,409	18,072	16,748	16,652	13,379	13,675	175,967
Turrah Well 1	AD3008	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 1	AD3021	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 2	AD3022	L	26,612	19,853	9,448	14,938	18,972	17,339	17,225	16,122	11,925	23,096	28,390	34,346	238,266
Jaber Well 3	AD3023	L	10,616	7,318	9,886	9,294	9,438	8,873	8,954	8,609	8,372	8,390	469	0	90,219
Jaber Well 4	AD3024	L	38,594	34,702	37,269	20,679	38,986	37,453	38,432	38,966	39,941	41,121	39,701	35,108	440,952
Jaber Well 5	AD3025	L	17,978	15,976	17,439	16,718	16,881	11,106	15,804	7,291	14,529	15,038	12,719	13,466	174,945
Jaber Well 7	AD3044	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Turrah Well 3	AD3045	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 6	AD3047	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well 8	AD3058	L	53	26,649	34,713	30,865	24,891	31,990	38,123	34,983	36,810	37,606	36,181	36,180	369,044
West Ramtha Well 2	AD3121	L	41,157	38,263	39,861	39,185	45,911	43,538	43,450	40,373	39,393	43,329	42,015	41,909	498,384
Ramtha Total Local			147,578	154,083	161,659	143,770	171,149	165,237	179,397	164,416	167,718	185,232	172,854	174,684	1,987,777
Ramtha Total Main															
Ramtha Total			147,578	154,083	161,659	143,770	171,149	165,237	179,397	164,416	167,718	185,232	172,854	174,684	1,987,777
Bani Ubaid - Al Mazar															
Name of Water Source	**Well code**	**Classification**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Total**
No'aymeh Well 1	AD1219	L	40	396	4,249	4,795	24,838	27,968	16,303	5,388	18,375	17,346	3,115	2,505	125,318
No'aymeh Well 2	AD1220	L	6,782	7,270	6,116	8,497	11,458	18,848	16,971	18,282	18,479	17,346	13,119	16,300	159,468
No'aymeh Well 3	AD3011	L	65	198	1,738	1,700	8,942	9,196	9,004	9,000	7,014	6,506	1,738	2,494	57,595
No'aymeh Well 4	AD3127	L	51,607	48,206	51,946	44,781	44,038	37,514	47,791	48,054	46,411	45,540	45,350	46,019	557,257
No'aymeh Well 5	AD3139	L	781	5,267	8,599	10,704	14,796	20,838	19,149	15,495	10,744	10,514	9,627	6,645	133,159
Bani Ubaid Total Local			59,275	61,337	72,648	70,477	104,072	114,364	109,218	96,219	101,023	97,252	72,949	73,963	1,032,797
Bani Ubaid Total Main															
Bani Ubaid Total			59,275	61,337	72,648	70,477	104,072	114,364	109,218	96,219	101,023	97,252	72,949	73,963	1,032,797
Jerash															
Name of Water Source	**Well code**	**Classification**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Total**
Kufr Khal Well	AD3060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Qairawan Spring	AL0672	L	42,973	50,344	51,942	66,078	64,667	8,062	7,007	65,766	57,393	60,268	74,264	50,965	599,729
Sakib Booster Station	AL0740	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Ghadeer Spring	AL0748	L	0	0	0	0		0	0	0	0	0	0	0	0
Ein Al Teis Spring	AL0758	L	56,681	63,164	87,558	75,526	54,491	42,539	28,094	33,650	27,896	20,789	25,359	22,935	538,682
Ain Al Deek Spring	AL0760	L	634	5	0	8,313	52,642	42,529	65,082	50,663	41,843	38,147	38,572	34,406	372,836
Burma Tank Well	AL0931	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Umm Mararh Spring	AL0993	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Souf Al Gharbi West Well	AL1429	L	5,071	7,533	11,356	9,622	17,211	17,960	15,654	10,918	10,808	9,424	8,922	7,960	132,439
Suof Esh Sharqi East Well	AL2358	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Rayashi Well	AL2360	L	12,321	18,822	19,488	44,275	5,390	10,429	10,999	11,992	12,988	13,003	12,005	12,003	183,715
AL Shawahed Al Shargi Well	AL2716	L	16,695	12,206	15,652	23,938	27,022	22,296	22,008	28,369	22,520	23,827	22,265	24,305	261,103
AL Shawahed Al Gharbi Well	AL2717	L	91	8,859	9,267	1,406	11	3,981	90	0	0	0	0	0	23,705
Jerash Al Maleh Well 2	AL3120	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Wadi Ed Dear Al Shargi Well	AL3352	L	27,254	22,778	26,822	20,504	30,208	28,370	25,035	35,826	27,843	28,465	25,401	2,243	300,749

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Bab Amman Well	AL3378	L	0	0	0	0	3,194	3,500	3,739	5,139	2,543	1,328	0	0	19,443
Al Majar Well 2	AL3380	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Talat Aruz Well 1	AL3546	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Debbein Well	AL3548	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Riyashi Well 3	AL3792	L	1,503	1,994	9,937	9,997	13,970	13,996	13,012	12,008	12,988	13,003	12,997	13,003	128,408
Um Qantarah Well	AL3820	L	6,951	3,030	9,946	9,997	11,987	12,988	13,003	13,000	12,005	12,995	12,005	12,003	129,910
Rumman Well	AL3620	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Burma Well	AL3854	L	8,925	5,870	10,815	3,415	7,963	7,998	8,002	8,000	7,998	8,002	7,998	8,002	92,988
Said Jacob Heirs Well		L	0	0	0	21,633	0	0	0	0	0	0	0	0	21,633
Faisal Nursery of Jabh Well		L	136,560	124,420	142,630	131,130	145,610	150,400	154,490	159,320	154,690	156,920	160,780	130,360	1,747,310
Faisal Nursery of Jerash Well		L													0
Gharaibeh Well		L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Shawahed Al Shargi Well		L	0	0	0	0	0	0	0	0	0	0	0	0	0
Maleh (farmers) Well (maintenance)		L	1,443	0	0	0	0	0	8,974	12,015	15,022	8,960	4,991	3,816	55,221
Jerash Total Local			317,102	319,025	395,413	425,834	434,366	365,048	375,189	446,666	406,537	395,131	405,559	322,001	4,607,871
Jerash Total Main															
Jerash Total			317,102	319,025	395,413	425,834	434,366	365,048	375,189	446,666	406,537	395,131	405,559	322,001	4,607,871

Ajloun

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Halawa / Zuqaiq Well 2	AB3152	L	30,074	25,291	43,593	40,560	42,206	37,041	32,275	50,795	44,646	47,265	47,812	35,743	477,301
Ain Rason Spring	AH0506	L	256	0	13,897	15,241	16,189	9,820	17,186	20,481	20,149	18,080	16,108	12,071	159,478
Ain Al Tanour Spring	AH0510	L	48,312	103,382	82,986	132,382	140,295	139,870	119,763	104,641	90,016	84,903	82,025	75,585	1,204,160
Faouar Spring	AJ0510	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Qantara Spring	AJ0520	L	29,960	53,823	84,599	75,270	63,761	51,278	50,768	45,347	38,642	36,214	29,954	53,262	612,878
Zuqaiq Spring 1	AJ0580	L	2,081	0	0	0	0	63,775	64,953	58,156	72,339	66,099	54,128	62,691	444,222
Ain Jana Spring	AJ0582	L	8,965	8,943	11,842	9,580	10,819	7,012	6,985	7,400	7,205	4,460	4,583	4,484	92,278
Ein Umm Qasem Spring	AK0521	L	6,757	7,856	9,855	10,073	11,215	9,120	10,318	10,993	10,578	9,912	9,124	7,990	113,791
Safsafa Well 2	AK1016	L	4,706	357	5,919	11,466	10,112	12,538	2,460	8,448	8,128	7,730	6,746	3,959	82,569
Zuqaiq PS 3	AH3007	L	26,866	28,608	28,922	27,347	28,047	28,269	29,003	25,082	23,979	24,831	25,940	18,889	315,783
Total Ajloun Local			157,977	228,260	281,613	321,919	322,644	358,723	333,711	331,343	315,682	299,494	276,420	274,674	3,502,460
Total Ajloun Main															
Total Ajloun			157,977	228,260	281,613	321,919	322,644	358,723	333,711	331,343	315,682	299,494	276,420	274,674	3,502,460

Mafraq (1)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Sumaya Well 3	AD1121	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 4	AD1122	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 5	AD1123	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 6	AD1124	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 7	AD1125	L	10,234	7,879	5,311	1,841	7,822	1,002	0	0	0	0	0	0	34,089
Sumaya Well 8	AD1126	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 9	AD1127	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumaya Well 11	AD1278	L	18,908	15,190	135	0	0	0	0	0	0	0	0	0	34,233
Jaber El Sarhan Well	AD1327	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Hudud (Jaber Custom) Well 7	AD3004	L	17,611	12,492	13,841	12,058	21,058	18,295	2,083	19,469	10,519	12,198	16,873	17,937	174,434
Um Es Serb Well	AD3005	L	4,767	1,210	357	4,649	10,503	9,387	10,077	9,797	5,316	2,146	3,581	668	62,458
Suwelmeh Well 3	AD3040	L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Zubaideyeh Well	AD3056	L	24,518	25,415	31,896	31,171	33,084	25,044	208	0	0	0	0	0	171,336
Sumaya Well 12	AD3057	L	72	0	0	0	0	1,869	4,829	5,435	4,162	4,153	4,893	7,001	32,414
Suwelmeh Well 4	AD3061	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 17	AL1023	L	0	0	0	0	0	0	0	0	0	0	0	0	0

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Khaldyeh Well 30	AL1037	L	6,854	6,786	8,209	10,729	10,456	6,650	6,733	6,752	6,334	6,800	6,313	6,264	88,880
Khaldyeh Well 21	AL1748	L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Za'atary Well 3	AL2710	M	0	0	0	0	0	0	14,879	121	0	0	0	0	15,000
AL Za'atary Well 4	AL3002	M	9,992	81	0	0	0	0	0	0	8,925	75	8,925	9,002	37,000
AL Za'atary Well 5	AL3003	M	10,000	81	0	0	0	0	9,919	81	9,917	83	9,917	10,003	50,001
AL Kum Al Ahmer Well	AL3132	L	0	0	0	0	0	0	0	0	0	0	0	0	0
AL Za'atary Well 7	AL3375	M	18,516	19,475	174	0	0	0	20,335	165	20,329	171	20,329	20,506	120,000
AL Za'atary Well 9	AL3376	M	8,016	11,957	10,026	9,997	10,003	115	9,919	81	9,917	83	9,917	10,003	90,034
AL Za'atary Well 10	AL3377	M	12,600	102	0	0	0	0	0	0	12,495	105	12,495	12,603	50,400
Dogmusseh Well	AL3382	L	6,023	6,119	7,137	7,061	7,124	6,519	7,044	6,093	6,241	7,283	5,876	5,802	78,322
AL Za'atary Well 6	AL3463	M	0	0	0	0	0	0	7,440	60	0	0	0	0	7,500
Znaieh Well 3	AL3483	L	72,081	54,344	65,343	60,192	65,236	68,112	48,094	63,614	42,845	46,820	22,178	33,205	642,064
Mafraq (1) Total Local			161,068	129,435	132,229	127,701	155,283	136,878	79,068	111,160	75,417	79,400	59,714	70,877	1,318,230
Mafraq (1) Total Main			59,124	31,696	10,200	9,997	10,003	115	62,492	508	61,583	517	61,583	62,117	369,935
Mafraq (1) Total			220,192	161,131	142,429	137,698	165,286	136,993	141,560	111,668	137,000	79,917	121,297	132,994	1,688,165

Mafraq (2)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Znaieh Well 4	AL3484	L	7,926	11,011	12,759	13,572	13,565	10,629	9,992	11,663	8,633	8,217	9,457	13,156	130,580
Znaieh Well 5	AL3485	L	32	12,250	13,834	7,969	10,944	11,117	41,706	30,502	25,908	23,741	21,951	12,610	212,564
AL Kum Al Ahmer Well 2a	AL3564	L	14,381	22,252	201	22,229	15,533	15,557	9,108	6,104	10,788	11,119	12,786	14,387	154,445
Irhab (Hamamit Alamoush) Well	AL3660	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well 96-2	AL1193	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 104	AL1225	M	57,000	53,970	57,022	56,985	57,511	57,485	47,100	47,000	46,987	48,005	387	56,540	585,992
Al Aqeb Well K 95	AL1241	M/L	107	0	0	0	0	0	0	59,040	480	0	0	0	59,627
Al Aqeb Well K 101-1	AL1244	M	22,169	49,828	47,184	53,236	52,697	47,755	43,051	40,024	323	0	0	42,653	398,920
Al Aqeb Well K 102	AL1265	M	60,000	56,975	57,049	56,985	58,007	57,984	38,385	39,202	39,199	40,004	59,823	60,016	623,629
Al Aqeb Well K 102.5	AL1273	M	43,527	39,761	41,821	43,608	44,562	42,233	44,097	43,438	35,596	29,045	29,854	9,359	446,901
Al Aqeb Well K 106	AL1274	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 93-1	AL1485	M/L	43,455	52,245	61,969	63,608	66,513	63,146	65,076	64,827	62,012	61,837	59,999	65,273	729,960
Al Aqeb Well K 94	AL1486	M	34,500	32,488	35,504	35,490	35,510	35,490	41,461	35,548	41,440	41,511	45,951	34,605	449,498
Um AL Jemal Well 1	AL1490	M	19,448	45,830	50,570	53,540	61,568	57,635	59,023	50,663	48,960	36,180	33,854	34,144	551,415
Rawdah Ameera Basma Well	AL1491	M	40,000	37,983	40,017	39,989	40,507	40,489	40,511	40,004	38,998	40,002	38,998	40,002	477,500
Sabha and Sobheya/El Balad Well	AL1493	L	17,639	12,166	14,708	8,151	68	0	0	0	0	0	0	0	52,732
Al Aqeb Well K 103-1	AL1495	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 90	AL1558	M	40,434	38,495	40,838	41,032	42,126	38,778	66,050	69,060	58,605	39,361	43,186	34,181	552,146
Al Aqeb Well K 107	AL2689	M	47,606	27,703	31,216	31,363	31,102	31,083	31,099	27,033	26,993	27,007	26,001	25,076	363,282
Alharrara Well	AL2709	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 94.5	AL3004	M	62	0	0	0	0	0	0	3,317	7,593	64	0	0	11,036
Am'ra and A'meira Well 1	AL3018	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Am'ra and A'meira Well 2	AL3019	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K 96-1	AL3362	M	33,500	32,480	32,528	33,483	33,509	33,491	33,509	27,052	28,976	29,504	33,459	33,509	385,000
AL Zamlah (Zamlehet Al Ameer Gazi) We	AL3422	M	29,052	21,046	31,853	21,240	24,482	43,983	57,900	23,282	34,894	35,009	34,991	35,505	393,237
Al Aqeb Well K 93.5	AL3423	M/L	40,866	33,775	55,306	39,886	32,018	25,049	25,007	25,000	24,993	208	65,450	550	368,108
Al Aqeb Well K 91.5	AL3452	L	54,000	50,980	55,012	54,985	55,015	54,985	50,551	52,484	53,478	54,506	53,990	54,015	644,001
Al Aqeb Well K 101-2	AL3513	M	54,559	34,163	29,650	34,645	38,310	27,212	27,008	29,976	242	0	992	8	276,765
Al Aqeb Well K 106	AL3517	M	41,615	66,576	55,501	24,142	48,974	397	48,774	51,265	49,379	52,091	50,576	58,271	547,561
Al Aqeb Well K 103-2	AL3518	M/L	32,500	32,472	34,512	33,499	33,509	61,807	27,788	50,634	47,443	48,744	32,622	32,509	468,039
Station Khcaa Slitin Well	AL3557	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Mafraq (2) Total Local			139,366	154,740	156,606	160,788	146,876	147,518	157,873	170,087	149,638	137,911	161,261	131,574	1,814,238
Mafraq (2) Total Main			595,012	609,709	642,448	608,849	649,154	608,787	649,323	657,031	542,282	488,244	493,066	524,795	7,068,700
Mafraq (2) Total			734,378	764,449	799,054	769,637	796,030	756,305	807,196	827,118	691,920	626,155	654,327	656,369	8,882,938

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total

Mafraq (3)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Um AL Jemal Well 3	AL3563	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Daba'an DP5A Well	AL3647	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K111p	F1079	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K124	F1124	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K136	F1125	L	20,629	23,959	34,636	36,803	36,929	34,170	39,335	44,745	43,623	39,710	47,728	26,685	428,952
Al Aqeb Well K134	F1305	L	18,454	15,495	12,773	9,380	25,843	20,158	23,084	19,923	21,464	25,462	26,138	26,392	244,566
Al Aqeb Well K114	F1310	M	38,499	37,766	39,925	41,574	41,377	39,267	40,794	39,807	38,956	325	0	0	358,290
Al Aqeb Well K 112	F1312	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Abu Karza Well	F1316	L	0	0	0	0	0	0	0	37	2,988	1,821	372	241	5,459
Al Aqeb Well K110	F1333	M	55,500	53,470	54,538	54,981	56,007	55,985	49,072	49,000	48,987	49,509	49,487	55,465	632,001
Al Aqeb Well K109	F1389	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukefteh Well 1	F3523	L	25,609	24,900	28,121	27,276	26,830	26,859	26,594	28,008	7,295	47,650	12,186	10,359	291,687
Mukefteh Well 2	F3524	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K133	F3530	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Mukefteh Well 3	F3761	L	7,652	4,751	463	1,152	13,046	4,645	14,914	11,914	8,104	11,920	6,968	4,371	89,900
Safawi Well	F3903	L	15,014	13,005	13,011	12,997	12,508	13,984	9,342	9,002	8,998	9,002	4,932	41	121,836
Al Aqeb Well K111a	F3930	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Aqeb Well K140	F3935	L	7,742	4,043	9,166	18,552	14,924	10,580	16,549	19,431	19,605	3,399	26	0	124,017
Al Aqeb Well K124	F3946	L	11,380	15,962	26,835	31,861	4,338	121,339	50,691	13,294	12,997	11,998	11,978	100	312,773
Al Rafayyat Well 1	F3987	L	18,122	17,409	22,322	22,390	22,156	20,887	21,707	20,943	20,809	17,136	15,055	14,737	233,673
Sumaya Well 3b	AD 3124	L	46,714	43,890	49,708	39,584	44,779	31,913	41,463	37,328	38,789	38,823	39,743	47,375	500,109
Al Harara /Thermal Well 1b	AL3889	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 3	H1060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 1	H2015	L	36,720	31,497	34,855	33,939	36,443	34,214	28,329	49,004	28,026	37,610	35,260	36,212	422,109
Rwashed Well 4	H3060	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 5	H3064	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Rwashed Well 6	H3069	L	26,845	22,391	22,022	28,555	23,960	18,043	29,670	30,498	16,762	25,382	22,067	14,515	280,710
Al salheh Na'aem Well	H3070	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Khaldyeh Well 24	AL1030	L	7,878	7,647	9,874	12,855	11,477	7,663	7,725	8,648	8,222	8,848	8,344	8,631	107,812
Suwelmeh Well 1	AD1262	L	27,284	27,303	22,788	29,260	35,011	27,300	23,641	21,321	20,951	24,186	22,441	24,722	306,208
Mafraq (3) Total Local			270,043	252,252	286,574	304,604	308,244	371,755	333,044	314,096	258,633	302,947	253,238	214,381	3,469,811
Mafraq (3) Total Main			93,999	91,236	94,463	96,555	97,384	95,252	89,866	88,807	87,943	49,834	49,487	55,465	990,291
Mafraq (3) Total			364,042	343,488	381,037	401,159	405,628	467,007	422,910	402,903	346,576	352,781	302,725	269,846	4,460,102

Mafraq (4)

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Mfaradat Well (New)	AL3705	L	3,375	3,300	4,621	5,622	5,782	5,669	6,510	5,749	6,450	6,398	5,650	4,147	63,273
Mukefteh Well 4 (New)	F4140	L	7,605	18,920	27,825	27,499	25,344	23,364	23,360	22,219	25,243	37,837	18,453	19,497	277,166
Al jbbea Well (New)	F4139	L	12,566	102	20,259	20,419	20,009	20,986	15,054	15,000	14,004	14,004	13,996	14,004	180,403
Al Aqeb Well K112 (New)	F4184	M	135	0	22,528	16,133	3,726	29	0	40,091	326	0	0	22,815	105,783
Al Aqeb Well K113	F4229	M	49,597	403	54,556	55,481	56,011	55,985	56,015	56,000	452	0	0	0	384,500
Al Aqeb Well K109	F4171	M	0	0	0	0	0	0	54,556	58,260	52,935	64,925	58,517	67,318	356,511
Znaieh Well 6 (New)	AL3713	L	12,989	10,130	12,132	16,140	14,434	14,992	14,836	16,381	14,460	14,315	13,208	15,162	169,179
Khaldye Wellh 20	AL1026	L	8,924	7,935	7,244	58	0	8,878	9,955	9,918	9,507	9,713	9,234	9,563	90,929
Sumaya Well 5 (New)	AD3078	L	121	14,375	26,161	19,465	20,738	15,828	11,969	6,362	51	0	0	0	115,070
Rwashed Well 2	H1012	L	2,500	2,498	2,502	20	16,712	16,843	20,066	20,001	18,011	18,005	17,995	150	135,303
Rwashed Well 7	H3074	L	0	0	8,531	8,384	70	0	8,570	22,971	17,798	148	0	0	66,472
Znaieh Well 7	AL3791	L	55,020	445	22,782	50,291	60,863	59,201	57,009	61,915	56,205	49,947	47,291	48,899	569,868
Al Aqeb Well K103b	AL3832	M	43,000	49,900	50,043	49,987	50,509	50,486	30,179	31,984	31,991	32,009	41,908	43,003	504,999

Name of Water Source	Well code	Classification	January	February	March	April	May	June	July	August	September	October	November	December	Total
Am'ra and A'meira Well 2a (New)	AL3797	L	8,562	3,089	44,970	43,554	48,637	19,119	18,910	37,302	43,618	44,018	44,088	43,933	399,800
Alkum Alhmar Well	AL3911	L	19,645	34,103	36,513	35,996	36,973	34,430	36,001	35,644	29,604	36,030	34,649	36,029	405,617
Jaber Well 9	AD3077	L	9,824	7,762	6,667	6,581	5,977	5,755	6,038	5,188	42	0	0	0	53,834
Jaber Bridge Well	AD3118	L	32,774	24,105	31,296	31,023	31,265	28,902	28,621	27,761	27,120	24,935	21,858	19,749	329,409
Economic Well 1	AL3908	M	50,000	47,975	48,041	48,515	46,659	48,916	45,045	45,000	44,988	46,004	45,988	49,980	567,111
Economic Well 2	AL3909	M	28,500	28,475	33,980	34,487	34,409	318	21,708	34,413	25,071	25,999	28,472	28,508	324,340
Economic Well 3	AL3910	M	45,084	37,350	42,008	43,972	34,037	35,038	40,882	40,920	330	20,915	40,708	341	381,585
Economic Well 4	AL3914	M	41,000	40,965	43,019	43,484	50,165	53,314	50,247	50,207	34,572	42,464	41,001	41,011	531,449
Economic Well 5	AL4240	M	61,000	57,974	59,042	58,984	58,999	11,384	43,737	44,000	42,997	56,899	59,960	61,008	615,984
Um Qutain Well	AL3863	L	1,414	11	1,782	2,722	2,849	1,941	1,937	32	2,975	3,001	2,999	3,001	24,664
Sabha Well 1b (New)	AL3956	L	1,190	20	7,103	25,670	26,997	20,051	20,005	55,868	52,020	52,014	51,986	36,143	349,067
Sumaya Well 6b	AD3140	L	85,690	78,543	7,076	29,188	28,880	36,893	92,095	83,411	87,070	87,147	67,574	28,272	711,839
Corridor 1	AL3475	M	0	0	0	0	0	0	0	59,040	57,600	59,520	57,600	59,520	293,280
Corridor 2	AL3476	M	0	0	0	0	0	0	0	47,637	47,097	44,952	47,962	46,280	233,928
Corridor 17	AL3768	M	0	0	0	0	0	0	0	41,616	42,126	41,929	41,988	26,752	194,411
Corridor 4	AL3478	M	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaber Well (Rent) Well	-	L	24,926	23,501	17,630	19,577	24,485	20,562	18,497	11,633	17,683	0	0	0	178,494
Jaber Suwelmeh (Rent) Well	-	L	9,428	13,878	16,113	12,433	12,588	17,368	20,388	23,278	20,161	0	0	0	145,635
Al jama'a Well	-	M	10,000	0	0	0	0	0	0	0	10,000	10,000	10,000	10,000	50,000
Khaldyeh Well 17	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabe Al Qade Well	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Al Bedor Well	-	L	52,900	42,770	0	0	9,880	0	52,710	49,850	49,760	5,518	51,960	0	315,348
Ali Salamah Well	-	L	0	0	0	0	0	11,554	14,172	12,674	10,998	18,256	22,611	25,358	115,623
Noaf Ali Well	-	L	0	0	0	70,403	67,845	50,339	58,345	61,865	68,954	47,893	26,526	0	452,170
Lafe Al Sa'aed Well	-	L	57,234	50,057	59,784	54,922	55,391	52,641	52,992	51,410	47,959	48,365	44,333	48,902	623,990
Naser Ata Allah Well	-	L	0	0	0	0	0	0	0	0	0	0	0	0	0
Abd Allh Abo A'alem Well	-	L	0	0	16,756	46,259	58,692	36,196	38,355	40,177	41,058	41,186	37,663	42,089	398,431
Taleb Al Zatary Well	0	L	0	0	0	0	6,349	83,845	101,381	87,592	97,531	96,867	100,603	0	574,168
Mafraq (4) Total Local			406,687	335,544	377,747	526,226	580,760	585,357	727,776	764,201	758,282	655,597	632,677	394,898	6,745,752
Mafraq (4) Total Main			328,316	263,042	353,217	351,043	334,515	255,470	342,369	549,168	390,485	445,616	474,104	456,536	4,543,881
Mafraq (4) Total			735,003	598,586	730,964	877,269	915,275	840,827	1,070,145	1,313,369	1,148,767	1,101,213	1,106,781	851,434	11,289,633
Total of Local Sources in East			1,659,096	1,634,676	1,864,489	2,081,319	2,223,394	2,244,880	2,295,276	2,398,188	2,232,930	2,152,964	2,034,672	1,657,052	24,478,936
Total of Main Sources in East			1,076,451	995,683	1,100,328	1,066,444	1,091,056	959,624	1,144,050	1,295,514	1,082,293	984,211	1,078,240	1,098,913	12,972,807
Total of Eastern Sources			2,735,547	2,630,359	2,964,817	3,147,763	3,314,450	3,204,504	3,439,326	3,693,702	3,315,223	3,137,175	3,112,912	2,755,965	37,451,743

(3) Total of Eastern and Western Wells

Total of Local Sources		2,889,146	2,730,044	3,187,508	3,556,045	3,761,822	3,711,750	3,804,333	3,866,081	3,740,814	3,651,842	3,510,943	2,981,503	41,391,831
Total of Main Sources		3,162,296	2,405,923	2,734,013	2,664,964	2,769,221	2,554,333	2,760,549	2,926,772	2,754,832	2,585,244	2,612,121	2,605,832	32,536,100
Total of Northern Governorate		6,051,442	5,135,967	5,921,521	6,221,009	6,531,043	6,266,083	6,564,882	6,792,853	6,495,646	6,237,086	6,123,064	5,587,335	73,927,931

Note:

In the Classification column, L indicates the wells, water of which is used in the locality in which it is located or in surrounding localities

M indicates the wells, that contribute its water to the main transmission line either coming from wadi al-arab in west to Zebdat PS or coming from Zata'ary PS in the east to Hofa Reservoir