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# FEMIP

## Executive summary of the Final Report

Jordan - Wadi Al Arab Water Sector PPP



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## GLOSSARY

<b>Arab Spring:</b> the series of protests and demonstrations across the Middle East and North Africa beginning in December 2010 and continuing throughout 2011, which is widely known as the “Arab Spring” or “Arab Revolution”	<b>ICAO:</b> International Civil Aviation Organisation	<b>MWI:</b> Ministry of Water and Irrigation
<b>ASEZ:</b> Aqaba Special Economic Zone	<b>ICC:</b> International Chamber of Commerce	<b>NGOs:</b> Non-Governmental Organisations
<b>ASEZA:</b> Aqaba Special Economic Zone Authority	<b>ICSID:</b> International Centre for Settlement of Investment Disputes	<b>NGWA:</b> Northern Governorates Water Authority (now Yarmouk Water Company)
<b>BOO:</b> Build Own Operate	<b>IFC:</b> International Finance Corporation	<b>NPV:</b> Net Present Value
<b>BOOT:</b> Build Own Operate Transfer	<b>IFI:</b> International Financial Institution	<b>NRW:</b> Non Revenue Water
<b>BOT:</b> Build Operate Transfer	<b>IMF:</b> International Monetary Fund	<b>NWMP:</b> National Water Master Plan
<b>BTO:</b> Build Transfer Operate	<b>IPP:</b> Independent Power Project	<b>OPIC:</b> Overseas Private Investment Corporation
<b>CBJ:</b> Central Bank of Jordan	<b>IRR:</b> Investment Rate of Return	<b>PA:</b> Projects Administration
<b>CSC:</b> Common Services Councils	<b>JBIC:</b> Jordan Bank for International Co-operation	<b>Phase 1 Report:</b> The report entitled “FEMIP Study on PPP Legal & Financial Frameworks in the Mediterranean Partner Countries”, volumes 1 to 3.
<b>DBFO:</b> Design Build Finance Operate	<b>JIB:</b> Jordan Investment Board	<b>PMU:</b> Performance Management Unit
<b>Draft PPP Law:</b> Draft PPP Law dated March 2013	<b>JISM:</b> Jordan Institute for Standards and Metrology	<b>PPP:</b> Public Private Partnership
<b>DSCR:</b> Debt Service Cover Ratio	<b>JOD:</b> Jordanian Dinar	<b>Privatization Law:</b> Privatization Law no. 25 of the year 2000
<b>ECA:</b> Export Credit Agencies	<b>JRSP:</b> Jordan Red Sea Project	<b>Privatization Regulation:</b> Privatization Regulation no. 80 of the year 2008
<b>EC:</b> European Commission	<b>JVA:</b> Jordan Valley Authority	<b>Project SPV:</b> An SPV set up for the purposes of the Project
<b>EDC:</b> Economic Development Committee	<b>KAC:</b> King Abdullah Canal	<b>QAIA:</b> Queen Alia International Airport
<b>EIA:</b> Environmental Impact Assessment	<b>KEXIM:</b> Export-Import Bank of Korea	<b>RFP:</b> Request for Proposals
<b>EIB:</b> European Investment Bank	<b>KfW:</b> KfW Bankengruppe	<b>Risk Matrix:</b> The risk matrix set out at Appendix B of this Report
<b>EPC:</b> Executive Privatization Commission	<b>LLCR:</b> Loan Life Cover Ratio	<b>ROU:</b> Regional Operating Units
<b>EOI:</b> Expression of Interest	<b>LPCD:</b> litres per day per capita	<b>SPV:</b> Special Purpose Vehicle
<b>EU:</b> European Union	<b>MCM:</b> Million Cubic Metres	<b>TUR:</b> Turkey
<b>EUR:</b> Euro	<b>MEMR:</b> Ministry of Energy and Mineral Resources	<b>UK:</b> United Kingdom
<b>GAM:</b> Greater Amman Municipality	<b>MMA:</b> Ministry of Municipal Affairs	<b>USD:</b> United States Dollar
<b>GDP:</b> Gross Domestic Product	<b>MoA:</b> Ministry of Agriculture	<b>WAJ:</b> Water Authority of Jordan
<b>GOJ:</b> Government of Jordan	<b>MoE:</b> Ministry of Environment	<b>WHO:</b> World Health Organisation
<b>HICP:</b> Harmonised Index of Consumer Prices	<b>MoF:</b> Ministry of Finance	<b>WSAU:</b> The Water Sector Audit Unit
<b>IATA:</b> International Air Transport Association	<b>MoH:</b> Ministry of Health	<b>WTP:</b> Water Treatment Plant
	<b>MoP:</b> Ministry of Planning	<b>WWTP(s):</b> Wastewater Treatment Plant(s)
	<b>MoT:</b> Ministry of Transport	<b>YWC:</b> Yarmouk Water Company
	<b>MoU:</b> Memorandum of Understanding	
	<b>MPWH:</b> Ministry of Public Works and Housing	

## EXECUTIVE SUMMARY

### PURPOSE AND SCOPE OF THE REPORT

This Report is part of a regional EIB Facility for Euro-Mediterranean Investment and Partnership (FEMIP) Trust Fund study on Legal and Financial Frameworks in the Mediterranean Partner Countries<sup>1</sup>, which was published in 2011. During the presentation of this regional study in Casablanca in May 2011, Jordan was selected as a pilot country for the second phase of the study, which aims to make recommendations for developing a viable Public Private Partnership (PPP) project in the country.

The definition of PPP for the purposes of this Report is a partnership between the public and private sectors pursuant to a long term contractual agreement and covering the design, construction, financing and ongoing operation and maintenance of an infrastructure asset. These projects are project financed, i.e. lenders take project risk and are mostly concerned with cashflows generated by the project for the payment of the loan applied to construction of the asset and with the assets of the project, rather than relying primarily on the general creditworthiness of the private sector sponsors. Provided they are well-prepared and structured, with the right risk allocation, PPPs can contribute to enhance significantly a project's discipline (contributing to infrastructure assets being built on time and within budget, as well as operated efficiently).

The study is focused on providing recommendations for structuring a PPP transaction, from a technical, legal and financial perspective, based on a proposed project put forward by the Jordanian government authorities. The project is intended to be the first of a programme of similar PPPs to be implemented to help initiate further private sector investment in the national infrastructure of Jordan and increase capacity for wider private sector involvement in Jordanian infrastructure.

At the beginning of the assignment, several potential projects were put forward by the Government of Jordan (GO) authorities – the Ministry for Water and Irrigation (MWI) and the Water Authority of Jordan (WAJ) – collectively, MWI/WAJ – for consideration in the form of concept papers. These concepts, listed below, were reviewed for both suitability and feasibility to be procured through a PPP approach:

- A PPP project for Performance-based Non-Revenue Water (NRW) Reduction
- Establishing a Water Treatment/Desalination PPP in Wadi Al Arab
- A PPP for Energy Efficiency in the Water Sector
- A Biosolids Waste to Energy PPP
- A Water Management PPP for Wadi Al Arab and associated geographical area
- A new bulk water supply pipeline to transport water from the Wadi Al Arab area to the city of Irbid in Northern Jordan: the Wadi Al Arab Water Supply PPP project.

Following review of the above options and discussion with MWI and WAJ, it was determined by the Jordanian authorities that a new bulk water supply project to transport water from the Wadi Al Arab area to the city of Irbid in Northern Jordan (see Figure 1) was the preferred project, due to the relative urgency of the water scarcity issue affecting the country.

The Wadi Al Arab Water Supply PPP project (the "Project") consists of a water conveyance system to supply water through a 35km pipeline, providing 25 million cubic metres (MCM) per year of potable water to Irbid, located in Northern Jordan. With the Project, the 1.3 million inhabitants in the Irbid Governorate will receive additional potable water. MWI/WAJ provided existing study reports, data on water demand and water resource availability which has been used to derive the physical characteristics and construction/operating costs of the project. The financial evaluation of the project has been undertaken using recent projects as comparators in order to derive a likely financing solution and indicative tariff.

Figure 1: Location of Irbid



<sup>1</sup> This study can be downloaded at the EIB website ([www.eib.org/attachments/country/femip\\_study\\_on\\_ppp\\_en.pdf](http://www.eib.org/attachments/country/femip_study_on_ppp_en.pdf)).

## POPULATION GROWTH PLACES EXTREME STRESS ON LIMITED NATURAL WATER RESOURCES IN JORDAN

Jordan is classified by the World Bank as an upper middle income country, with estimated total GDP of USD 31.4 billion and GDP per capita of USD 4,340 in 2013. Despite limited natural resources (although there are relatively unexploited oil shale deposits), Jordan has a relatively diversified economy, with notable strengths in pharmaceuticals, fertilisers, potash, phosphate, tourism and travel. However, it is heavily reliant on foreign transfers both from Jordanians working abroad and also foreign government grants. The regional political turmoil since early 2011 has put pressure on the Jordanian economy and its public finances. In the face of continued minimal economic growth in its principal export markets in Europe and the USA and sustained high global energy and commodity prices, it is unlikely that the strong real economic growth rates enjoyed up to 2008 (of around 8% per annum) will be repeated in the near term. Specific effects of the regional turmoil on Jordan have included increases in energy costs arising from disruptions/delays in the supply of gas from Egypt; lower surface transit traffic; reduced tourism receipts; and increased strain on the country's economy and resources (especially water and energy) as a result of the influx of Syrian refugees. As a result, outstanding public debt has risen markedly since 2008 from 60% to 80% of GDP at the end of 2012<sup>2</sup>. However, foreign debt, at 22% of GDP at the end of December 2012, has remained steady as a proportion of GDP since 2008 and is low by international standards.

Jordan's arid climate and lack of abundant natural water resources continue to impact on its rapidly growing population. It ranks as the third weakest nation in terms of freshwater resources and availability worldwide, at 133m<sup>3</sup>/person/year. Water scarcity is therefore a key national issue for Jordan that needs to be addressed. The Government Water Sector Strategy for addressing this serious challenge looks at a combined approach of effective water demand management, efficient water supply operations and institutional reform.

Domestic water supplies are currently intermittent in the majority of urban and rural areas in Jordan. The situation has been partially alleviated since July 2013 following the commencement of operations on the Disi to Amman Water Conveyance System PPP project, that will add a further 100 MCM of water for Amman and surrounding areas through water transfer arrangements. Groundwater is a key resource for Jordan, but over abstraction in previous years has led to reduced water levels. According to the UN, in 2011 Jordan extracted 99.4% of all its renewable water resources.

Current water resources are insufficient to meet the required demand. Irrigation is a large percentage of overall water demand and therefore the government is taking steps to try to reduce this problem as a first priority and to reallocate higher quality water to domestic and municipal purposes.

MWI/WAJ forecasts that demand for potable water across Jordan will rise from 313 MCM per year in 2010 to 534 MCM per year in 2035. To put this into perspective, the deficit between supply and demand was around 60 MCM per year in 2010 and is predicted to worsen to a deficit of around 300 MCM by 2035. MWI/WAJ has been addressing this through its comprehensive Water Reallocation Strategy in 2010 which set out how new resources such as the Disi Project and the Jordan Red Sea Project (JRSP) will bring the country into a supply demand balance in around 2019/20. The JRSP was to be the largest contributor to the overall water balance, but in practice the project economics have forced GOJ to scale back the project and it is now being considered as part of a water sharing deal with Israel. GOJ announced the modified project in August 2013 with an overall desalination capacity of 200 MCM/yr and a USD 1 billion budget. No timeline was confirmed, but given the experience over the last decade with mobilising major project funding and in agreeing trans-boundary water issues, the 2019/20 target will be difficult to achieve and a 10 year development period with completion in 2023 is considered realistic.

## URGENT MEASURES ARE NEEDED TO ADDRESS WATER SHORTAGE IN IRBID...

Irbid, located approximately 70 km north of Amman, is the second largest of Jordan's 12 Governorates with a population of over 1 million. The Governorate is expected to grow further in population from 1.07 million in 2010 to 1.81 million by 2035 according to MWI/WAJ projections.

Irbid faces declining quantity and quality of water abstracted from aquifers that supply it. Current annual estimated unconstrained water demand in the region amounts to approximately 87 MCM (equivalent to approximately 131 litres per capita per day (LPCD)). However, supply constraints mean that current water consumption is significantly lower and the total water supplied from all the available Irbid water resources in 2015 is projected to be 32 MCM, or 56% of the estimated unconstrained demand. Assuming no increase in per capita demand, expected population growth alone in the region would increase annual demand from current levels to 64 MCM by 2020, and to 71 MCM by 2025 – i.e. 23% growth in 10 years. The current water deficit in the Irbid Governorate is around 25 MCM and, considering the expected population growth, it is expected to rise to over 50 MCM per year by 2035, if no further resources are made available.

<sup>2</sup> Central Bank of Jordan, *Monthly Statistical Bulletin – Table 1 (Main Economic Indicators)*, December 2012



Any project to increase supply must be accompanied by measures by WAJ and the Yarmouk Water Company (YWC) to reduce Non-Revenue Water (NRW) – both technical and commercial losses. The economic and social impact of a bulk water supply project is significantly reduced if (as is the case currently) approximately 20% of the water is lost in local distribution network losses, and a further 20% is not measured, nor billed and collected. While reducing NRW is essential, it will be difficult at this stage to include it in a Build-Operate-Transfer (BOT) PPP contract, as it would involve taking over the management of the whole Irbid pipeline distribution network from the YWC. Although this is possible technically, investors are unlikely to accept the financial risks stemming from the difficulty of controlling non-technical NRW. Instead, if GOJ is minded to have private sector involvement in reducing NRW, a bespoke management or O&M contract is more likely to be the appropriate contractual mechanism providing that an appropriate baseline measurement can be achieved and support from MWI/WAJ for limited capital investment interventions can be agreed.

The proposed Project would help to improve the continuity of supply, but it is important that the distribution system is improved in parallel to the construction of the new water supply infrastructure and in any event before the additional supply is made available. Previous studies by MWI and Yarmouk Water Company have identified the improvements to the distribution systems that are required in Irbid and GOJ is attempting to obtain funding to progress these improvements.

Analysis of water supply and demand in Irbid clearly shows that both the bulk water supply project and measures to reduce NRW need to be implemented – they are not competing alternative solutions.

### **THE OBJECTIVE OF THE PROJECT IS TO DELIVER A COST EFFECTIVE AND SECURE POTABLE WATER SUPPLY TO THE NORTHERN GOVERNORATES...**

The Project was conceived as a result of the pressing need to increase water supply to the Northern Governorates and in particular, the Irbid area. The successful bidder will design, build, finance and operate a bulk water supply pipeline and associated water treatment and pumping facilities, to provide an additional 25 MCM per year of potable water from the Wadi Al Arab area to the 1.3 million people of Irbid Governorate. This additional water, in association with other new resources, will assist in meeting the water supply deficit up to 2035.

The supply of water for the Project will be sourced from a reallocation of existing water resources or other water resources developed in other regions of Jordan. Therefore, under the scope of this Project, there is no need to develop new water resources.

### **...AS PART OF A WIDER WATER REALLOCATION STRATEGY FOR NORTHERN JORDAN.**

Irbid is one of the 4 Governorates that comprise the Northern Governorates area, together with Jerash, Ajloun and Mafrq. By 2035, additional water supplies of 60 MCM per year will be required to meet current and forecast potable water deficits. As reflected in its Water Sector Strategy, MWI plans to meet this deficit by providing the following additional water resources:

- 25 MCM per year from the Northern Jordan Valley (the proposed Project).
- 15 MCM per year from Abu Alanda reservoir in Amman (additional water delivered by the Disi project) through a new transmission pipeline to Khaw-Za'atry, and then to Hofa reservoir in Irbid.
- 20 MCM per year from Dabouq reservoir in Amman to the Jarash/Ajloun area.

### **THERE ARE SEVERAL AVAILABLE ALTERNATIVES FOR WATER RESOURCES IN THE PROJECT AREA...**

The geophysical nature of the study area is varied, with the city of Irbid located on a plateau at an elevation of around 500m above sea level, whilst the sources of water associated with the study area are generally in the low lying valley areas as low as 200m below sea level. More specifically, the sources of water relevant to the western region of the Irbid Governorate include:

- **Groundwater from the Wadi Al Arab well field.** This is the current major source of potable water for the city of Irbid and these wells are located in the Wadi Al Arab area at the Northern tip of Jordan near the Yarmouk River. The Wadi Al Arab supply is augmented by water supplied from the Manshyeh wells and the Tabaqat Fahel wells in the Jordan valley.
- **Groundwater from the Mukheiba wells located at the Northern boundary of Jordan near the Yarmouk River, at Al-Hamma town.** These artesian wells have been in operation for more than 25 years and water production has varied from 15-30 MCM per year. This well field is considered by MWI/WAJ to be a secure and a reliable water source. However, further investigation will be needed in the next stages of the Project to confirm the sustainable level of abstraction from this groundwater source. Currently, flow from this source is discharged into the Mukheiba canal which joins into the King Abdullah Canal (KAC) which supplies irrigation water in the Jordan valley and potable water to Amman (Zai Water Treatment Plant (WTP)).
- **Surface water from Lake Tiberias.** This is a key water source for Jordan and it supplies water into the KAC through the Deganya pipeline. The treaty between Israel and Jordan specifies the quantities and seasonality of the transfers from Lake Tiberias into the KAC.



- **Surface water from the Yarmouk River and the Al Wehdeh Dam.** The Yarmouk River is the primary source of water for the KAC. Water enters the KAC at Adassiya weir on the Yarmouk River. Flows in the Yarmouk River and the amount that Jordan can abstract from the river are controlled by the Al Wehdeh Dam sited on the border between Syria and Jordan. The amounts that Jordan can abstract from the river and the dam are set out in the Yarmouk River water agreements between Syria and Jordan and Israel and Jordan. MWI confirmed that WAJ actively reviews the management of the agreements and that further abstraction from a combination of the sources would be feasible.
- **Treated Wastewater.** The construction of a new MWI project is expected to be awarded in 2013 and includes the rehabilitation of the existing Central Irbid and the Wadi Arab wastewater treatment plant (WWTP) so that the effluent from these two plants, in addition to the effluent from the newly built Al-Shallalah WWTP, can be reused for irrigation purposes.

The existing West Transmission System network was developed in the mid-1980s and delivers approximately 20 MCM per year to Irbid (with a possible capacity of 25-28 MCM), carrying water from the Wadi Al Arab, Tabaqat Fahel and Manshyeh well fields to the Zabda (Zubdat Farkouh) Reservoir in Irbid. The two well fields are pumped from below sea level at the Wadi Arab PSo pump station, to join the flows from the Wadi Al Arab well field at the

Wadi Arab water treatment plant. From here, the flows are pumped successively at 3 booster pump stations PS<sub>1</sub>, PS<sub>2</sub> and PS<sub>3</sub> to reach Zabda reservoir in Irbid. The total pumping head from the base of the Jordan valley to Irbid is over 900m.

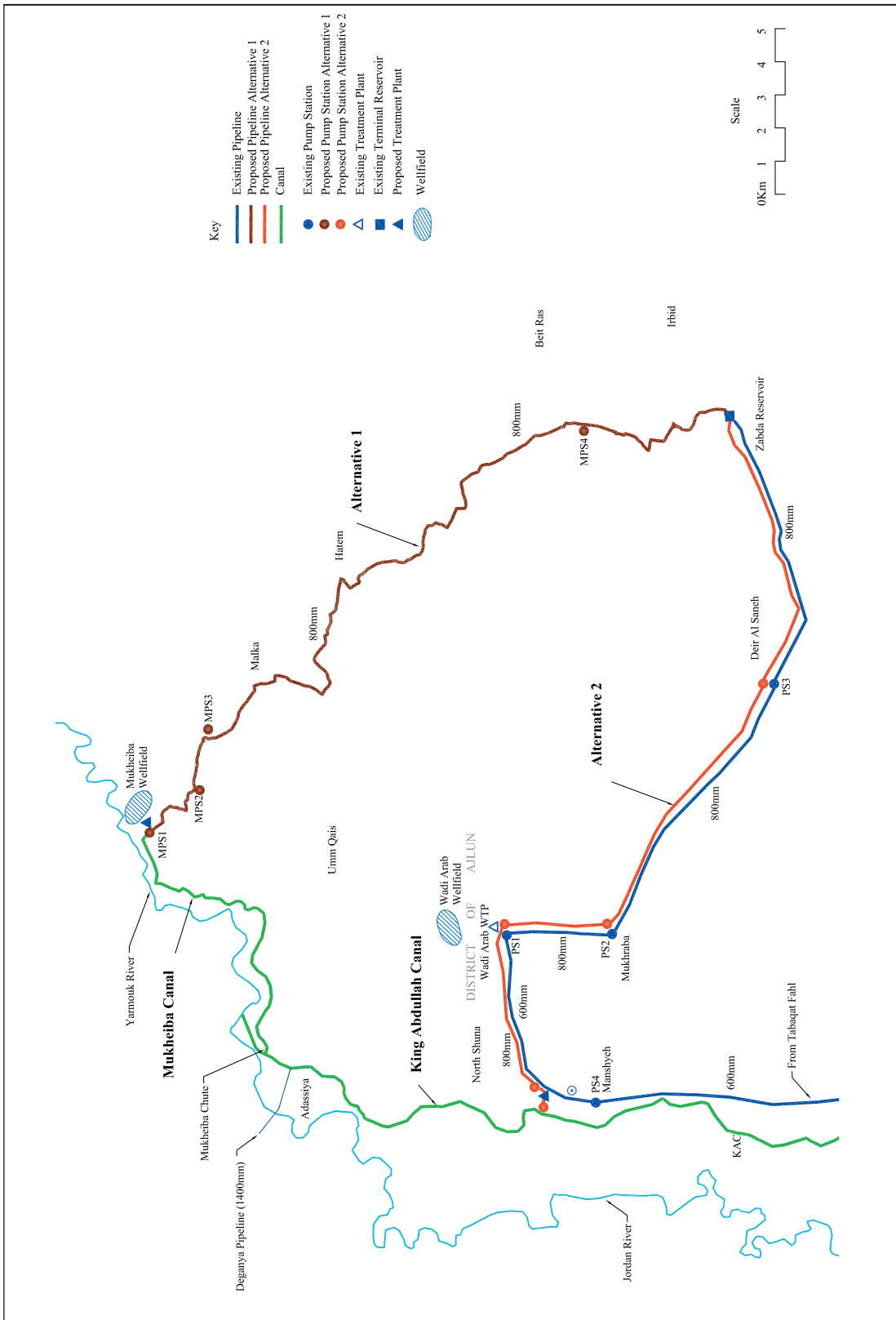
### ...AVAILABLE TECHNICAL ALTERNATIVES FOR THE PROPOSED PROJECT WILL REQUIRE SELECTION FOLLOWING FULL FEASIBILITY ASSESSMENT.

Two alternative technical solutions put forward by MWI/WAJ were analysed in order to identify potential advantages and disadvantages to help inform future project development. The two alternatives, shown in Figure 2 are:

- **Alternative 1:** taking groundwater directly from the **Mukheiba well field** and pumping this using a 35 km pipeline and four pump stations to Zabda reservoir in the city of Irbid; or
- **Alternative 2:** taking **surface water from the KAC** and pumping this using a 32 km pipeline and four pump stations to Zabda reservoir in the city of Irbid.

Although, the 715 metre difference in the level between the water source and the point of supply is significant, the designs and construction necessary to address this head difference are technically feasible. The specification for the pipelines and pumping equipment required will be within the capability of industry suppliers.

Figure 2: General Layout of Proposed Options



## ALTERNATIVE 1: MUKHEIBA WELL FIELD TO ZABDA RESERVOIR

The proposed scheme involves stopping the discharge of Mukheiba wells into the Mukheiba canal and, instead, diverting the water to supply 25 MCM per year to Zabda reservoir on the west of Irbid. The wells are artesian and no additional pumping is envisaged to extract water from below ground level. The pipeline route will be from the Mukheiba well field to Zabda reservoir in Irbid through the Bani Kenanah district. The scheme will comprise:

- The existing Mukheiba wells and any additional wells needed to provide a reliable 25 MCM per year.
- 20,000 cubic metre collection reservoir at Mukheiba well field.
- A new treatment works at Mukheiba with aeration, filtration and disinfection facilities.
- 800mm diameter ductile iron or steel transmission pipeline, with a length of 35 km.
- 4 pump stations with a total pumping head of 830m, each with balancing reservoirs and a surge control system.
- Connection works at the existing Zabda reservoir.
- Power supply, telemetry and SCADA systems.

This option has the benefit of introducing further resilience to the water supply as it follows an alternative route and new pump stations.

Limited information on the **water quality** from Mukheiba wells has been provided but the water can be characterised as follows:

- High hardness and total dissolved solids.
- Low turbidity, total organic carbon, iron and aluminium.
- High levels of hydrogen sulphide.

The water quality is similar to that reported to be obtained from the Wadi Al Arab well field which forms part of the current supply system to Irbid. Studies around 1998-2000 also reported elevated levels of molybdenum, radon, radium and uranium within the water from the Mukheiba well field. Treated water with an acceptable level of these contaminants may be obtained by controlled blending or removal of specific wells from service.

Selection of a preferred water treatment process will require further water quality sampling and analysis. To provide confidence in the scheme it will be necessary for there to be sampling and analysis for molybdenum, radon, radium and uranium from all the potential water sources to the reservoir at Irbid in order to fully understand the risks posed by the elevated levels of these elements in the water from the Mukheiba well field. Only with this information can the suitability of the Mukheiba well field be fully confirmed as a direct source of potable water.

### Water Treatment Alternative 1.1

The design of the water treatment plant will be dependent on recent water quality analyses or further detailed testing. If such analyses confirm that the concentrations of molybdenum, radium, or uranium in the well water are acceptable, a treatment system similar to that used at Wadi Arab WTP is proposed. This involves aeration, filtration and disinfection. Filtration is expected to be needed as turbidity in the well water can exceed 1.0 NTU.

### Water Treatment Alternative 1.2

However, if water quality testing on the individual and combined well water identifies the measured concentrations of molybdenum, radium, or uranium in the well water to be unacceptable, then treatment for that contaminant would be required. This treatment of radium and uranium is technically feasible, although expensive, and uses processes such as:

- Precipitation softening
- Ion Exchange
- Reverse osmosis.

Earlier studies in 1998-2000 demonstrated the effectiveness of precipitation softening in removing molybdenum from water taken from the Mukheiba well field.

There is uncertainty regarding the reliability of **water supply**. Alternative 1 assumes that 25 MCM of water is available from the Mukheiba wellfield for the life of the PPP project. However, in the 21 year data recorded since 1990, output has only exceeded 25 MCM in 6 years. Two additional wells (1A and 7A) were commissioned in 2001/2002 and this has enabled the output of the wellfield to increase to more than 25 MCM.

There is certain unpredictability regarding the capacity of the current wells to deliver 25 MCM per year reliably over the whole project life without the artesian pressure and the well output being reduced. It may be necessary in the future to drill additional wells or even install pumps in the wells to maintain an output of 25 MCM per year.

## ALTERNATIVE 2: KING ABDULLAH CANAL TO ZABDA RESERVOIR

The proposed scheme involves the abstraction of 25 MCM per year from the KAC to supply the Zabda reservoir which is located on the west side of Irbid. This will be achieved by the construction of a new intake water treatment and transmission system located along the existing Wadi Al Arab transmission pipeline right of way and utilising new pump station buildings adjacent to the existing pump station sites. The system will comprise:

- Intake and low lift pump station on the KAC near Shuna/Manshyeh.
- Treatment works in the Shuna/Manshyeh area with pre-clarification, coagulation, clarification, filtration, adsorption and disinfection and a 20,000 cubic metre reservoir.

- 800mm diameter ductile iron or steel transmission pipeline, with a length of 32km, running parallel to the existing 800mm main.
- 4 pump stations with a total pumping head of 919m with balancing reservoirs and surge control systems at each pump station site. These pump stations will be near the current pump stations.
- Connection works at the existing Zabda reservoir.
- Power supply, telemetry and SCADA system.

Further water quality sampling and analysis is required to enable selection of a preferred water treatment process. Earlier studies<sup>3</sup> in 2005 identified that the water within the KAC contains high levels of both particulate matter and pathogens and also noted potential concerns over the levels of bromide, pesticides, herbicides and taste and odour compounds in water within the KAC. The measured concentrations of suspended solids and pathogens (and other contaminants) indicate that the water in the KAC at this point is heavily contaminated and would require extensive treatment.

#### Water Treatment Alternative 2.1

The existing water treatment plant at Wadi Arab has a capacity of 20MCM per year and uses aeration, filtration and chlorination. This combination of treatment processes in the existing plant is generally suitable for high quality ground water but is unsuitable for the more contaminated surface water as found in the KAC. Utilising any spare treatment capacity at the existing Wadi Arab WTP to treat water from the KAC is unlikely to provide any significant benefit to the project. Accordingly, treatment of the water from the KAC is anticipated to be carried out in a dedicated new water treatment plant treating water only from the KAC.

The combinations of treatment processes appropriate for treating waters abstracted from rivers and canals include:

- Conventional treatment using coagulation, clarification, filtration and disinfection.
- Membrane treatment using ultra filtration or micro-filtration.

The turbidity values reported in the KAC are sufficiently high that a pre-sedimentation stage may be required prior to the main treatment processes to reduce the solids loading upon them. An adsorption process (i.e. GAC adsorbers) may also be required to achieve the required taste and odour criteria and to remove any pesticides or herbicides present in the feed water. The treatment processes used to treat water from the KAC will generate a large quantity of sludge which will need to be thickened and dewatered. A suitable route for disposing of the resulting sludge cake will need to be provided.

#### Water Treatment Alternative 2.2 – Hybrid KAC

There is understood to be spare capacity in the current Wadi Al Arab to Zabda transfer system. Integrating the Project's transfer and pumping system with the existing system could provide some Capex and fixed Opex savings. Constructing the new pump stations at the sites of the current stations and laying the new main next to the existing main could also provide some efficiencies, particularly for infrastructure such as power supplies and land and pipeline route acquisition.

Combining the existing Wadi Al Arab groundwater scheme with this new Project for a further 25 MCM per year might also deliver some longer term operational benefits in terms of asset replacement optimisation and an overall optimisation of whole life costs. However, it would also entail transfer of the existing system to the new operator – which would in turn require some due diligence on the part of the new operator. If this were to be undertaken at the start of the Project, there would be an opportunity to establish a revenue stream for the new operator and very significant knowledge transfer – in both directions: from MWI/WAJ, their knowledge of operating/maintaining the assets under a range of conditions; and from the private sector, their knowledge of asset management best practice. A detailed survey and review of the existing system would be necessary to define the potential extent of these efficiencies and the costs and benefits of combining the two systems.

### TECHNICAL REVIEW OF THE TWO ALTERNATIVE SOLUTIONS

Both Alternative 1 and Alternative 2 are viable technical solutions to meet the Project objectives. From a technical perspective, an effective selection of a water treatment process will depend on obtaining more and better water quality data, particularly regarding the individual Mukheiba wells and the KAC at Shuna. Even though there are real water quality risks associated with both alternatives, Alternative 2 bears less risk than Alternative 1 because water arrives at the KAC abstraction point as a blend of different sources diluting the impact of any pollution/contaminant from an individual contributing source.

**Resilience of the Project is highly important.** Broadly speaking, having two separate sources and two pipelines using different route alignments can reduce operational risk although with possibly increased Opex. The first alternative has the additional benefit of introducing resilience to Irbid's overall water supply strategy and is simpler in its concept than Alternative 2. It has lower pump heads and may have lower treatment costs.

<sup>3</sup> Conceptual Study of Water Treatment Alternatives, Final Feasibility Study, February 2005, CDM.

**Pipeline route selection has yet to be finalised.** Further option development will need to assess various elements of the pipeline routes to confirm the best route is selected. Alternative 1 involves a new pipeline route which can be expected to be optimised during the feasibility stage, whereas Alternative 2 is expected to involve running a duplicate pipeline along the existing pipeline reservation.

**Alternative 2 has additional construction complexity.** There will be potential interaction between the existing water supply infrastructure and the construction of the new infrastructure in the same geographic locations. In addition, a new intake and treatment works will be constructed near the KAC. It is an advantage to avoid this additional construction/operational complexity by choosing Alternative 1, but this needs to be considered with regard to other advantages and disadvantages of the two options. The duration of the design and construction programme influences the financial viability of the Project, as it affects the point at which revenue starts being collected and the point at which loans can start to be repaid. At this stage, based on a review of the various aspects, a construction programme allowance of 24 months is recommended and this should not vary greatly between the two alternatives. This construction programme will need to be developed as part of subsequent studies.

**This Project can be achieved with proven technology and is well within the expertise and capability of the private sector.** Therefore, the Project is considered technically viable. High levels of innovation or technical complexity can pose increased risk for the Project and less certainty in construction price, construction duration and operational/maintenance costs, which would make the Project less attractive to the private sector. The 820 metre difference in the level between the water source and the point of supply is significant but the designs and construction necessary are within international best practice.

**Pressure reduction in the Irbid distribution network will contribute to NRW reductions.** As part of the downstream off-taker's obligations, consideration needs to be given to pressure control (to reduce physical leakage) and the possibility of installing micro turbine energy recovery as part of this process.

**Providing water from KAC would provide greater flexibility in terms of water quality, as it is supplied from a variety of largely surface water sources.** As mentioned above, the natural radioactivity in the groundwater needs to be considered as there are issues with higher levels of naturally occurring radioactivity in local groundwater sources and blending may be required with surface water to ensure the final treated water is of a suitable quality. The individual wells exhibit significant variation in their levels of radioactivity. The capability to blend the water with other sources (such as water from the KAC or other surface water sources) is a key consideration. As the majority of existing water at the Zabda distribution reservoir in Irbid comes from groundwater supplies, there may not be much capacity for blending. This issue requires further consideration based on the results of MWI/WAJ's resampling of groundwater sources in 2012/13. The quality of the water supplied through the Project will need to comply with the Jordanian drinking water standard, JS 286:2008. As the duration of the Project is over 20 years, further work to determine the viability of these sources over this timescale needs to be considered; particularly the long term reliability of the quantity and water quality that will be provided by the Mukheiba well field.

### **PRELIMINARY COST ESTIMATES OF THE ALTERNATIVES HAVE BEEN CAREFULLY COMPARED...**

Initial construction and maintenance/operational cost estimates of these two alternatives were supplied by WAJ and reviewed in this study, in comparison to local and international benchmarks. In addition, further costs have been derived for the sub-option for Alternative 1 which includes the possibility of additional treatment processes for water from the Mukheiba Wells.

As part of the review, costs in the WAJ report have been compared with cost data held by Mott MacDonald for similar schemes in Jordan (for example civil work rates from the Disi-Mudawarra to Amman Water Conveyance System Project) or the wider region and Europe (particularly pipeline and electromechanical (MEICA) cost rates). Mott MacDonald has not sought specific cost data from suppliers for this review. Table 1 provides a breakdown of the key cost components for each alternative (in 2012 prices).

Table 1: Breakdown of key cost components for the alternative options

	Mukheiba to Zabda Reservoir Treatment; aeration, filtration, and chlorination	Mukheiba to Zabda Reservoir full treatment	King Abdullah Canal to Zabda Reservoir full conventional treatment
	Alt-1.1	Alt-1.2	Alt-2
<b>Capex (US\$ '000)</b>			
Intake pumps and civil structure	–	–	920
Water treatment plant	6,910	13,020	18,600
Treated water reservoir	1,840	1,840	1,840
Treated water pumping stations and reservoirs	13,160	13,160	13,820
Bulk transmission pipeline	37,240	37,240	34,610
Ancillary facilities	4,330	3,330	4,330
Zabda reservoir rehabilitation	280	280	280
Contingency (10%)	6,450	7,060	7,410
<b>Total CAPEX (US\$ '000)</b>	<b>70,210</b>	<b>75,930</b>	<b>81,810</b>
<b>OPEX (US\$ '000/yr)</b>			
<b>Fixed Opex</b>			
Operations staff	1,100	1,100	1,550
O&M	310	400	480
<b>Total fixed Opex</b>	<b>1,410</b>	<b>1,500</b>	<b>2,030</b>
<b>Variable Opex</b>			
Electricity unit cost (US\$/m <sup>3</sup> .yr)	0.2778	0.2780	0.3154
Chemicals unit cost (US\$/m <sup>3</sup> .yr)	0.0049	0.0982	0.0256
<b>Total variable OPEX (US\$ '000/yr)</b>	<b>7,070</b>	<b>9,410</b>	<b>8,520</b>
Contingency (10%) (US\$ '000/yr)	848	1,091	1,055
<b>Total OPEX (US\$ '000/yr)</b>	<b>9,330</b>	<b>12,000</b>	<b>11,610</b>
<b>Total Renewal Capex over 25 years (US\$ '000/yr)</b>	<b>14,960</b>	<b>16,370</b>	<b>17,190</b>

**Notes:**

1. Capex and Opex are estimated at Q4/2012 price base.
2. Total Opex assumes each plant delivers 25 MCM
3. Renewal Capex assumes lifecycle major maintenance and renewals at 5, 10, 15 and 20 yr intervals in order to meet an average handback condition in year 25.
4. Capex and Opex do not include interest during construction or financial costs (such as advisors).



## A COMPARISON OF ALTERNATIVES MIGHT BE MISLEADING...

Table 2 below, summarising the main conclusions of the comparative analysis, shows that Alternative 2 is marginally more attractive than Alternative 1. The Capex and Opex comparisons are quite dependent on which water treatment option is developed and this is still subject to further feasibility analysis and final selection.

**Table 2: Summary of the main conclusions of the comparative analysis of the two alternatives**

Comparison Criteria	Alternative 1	Alternative 2
Greater overall water resource resilience		✓
Optimal pipeline route		✓
Relative construction complexity		✓
Potential for reducing NRW	✓	✓
Proven technology	✓	✓
Lower Capex	✓	
Lower Opex	✓	✓

### Note:

1. Lower Opex – Alternatives 1 and 2 are similar in this respect. It is not possible to differentiate without further water quality and treatment studies.

Although Mukheiba Wells is the cheaper option, its cost advantage is insufficient to overcome the risks associated with the uncertainty of the sustainability of supply from this source in the quantities required over the life of the Project. For this reason, from a technical point of view, this study recommends Alternative 2, the KAC option.

This conclusion is solely based on a pre-feasibility assessment. At feasibility stage, this preliminary assessment will have to be carefully reviewed, particularly in order to take into account any potential extra project costs that may be identified by future studies on the long term reliability of water quality and quantity.

## THE PROJECT IS PROPOSED AS A PPP WITH THE FOLLOWING MAIN ASSUMPTIONS...

In line with other similar water in Jordan, this project is proposed as a PPP in which the private sector is required to **Design, Build, Finance, Operate and Transfer** (DBFOT, referred to also in this report as BOT for simplicity) the project back to the public sector in line with pre-agreed conditions at the end of the PPP Contract period, typically 25 years.

It is expected that with an appropriate asset management programme and maintenance, the operational life of the civil engineering assets (including the pipelines) could last at least 50 years. The mechanical and electrical plant will require substantial major maintenance and renewals during the 25 year term of the BOT contract in order to ensure that it meets a handback condition at the end of the 25 years. As is standard for PPPs, the project would have its own operational staff and management. The degree of water treatment processes required will impact on the cost and complexity of operations and lifecycle major maintenance and renewals – these have been costed into each option. The specific O&M requirements would be set out in the PPP agreement – this would be in line with other major bulk water systems in Jordan and would be accommodated in the design of the project by the Project Company.

The study has estimated the levels of tariffs that are likely to be applicable for the Project, using the **key assumptions listed below**. It is important to highlight that the level of tariffs estimated in this study are merely indicative. The final base water tariff for the project, when and if it will be procured as a PPP, will depend on what the winning bidder will have offered during the project's tendering.

- Estimates of project construction and operating costs stemming from the preliminary technical feasibility analysis (see above);
- Average annual volumes of 21 MCM (84% capacity utilisation);
- A 25 year project operating period: the ideal term of the PPP contract is determined not only by its technical and economic life, but also by the term of the initial project funding. With project debt funding expected to be repayable over 20 years from the end of construction, a 25 year PPP operating period would give lenders a five-year cash flow 'tail period' following scheduled debt expiry, considered sufficient to provide cover should the project debt ever require to be rescheduled. A 25-year PPP contract results in the Project SPV being financially responsible for a substantial portion of the asset life, leaving WAJ less exposed to operating cost and life cycle maintenance cost overruns. The PPP contract would ensure this by specifying minimum technical conditions which the project assets must satisfy on expiry of the PPP contract and transfer of the Project operations back to WAJ. This would enable, with proper maintenance, as mentioned above, the operational life of the civil engineering assets (including the pipelines) to achieve their design life of at least 50 years;
- Capital expenditure (Capex) financed through 30% sponsor equity and 70% project debt, assumed to be raised in USD. Of the 70% project debt, 50% is assumed to be sourced from international financial institutions (IFIs), 10% from export credit agencies (ECAs), and 10% from commercial banks. This funding mix is intended to be a conservative estimate of the Project Special Purpose Vehicle's (SPV's) cost of capital. A higher proportion



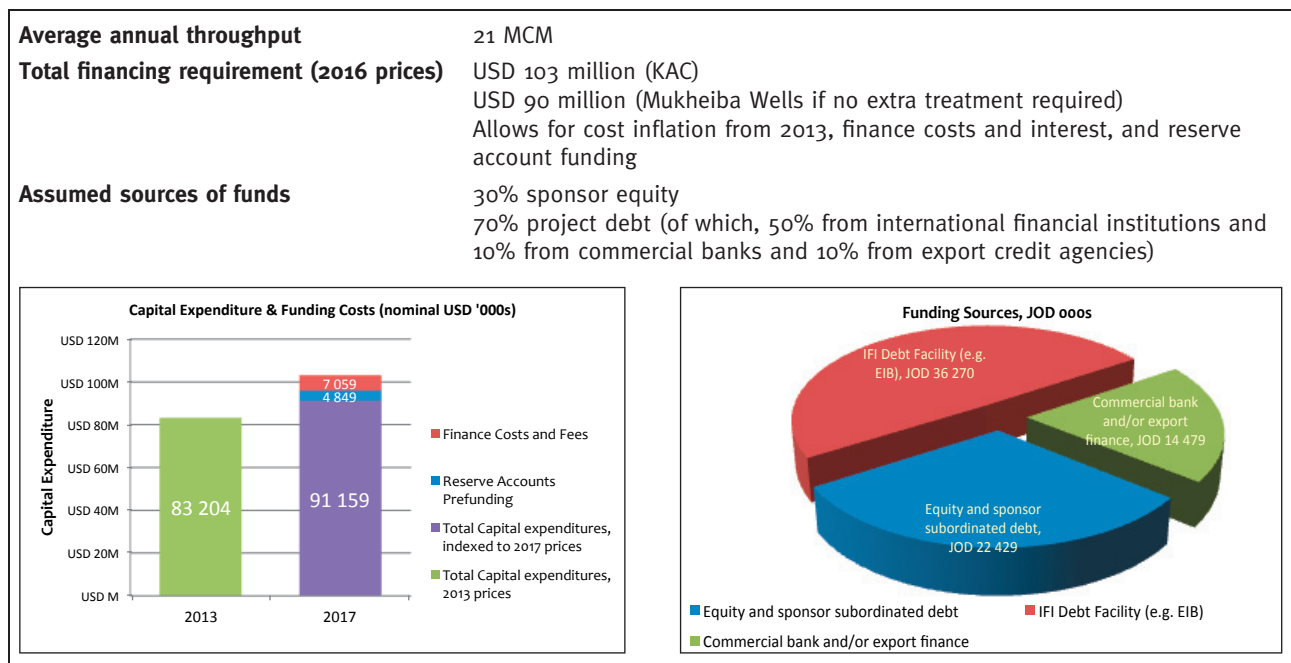
of export credit guarantee, if available, would reduce the SPV's cost of debt. ECA – guaranteed bank debt (whereby the commercial bank lenders would not take political/breach of contract risk) would have an all in cost approximately the same as an IFI providing debt, and would also reduce the Project SPV's cost of debt.

- Construction costs are assumed to escalate between early 2013 and early 2016 by 3.2% per annum in line with inflation. The costs have been reviewed against comparative international projects and are considered to be reasonable estimates for the purposes of this preliminary feasibility analysis. The assumed procurement and transaction costs reflect the Project being structurally similar to other successful water project PPPs internationally, and hence benefitting from contract documentation and due diligence precedents.

The tariffs would not include local distribution costs incurred by YWC, as they would be the charges that the Project SPV would require, as per the bidding price, for delivering water to the inflow point to YWC's distribution network (i.e. to Zabda reservoir). To arrive at the total cost of supplying water to customers in the region, it would be necessary to add YWC's average unit costs, adjusted for non-revenue water (NRW) measures that are identified by WAJ to be implemented by 2020.

As a result, the estimated total financing requirement is just over USD 100 million (allowing for inflation from 2013 until the start of construction). See Figure 3 below for further details.

Figure 3: Headline financial parameters of the Project



The resultant sources and uses of funding for the Project are shown in Table 3 below, assuming a construction start date of early 2016.

**Table 3: Sources and Uses of funding**

	Mukheiba Wells to Zabda Reservoir		KAC to Zabda Reservoir	
<b>Uses of funding</b>				
Construction costs including contingencies and project management – 2013 prices	70,751		80,736	
Transaction costs (advisors' costs, legal costs, and lender due diligence) – 2013 prices	1,000		1,000	
Construction all risks insurance incl sponsor PRI – 2013 prices	1,415		1,468	
<b>Total Capital expenditures</b>	<b>73,166</b>		<b>83,204</b>	
<b>Total Capital expenditures indexed to financial close</b>	<b>80,008</b>		<b>91,159</b>	
Pre-funding of reserve accounts	4,240		4,849	
Loan interest and fees during construction	6,195		7,059	
<b>TOTAL USES OF FUNDS</b>	<b>90,443</b>		<b>103,068</b>	
<b>Sources of funds</b>				
Sponsor Equity and Subordinated debt	27,721	30.7%	31,591	30.7%
IFI Debt Facility (e.g. EIB)	44,827	49.6%	51,084	49.6%
Export credit facility	8,840	9.8%	10,074	9.8%
Commercial Bank Debt	9,055	10.0%	10,319	10.0%
<b>TOTAL SOURCES OF FUNDS</b>	<b>90,443</b>	<b>100.0%</b>	<b>103,068</b>	<b>100.0%</b>

The relatively small size of the Water Supply PPP Project (approximately USD 100 million funding requirement assuming no grants) could still allow **domestic bank debt** to be included in the funding mix, alongside sponsor equity, IFI or other official external debt. As a result, the Project – and any similar follow-on projects in the sector – can assist in developing domestic bank expertise in PPP – an important pre-condition for a successful PPP programme.

For this Project, the base case conservatively assumes that **no grant monies** are used to fund the Project. Given the significant volume of grants available to Jordan, as reflected for instance in the latest pledge by the Gulf Cooperation Council to provide up to USD 5 billion in grants for projects in various sectors, available over 5 years, the Project could benefit from partial grant funding. Although grant funding would serve to reduce the net cost of the Project, if the grant monies available to WAJ are limited, it may be more appropriate to allocate grants to more complex spending requirements such as NRW measures, or sanitation system upgrade, which are not particularly suited to PPP, and to leave the PPP project to be fully funded from the project debt and sponsor equity sources that are available. Therefore, to identify if grants could be used to fund the Project in practice, GOJ's priorities as to use of available grant funding would need to be confirmed. However, in any case, the level of grant should not be so large as to make the Project debt and equity funding too small to be

economic. With a funding requirement of approximately USD 100 million, the grant element should be no more than 20% to 30%, to enable the project equity and debt fundraising to warrant the transaction costs mentioned above (e.g. high costs of advisors for PPPs). For this reason, we have calculated (as a project sensitivity) that funding 20% of the capital cost of the Project with grant monies would reduce the annual tariff by approximately 8%. Another alternative for the project would be to blend cheaper sources of funding with the PPP financing, as was the case in Disi Water project where over 30% of the capital cost was funded by government contributions (coming from sovereign loans) instead of grants.

Regarding **local currency** funding, although some long term JOD project funding is potentially available, local financing does not necessarily reduce financial risks for the Project. The domestic banking sector is small and constrained regarding the level of support it can provide. The capacity of the domestic banks for PPP was evidenced in the financing of the As Samra extension project in 2012, which included a JOD 104 million 20 year loan facility from a syndicate of nine local commercial banks. The facility was JOD-denominated but operational period loan balances were funded on an unhedged prime rate (i.e. variable) basis, due to the absence of a long-term bond or interest rate swap market in JOD which would have allowed the interest rate risk to be hedged. As a result, the government is exposed to domestic

interest rate risk through the project payment mechanism. This does not necessarily provide a better solution than funding in foreign currency (USD is appropriate for Jordan as a result of the peg of the JOD to the dollar) since domestic interest rate risk is strongly correlated to the exchange rate risk. In addition, most costs are likely to be denominated in foreign currency. Finally, the optimal risk allocation requires the public sector to assume risks that it can control – in a controlled peg situation, the public sector is the best placed to assume the exchange rate risk. As a result, for the purposes of feasibility assessment, this study presumes funding in USD as the appropriate currency in which to fund the Project.

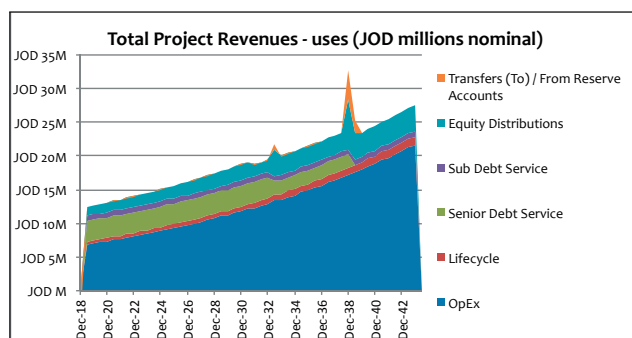
**...RESULTING IN THE FOLLOWING MAIN OUTPUTS**

Using the main assumptions above, a financial model was developed in order to determine the project’s key outputs and robustness, yielding in particular the following:

- An estimated average Project tariff (in 2013 prices) of JOD 0.75 or USD 1.05 per cubic metre supplied by the Project
- An annual cost payable by WAJ/MWI of JOD 15.7 million, or USD 22.1 million in 2013 prices
- An average and minimum annual debt service cover ratio (DSCR)<sup>4</sup> of 2.1 and 1.86 respectively.

Figure 4 below shows the allocation of project revenues to operating costs and to servicing finance over the life of the Project. In the early years of the operating phase of the Project, approximately half of revenues (comprising the capital component of the Project tariff) are allocated to servicing finance. However, the finance costs are fixed in nominal terms, and over time the effect of inflation on operating costs results in the indexed components of the Project tariff increasing as a proportion of total revenues. In years in which debt facilities expire, debt service reserve accounts are reduced, releasing cash as shown by the peaks in the diagram.

**Figure 4: Total Project Revenues**



**...A ROBUST FINANCIAL STRUCTURE THAT LENDERS WILL FIND APPEALING...**

The base case financial analysis has been based on a prudent assessment of what is achievable in current market conditions – the debt:equity ratios, loan tenors, and loan margins are in line with what is currently available on project loans and may be subject to change in the future. In this Project, the base case loan cover ratios (with a minimum annual DSCR of 1.86x) indicate a very robust financial structure that will assist in attracting funders to the Project. The robustness of the Project’s financial model is shown in the following sensitivity analysis illustrating the effect of unforeseen increases in costs following financial close (e.g. due to sub-contractor default) that are borne by the Project SPV.

**Table 4: Sensitivity analysis showing the effect of unforeseen increases in costs following financial close that are borne by the Project SPV**

Sensitivity	Minimum DSCR	Average DSCR
Base Case –	1.86	2.14
Construction costs + 10%	1.63	1.90
Operating costs (excl. electricity) +10% in real terms	1.73	2.01
Electricity costs + 10%	1.61	1.88
Combined case – construction costs + 10%;	1.11	1.29
all operating costs plus 10%; interest rates + 2%	1.00	1.24
Break-even point: “Min DSCR = 1” – All Operating costs (incl. life cycle costs and electricity) +20% in real terms		

<sup>4</sup> Debt Service Cover Ratio (DSCR): the ratio of cash flow available for debt service (i.e. operating cash flow less tax and specified reserve account movements) during a certain period (typically 12 months) to scheduled senior debt service (principal and interest after any hedging) due during the same period.

### ...AND A LOWER UNIT WATER TARIFF THAN ANY OTHER FEASIBLE SOURCE OF NEW SUPPLY IN THE MEDIUM TERM

To assess the financial viability of the Project, the Disi base water tariff (estimated to be approximately JOD 0.78 per m<sup>3</sup> in 2013 prices)<sup>5</sup> is used as the benchmark tariff for comparative cost assessment. From review of MWI studies, prior to availability of water from the Jordan Red Sea Project (JRSP), diversion of Disi water to Irbid and the Northern Governorates is the only feasible medium-term alternative to the Project in order to supply water in the volumes necessary to meet the current and anticipated regional water deficit. As a result, the alternative cost against which to compare the Project tariff would be the cost of delivering Disi water to the inflow point to the Yarmouk Water Company (YWC) network (Zabda reservoir). We assume this cost to be the aggregate of the Disi tariff for delivering water to the Amman/Zarqa areas, plus the incremental cost of conveying water from Zarqa to Zabda reservoir. However, as of today, the cost of capital works required to add pipelines and pumping stations between Zarqa and Zabda has not yet been estimated. As a result, in this study we take the conservative approach of using the estimated Disi tariff as the comparator tariff (applying assumed indexation factors to the original published tariff to arrive at the estimated tariff in 2013 prices), in order to provide a benchmark to assess whether the Project cost is in line with that of other new or upgraded water supply infrastructure procured by WAJ<sup>6</sup>. Since the fully-costed comparator would be higher than the base Disi project tariff (since the conveyor link from the Disi network to the Zabda reservoir has not been costed), if this Project's estimated tariff is lower than the Disi tariff it will be even lower than the fully costed comparator.

The Project procured as a PPP would deliver water to the Wadi Al Arab region for a lower cost than any existing alternative source of new supply on the same scale. On the assumptions set out above, under either the KAC or the Mukheiba Wells alternative, the Project tariff would be lower than the current Disi tariff, which, as explained above, is the nearest benchmark against which to assess whether the Project cost is in line with that of other new or upgraded water supply infrastructure procured by WAJ. The estimated Project base water tariff under a PPP would be approximately JOD 0.75 per m<sup>3</sup> (2.6% lower than the Disi tariff) in the KAC alternative, and JOD 0.63 per m<sup>3</sup> (17% lower than the Disi tariff) in the Mukheiba Wells alternative. The annual cost to WAJ in 2013 prices would be JOD 15.7 million in the KAC case and JOD 13.2 million in the Mukheiba Wells case if no extra treatment is required. The financial case for the Project is made even stronger if its capacity utilisation is maximised, which would also help reduce unsustainable groundwater abstraction rates in the region. If the pipeline was operated at 24 MCM per year (96% of capacity) rather than at 84% of capacity estimated in the base case, the

average unit tariff would be approximately 10% lower than the base case estimate.

The feasibility analysis takes Alternative 2 (abstraction from KAC) as the preferred alternative from a technical perspective as seen above, and uses its costs to assess the relative affordability of the Project. As noted above, KAC is selected due to the greater uncertainty of the Mukheiba Wells option being able to supply the required project volumes each year over the life of the Project. This is despite the estimated Mukheiba Wells project tariff, in the base case, being approximately 16% lower than the KAC tariff – reflecting its 12% lower estimated capital cost (USD 73 million against USD 83 million in 2013 prices) and 19% lower estimated annual operating costs (USD 9.5 million vs USD 11.7 million). Even if the Mukheiba Wells required more substantial water treatment facilities and input chemical costs (entailing up to 9% higher construction costs and 32% higher operating costs), its tariff would still be 1% lower than the KAC alternative tariff and over 3% lower than the Disi Water comparator tariff.

### THE PROJECT USES A REMUNERATION STRUCTURE THAT IS FAMILIAR TO POTENTIAL BIDDERS IN THE WATER SECTOR...

The Project characteristics justify a similar charging structure to Disi water, as both projects are capital intensive water conveyor projects with relatively low operating costs other than energy costs. The tariff, paid on a monthly basis by WAJ, would be divided into three components: i) a capital component that is a constant fixed amount per period, to service debt and equity remuneration; ii) an indexed fixed component that is intended to cover fixed operating costs which do not vary with volume (labour, insurance, administration, and maintenance charges etc.); and iii) an indexed variable component which is intended to cover volume-related elements such as electricity and treatment chemicals. Adjustment is also likely to be required for those elements of the construction cost which cannot be fixed by the contractor in advance, such as the cost of steel: in such a case the adjustment is for variation in an agreed commodity index, to be applied to the quantity of that item allowed for in the construction specification.

Since the Project is assumed to be funded in USD, it is standard for the capital component of the tariff to be denominated either in USD, or else in JOD but adjusted in accordance with a JOD/USD index, or alternatively (more rarely) benefit from an exchange rate guarantee. This is particularly important in countries like Jordan where the exchange rate is pegged, therefore the public sector is the best placed to assume the exchange rate risk.

The indexed components are indexed to price inflation of the various cost components. As with the Disi project, indices can be expected to include (for domestic cost

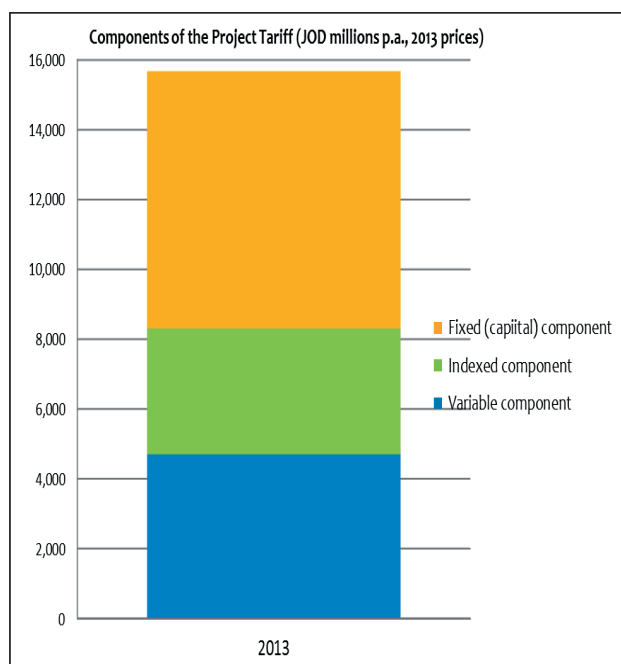
<sup>5</sup> USAid, *A Review of Water Policies in Jordan and Recommendations for Strategic Priorities*, May 2012, page 27

<sup>6</sup> We have used the base Disi project tariff as a comparator in this study, which is less than the full Disi cost. If the estimated tariff of the Wadi Al Arab Water Supply PPP Project is lower than the base Disi tariff, then the cost of the Project to MWI/WAJ will clearly be less than the identified alternative sources of new supply.

elements) indices for average wages, machinery and equipment producer prices, and wholesale prices; specific adjustment for power prices; and (for foreign cost elements) a cost or wage index linked to a currency index (e.g. EUR/JOD) to complete the matching of foreign cost price changes to tariff changes. Importantly, while indexation is intended to protect the Project SPV against price movements it cannot control, the Project SPV remains obliged to hold underlying base prices for each component of the cost. Each index is applied to the amount of the relevant operating cost as specified in the base case financial model as at bidding/tendering. For example, for electricity, the payment mechanism would specify a fixed unit consumption (kWh/m<sup>3</sup>), with the Project tariff adjusted only for changes in the electricity tariff and the Project SPV assuming the risk of consuming more electricity than committed to at bidding stage. Likewise, for chemicals, the payment mechanism would specify a fixed unit consumption (kg/m<sup>3</sup>), with the Project tariff adjusted only for changes in an appropriate index for the price of the relevant chemicals.

Using the base case assumptions for the Project, we estimate that the fixed component of the tariff would be just under half of the indicative Project tariff (47% in the KAC alternative and 49% in the Mukheiba Wells alternative).

**Figure 5: Components of the Project tariff**



In order to reduce technical losses, we recommend that the payment mechanism also be used to incentivise the Project SPV to properly maintain the pipeline. Since the source water for the Project can be abstracted by alternative means (unlike Disi water as explained below), charging the Project SPV an input tariff payable to WAJ for water abstraction at

source, would act as a penalty on the Project SPV if it incurred technical losses. The Project tariff would be grossed up by the amount of the input tariff, so that the input tariff would be a net cost to the Project SPV only if inflows to the Project exceed outflows in a period. The level of such an input tariff should be set so as to compensate WAJ for the full cost of supplying water to the point where it was originally planned to be abstracted for other uses, had it not been abstracted and lost by the Project. This mechanism was not included in the Disi payment mechanism, because Disi does not contain treatment processes that can give rise to losses, but is justified in this Project since water from both the Mukheiba Wells and KAC can be abstracted (as is the case currently) for uses other than supplying the Project. The mechanism has been used in other projects internationally. This input tariff mechanism could be applied in addition to a non-delivery penalty similar to Disi, which applies in the case of failure to deliver the required amount in a monthly period.

As a final point, an important drawback in the Jordanian water sector, similar to other countries in the region, is that its water pricing policy and historically low water tariffs results in entities with weak capital structures, therefore often requiring government subsidies and/or guarantees. With aggregate expenditures exceeding JOD 500 million per year since 2011, the sector's third party revenues (including grants) are less than JOD 300 million per year. As analysed in previous studies<sup>7</sup>, this results in an endemic requirement for government subsidy and borrowing to cover shortfalls, since revenues under current pricing policies are inadequate to service capital. Major capital expenditures and the covering of deficits in the water companies (including in YWC) fall to WAJ and WAJ's borrowings currently carry a government guarantee. The projected rise in WAJ's borrowings and deficits makes it highly likely that project lenders and sponsors would only participate if the PPP payment obligations were either fully or partially guaranteed. As is common in many countries, insufficient creditworthiness of the public sector offtaker would require the payment obligations of MWI/WAJ under the Project Agreement to be supported by a sovereign guarantee. This leads us to the next section on affordability of the proposed base tariff for Wadi Al Arab.

**...AND THAT COULD BE READILY RECOVERED WITH MINIMAL IMPACT ON AVERAGE HOUSEHOLD BUDGETS.**

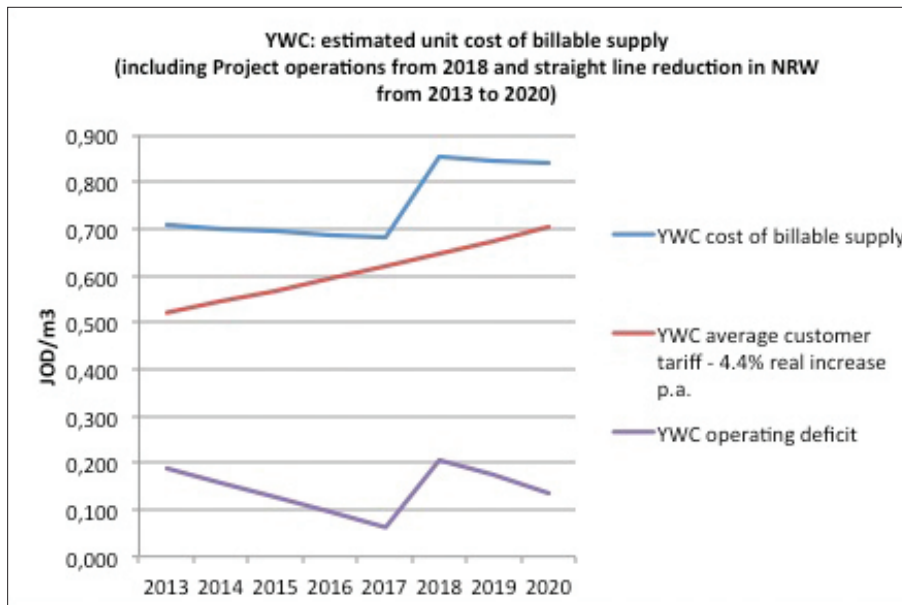
We have estimated that the impact of the Project on the cost of supplying water to the Wadi Al Arab region could be readily recovered from increases in customer tariffs, with limited impact on average household budgets. In 2013, YWC's cost of billed water is estimated to be JOD 0.71 per m<sup>3</sup>, which with an average tariff of JOD 0.52 per m<sup>3</sup> produces a deficit of JOD 0.19 per m<sup>3</sup>. By 2020, allowing for the impact of the costs and benefits of NRW measures that WAJ has identified for the Northern Governorates<sup>8</sup>, this study estimates that YWC's cost of billed water would increase to approximately JOD 0.84/m<sup>3</sup>, of which JOD 0.18/m<sup>3</sup> would represent the impact of the Project tariff (if the Project was implemented

<sup>7</sup> Cg. USAid, *Jordan Fiscal Reform Project II: Water Public Expenditure Perspectives Working Paper*, October 2011.  
<sup>8</sup> These costs correspond to the estimated costs of the NRW target measures set out in *Water Reallocation Strategy between Governorates* (2010), Eng. Mohammad Al-Najjar Minister of Water and Irrigation, Eng. Basem Telfah, MD of Performance Management Unit at that time.



without NRW measures having been introduced, the Project tariff would equate to JOD 0.22/m<sup>3</sup> of aggregate billed supply). To reduce the WAJ subsidy of YWC by 25% from 2013 levels in real terms, YWC customer tariffs would have to increase by 35% by 2020, equivalent to annual increases of 4.4% each year from 2014 to 2020 inclusive. Figure 6 below illustrates the impact of such annual increases in customer tariffs on the YWC deficit, assuming that the Project tariff costs are passed through to YWC from 2018 (start of operations) and that the identified NRW measures are implemented and maintained evenly over the period 2013 to 2020.

**Figure 6: YWC estimated unit cost of billable supply**



While these large capital projects in the water sector have a significant effect on water tariffs and/or subsidies, their costs have a relatively minor impact on median household expenditures: even with customer tariff increases of the scale above, average household water bills in the region would still be less than 2.6% of median annual household expenditures in Irbid Governorate. The low share of water bills in household spending indicate a capacity for customers, on average, to bear a higher proportion of the total cost of water, and for government subsidies to be gradually reduced providing that price increases are introduced broadly in line with clear service improvements and increased reliability of supply. Moreover, those households who currently purchase additional tankered water to meet their needs will benefit from the greater availability of water from the public network at a significantly lower cost than the private tankered supplies. This simplified analysis does not consider differences in earning capabilities between households. This would have to be taken into account in further studies, in order to avoid heavy water burdens on the poorer households.

### **THE PPP ALTERNATIVE IS LIKELY TO PROVIDE CERTAIN ADVANTAGES COMPARED TO CONVENTIONAL PUBLIC PROCUREMENT.**

A PPP will have a higher cost of capital than conventional public procurement, reflecting the required equity returns, lenders' risk premia and higher advisory costs. However, provided the PPP is well-structured and risks are adequately distributed between the private and public sector, the project discipline of a PPP creates strong incentives for the private sector contractor to control costs and maintain performance levels, otherwise it risks payment deductions and loss of capital. This results in the PPP alternative delivering the Project at a known, contractually determined cost until handover to WAJ at contract expiry. In contrast, under conventional procurement, long-term cost and performance disciplines are difficult to apply due to the lack of performance incentive or the constraints imposed by annual budgets in certain years. The resultant inefficiency in operation of project assets causes, over the long term, higher operating costs, poorer maintenance standards, and reduced performance levels compared to the PPP alternative.

A PPP's value for money is achieved when it can be established with reasonable certainty that the whole life cost of the Project to the Government will be lower under the PPP alternative compared to the "public sector comparator", i.e. publicly funded procurement, management and operation of the project, including externalities. In financial terms, choosing a PPP is justified if the net present value of the PPP charges is lower than the risk-adjusted estimated costs established in the public sector comparator. Recent international studies<sup>9</sup> point to PPP continuing to deliver greater time and cost certainty, with estimated whole life cost savings of 10% to 20% in typical cases. In this Project, despite its higher cost of finance, it is estimated that the PPP would yield a lower unit cost of water than the conventional public procurement if (under the government funding alternative) outturn construction costs were 10% higher, whole life operating costs 15% higher, and technical losses averaged 3% relative to the levels committed to by the Project SPV. These levels of difference in outturn versus budgeted performance are in line with the international comparisons. They are also consistent with analyses in the Jordanian water sector itself, where recent findings by the GIZ Improving Energy Efficiency programme<sup>10</sup> have highlighted the increased costs associated with not applying operating practices that are standard in PPP project operations. The GIZ study identified total energy saving potential of 25% per year on average at the pumping stations reviewed. A conventional procurement would have risks similar to those found by the GIZ study, of operating efficiency declining over time, causing higher costs to be incurred.

The introduction of a PPP project such as this into the local economy will have a direct impact in improving the skills of the workforce – this has been the direct experience on the As Samra and Disi projects developed by MWI. Staff at all levels have been provided with formal training and are experienced in compliance with international standards and quality certification – all key factors in establishing a modern utility business where product quality and customer service are of critical importance. A slight downside is that these skills are to some extent transferrable within Jordan and elsewhere in the region, so the Project SPV will need to

be mindful of salary levels and retention for skilled workers. It is expected that the majority of the O&M contractor staff could be sourced locally, thereby contributing to employment creation.

### **SUCCESSFULLY FINANCED WATER SECTOR PPP PROJECTS IN JORDAN HAVE CREATED A GOOD BENCHMARK FOR THE WADI AL ARAB WATER SUPPLY PPP PROJECT...**

Three major water sector PPP projects have been successfully procured in Jordan and provide a high benchmark, as well as some lessons learned. The As Samra Waste Treatment Plant project, which was signed in 2002, was the first project to be executed on a BOT basis in Jordan, and since then the Disi Water Conveyance Project and As Samra extension were signed in 2009 and 2012 respectively. All three projects adopt the general risk profile typical of project-financed water sector PPPs.

As the Project is expected to benefit from the contractual structure of previous water sector PPPs in Jordan, we estimate that the bidding time and transaction costs will be lower than on previous occasions. Moreover, we would recommend that, once the Project contracts are drafted, these should be used for other similar bulk water supply projects in Jordan in order to create a viable pipeline of projects that uses well-known and tested contractual structures. The Project cost, with a funding requirement of around USD 100 million, is on the low side for a viable project finance transaction, due to the fixed advisory costs characterising most project finance deals. However, given the relative simplicity of the Project and the precedents, it is feasible to consider a project finance structure for Wadi Al Arab. In addition, we recommend that local lenders (including subsidiaries of foreign banks) try to lend to the Project alongside IFIs in order to provide local financing and to contribute to the expansion of know-how in the Jordanian market. The participation of local lenders in the 2012 financing of the As Samra extension project indicates capacity and capability to lend for the long tenors (up to 20 years) that help to make PPP projects cost-effective. Table 5 summarises the Jordanian PPP transactions since mid 2009.

<sup>9</sup> Detailed in Box 5, section 3.5.8

<sup>10</sup> Phase 1 of the GIZ study *Improvement of Energy Efficiency of WAI*, <http://www.iee-jordan.net/en/home>



Table 5: PPP precedent transactions in Jordan

Project	Jordan Queen Alia International Airport Expansion	Disi Water PPP	Al Qatrana IPP	As Samra WWTP Extension Project – refinancing
Sector	Transport – Airports	Water treatment	Power – Co Generation	Waste water treatment
Date signed	November 2007	June 2009	October 2009	June 2012
Main Sponsor(s) & nationality	Abu Dhabi Investment Company (UAE) 40%, EDGO Investment 10%, Noor Financial Investment Co. – KSCC 25% (JOR), ADP 5% (France), J&P Avax 20% (Greece)	Gama (TUR), GE Energy Financial Services (US)	KEPCO (Kor) 65% Xenel Int. (Saudi Arabia) 35%	Samra Plant Company
Project cost USD	\$675m	\$951m	\$465m	\$206m
Equity USD	\$305m	\$196m	\$131m	\$7m
Government capital contribution	–	\$300m	–	\$95m
IFI/ECA/Development bank funding USD	\$100m (Saudi Arabia), \$110m (US)	\$455m	\$237m	–
IFI/ECA/Development bank source	Islamic Development Bank (Saudi Arabia), IFC (US)	Proparco (France), OPIC (US), EIB, AFD	Proparco (France), Islamic Development Bank (Saudi Arabia) KEXIM (Korea)	Millennium Challenge Corporation (US)
Commercial Bank funding	\$160m	–	\$92m guaranteed by KEXIM, \$5m Standby Facility	\$104m
Commercial Bank source	Credit Agricole, Natixis (France), Europe Arab Bank (Jordan)	–	BNP Paribas (France), KfW (Germany)	Arab Bank, Jordan Kuwait Bank, Capital Bank, Société Générale de Banque – Jordanie, Investbank, Social Security Investment Fund, Bank of Jordan, Arab Jordan Investment Bank and Bank al Etihad
Project Period	25 yrs	25 yrs	25 yrs	25 yrs
Loan Period	16 yrs		20 yrs	20 yrs

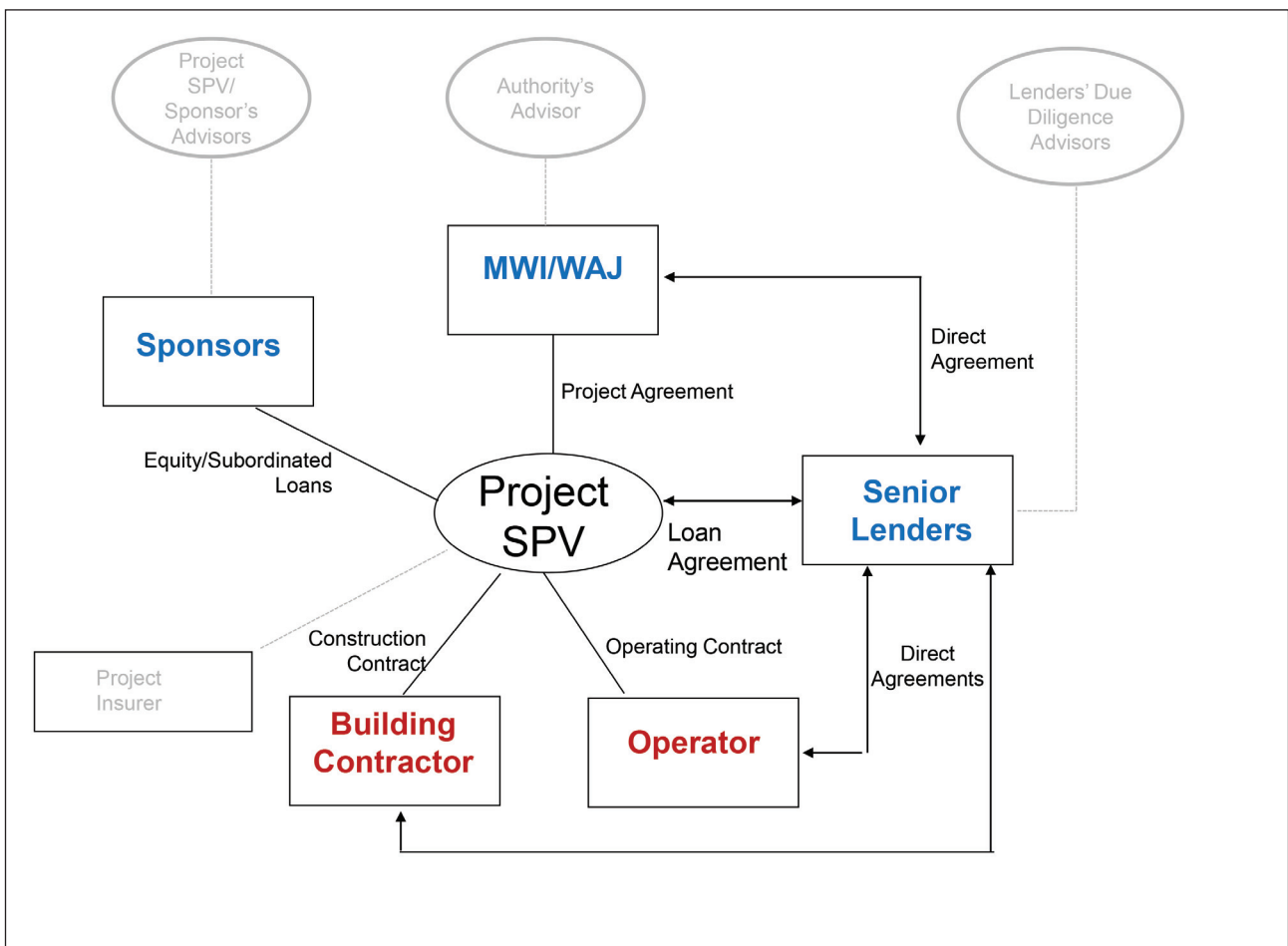
**...WHICH IS EXPECTED TO HAVE A SIMILAR CONTRACTUAL STRUCTURE TO PREVIOUS JORDANIAN WATER SECTOR PPPS...**

The public promoter will be MWI acting through WAJ. As in similar projects, we recommend that the main Project Agreement, the PPP contract, is signed between (i) MWI/WAJ and (ii) a project company created specifically for the Project by the winning bidder (the Special Purpose Vehicle, SPV or Project SPV). As is standard in projects of this sort, the Project SPV will subcontract its obligations, principally to a construction company and an operating company. These subcontracts will follow the “back-to-back” principle with respect to the SPV’s obligations under the Project

Agreement. Following accepted standard practice, the construction contract will need to be a turnkey Engineering, Procurement and Construction contract in order to ensure a single point of accountability in respect of the design and completion of the pipeline and associated assets, for a fixed cost to a fixed timetable. Previous experience in similar projects shows that typically the financing documents will be supported by direct agreements with the public sector counterpart (in this case MWI/WAJ) to enable step in by lenders to protect the revenue flows upon which their recoupment of capital and interest depend.

A diagrammatic representation of a typical PPP contractual structure is set out in Figure 7 below.

**Figure 7: Contractual Structure**



## ...AND RISK ALLOCATIONS WHICH HAVE PREVIOUSLY BEEN ADOPTED SUCCESSFULLY IN JORDAN.

In order to attract qualified private investors more easily and to shorten the period from bidding to financial close, it is desirable to ensure that PPP project documents follow well-known and tested standard approaches, to the extent that standardisation is possible in a changing market. Box 1 shows the approaches taken to physical security, construction delay and change in law risks for projects in the region. The approach taken on Disi is substantially the same as for those other regional projects.

### Box 1 – Risk Approaches to Physical Security, Delay Events and Change in Law taken in other Projects in the Region

#### Physical Security

The approach most commonly observed in the region is for the project company to bear the cost of physical security measures. Project agreements typically impose an explicit obligation on the private sector to provide adequate protection and security measures. However, in certain cases this approach may not be viable.

The project agreement for a similar PPP project in Jordan introduces an element of shared risk by providing that, even though the project company bears the cost of physical security measures, on the occurrence of certain defined events, the liability to pay for additional security passes to MWI/WAJ. These events include increased risk of terrorism or sabotage, or where GOJ is providing and bearing the cost of security to other industrial facilities owned or operated by the private sector.

We consider that the latter approach would be more appropriate for the Wadi Al Arab Water Supply PPP Project and potentially cheaper as it is likely that private insurance for such events would either be unavailable or too costly. The project company would be able to price for security needs at the outset and that GOJ is able to arrange the additional security required and sanction the level of response for any threat to the site.

#### Delay Events

Although different terminology is used, for example one project based in Bahrain adopts the concept of “excusable delay” in the context of delay events, the general approach in the projects is very similar. In the event of delay caused by events outside of the control of the project company, this approach is to relieve the project company of liability and grant it an extension of time equal to the period of delay to the progress of construction.

Liquidated damages at a daily rate are payable by the project company to the government where the project company fails to achieve the completion date for a reason within its control. Delays which are not excused typically include those such as an insufficiency of funds or failure of the project company to make any payment of money payable under the project agreement, delays or events resulting from reasonably foreseeable unfavourable weather or any disruption in electricity supplies to the site. We have suggested that this general approach to delay events should also be adopted in the Project.

#### Change in Law

The common approach in other PPP projects in the region is for change in law to be allocated as a government risk. On the occurrence of an event defined as a change in law, the project company is put in the position that it would have been in had the change in law not occurred. A detailed analysis of change in law risk adopted in projects in the region is provided in Box 8 below.

It would be optimal if a risk allocation similar to that used on the Disi Water Conveyance Project were used for this Project in order to reduce the time and costs of procurement and negotiation, given that the market has not changed significantly in the intervening period. Some examples of how key contractual clauses have been dealt with in Jordan, in line with international standards, are shown below.

### SUCH AS CERTAIN DELAY EVENTS...

The circumstances under which the Project SPV should be given relief for delay in completion of the construction phase is often heavily debated, but a common approach appears to have been settled in respect of delay caused by land availability (i.e. rights needing to be obtained in respect of third party land), the occurrence of unforeseen site conditions (such as undisclosed power or utility lines, or unexpected archaeological findings) and delay in obtaining the required governmental authorisations needed to perform the works and operate the Project.

The settled approach recognises that MWI/WAJ has experience in dealing with such major causes of delay and is better placed to manage those risks, often by adopting a pragmatic approach towards their resolution – whilst the Project SPV and the lenders are provided with contractual protection for the delay and cost risks in respect of such events. For example, the expropriation of third party land: GOJ has the power to expropriate land, subject to their following a prescribed procedure (the timescales of which are within GOJ’s control), and the obligation to provide adequate financial compensation<sup>11</sup>. It is important that, to avoid alienating the affected population or creating resistance to the Project, such compensation is fair. We would suggest a similar approach to such risks is adopted by MWI/WAJ for the Project. As a consequence, the Project Agreement would

<sup>11</sup> Expropriation Law No.(12) of 1987

provide that the Project SPV would be given an extension of time and compensation for its direct costs incurred. Delay caused by the Project SPV default, such as poor design leading to failures during the handover testing, obviously remains a Project SPV risk.

### ...CHANGE IN LAW...

The change in law position is another example of where it would be beneficial to adopt a tried and tested approach for the Project. It is recommended that MWI/WAJ accept change in law risk, as it is the party best placed to be able to influence any changes in law that would affect the Project. This position has been seen in other PPP projects, both in Jordan and in the region, where change in law has been carefully defined and allocated as a Government risk. Whilst it has been the case for some PPP projects in Jordan and indeed many other parts of the world for there to be a minimum threshold for compensation (below which it is the private sector who assumes the risk), such a risk share approach is unlikely to represent best value for money for GOJ in respect of this Project, because lenders and sponsors would be likely to place a high risk premium on accepting any change in law risk due to the potential uncertainty in any changes that may be implemented over the course of the Project. On the occurrence of an event defined as a change in law, the Project SPV is put in the position that it would have been in had the change in law not been implemented.

### ...QUALITY/QUANTITY OF INFLUENT WATER...

The Project SPV has no control over the ability of other entities to extract water from the KAC or Mukheiba Wells and there is uncertainty associated with the long term output of the Mukheiba well field. It is therefore appropriate for MWI/WAJ to bear the risk for ensuring the required quantity and quality of influent water. By requiring MWI/WAJ to pay the Project tariff for the minimum quantity specified in the Project Agreement on not only output volume, but also on any shortfall of influent volume at source, and by setting a performance regime providing for deductions to the Project tariff for poor quality output water, the risk relating to the quantity and quality of the influent and output water is governed by the payment mechanism. The mechanism will also need to provide that certain other non-technical losses will need to be addressed.

### ...OR POLITICAL RISK.

As in other similar PPP projects, there are certain local political risk events that need to be given specific treatment within the contract, as it would be unlikely to represent good value for money to require the private sector to accept the cost of those risk events. These would include, for example, acts of war within the country, strikes not affecting the Project alone, change in law which renders the Project unlawful, or for which relief to the Project SPV is unavailable under the change in law provisions and the revocation or other withdrawal of any required governmental consents, or any failure of the relevant authority to grant, maintain, renew or accept any relevant consent. The accepted method seen

on international PPP projects and recommended here for dealing with those risks is to give the Project SPV relief from termination and also compensation for costs incurred, to the extent not recovered under insurance. If an event is prolonged and the Project Agreement is terminated, lenders and sponsors will require compensation payments on the same basis as for MWI/WAJ default.

Security of the pipeline can be affected by certain of the local political risk events discussed above, and therefore the Project Agreement should contain explicit provisions dealing with security. One recommended approach, which we have seen adopted on similar water PPP projects in Jordan, is that the Project SPV bears the cost of physical security measures, except on the occurrence of certain defined events, whereby the liability to pay for additional security passes to MWI/WAJ. These events would include: increased risk of terrorism or sabotage; additional security provided at the request of MWI/WAJ; and occasions where GOJ is providing and bearing the cost of security to other industrial facilities owned or operated by the private sector. We suggest that this would be a sensible balance of risk, since the Project SPV will derive a benefit from a secure pipeline, and is also able to price for security needs at the outset. However, as the proposed Project would be a GOJ asset of strategic importance, it has a vested interest in ensuring its security. Crucially, it also has the authority to arrange the amount of such additional security and sanction the level of response permitted for any threat to the site.

### ...AND THE REGULATORY AND INSTITUTIONAL STRUCTURE IN JORDAN IS CONDUCIVE TO PPPS...

The Jordanian Privatization Law and the Privatization Regulation provide a legal structure for tendering and concluding PPPs. Whilst these laws are not specific to PPPs, they are designed to legislate for a broad programme of private sector participation in public services, which encompasses PPPs. No further amendments to the water sector specific laws are required to explicitly permit the Project being procured as a PPP. Article 4 of the Privatization Law specifies that an agreement between the public sector and the private sector can be done by any method decided by the Council of Ministers and it is therefore widely accepted that these provisions satisfy the constitutional requirement that PPPs are sanctioned by law.

The current law addresses the procurement process adequately, providing for minimum negotiation. In a transparent and competitive bidding process which is well prepared in advance, this should facilitate a timely procurement. It is recommended that a similar approach is used as for the Disi Water Conveyor water supply PPP, which had an effective procurement process, with clear and well-defined technical objectives from the outset.

Under the Investment Promotion Interim Law No. (68) of 2003, the proposed Project may benefit from tax exemptions granted by the Council of Ministers. Additionally, under

the current draft Investment Promotion Interim Law (March 2013) international investment in Jordan is encouraged by entitling non-Jordanian investors to the same treatment as Jordanian investors, including the ability to remit abroad in a convertible currency all or part of the invested foreign capital that was brought into Jordan for the purposes of investment, and to repatriate revenues outside of Jordan.

Similarly, a PPP-friendly environment exists within the institutional framework in Jordan. Faced with challenges to improve water resources, increase water availability and improve asset efficiency, the Government of Jordan has implemented several ground-breaking policy reforms, and has a future agenda to carry out further reforms, which could make Jordan a pioneer in the Middle East Region in managing its scarce water resources.

The Al Meyyah Project is an example of this: In 1997, the Programme Management Unit (PMU) was created as an organisational body assigned to carry out the management and administration of a number of projects. Due to its success, additional projects were progressively added to its remit and it was subsequently re-titled the Performance Management Unit. There are several major actors in the decision-making matrix that have already been involved in water sector PPP projects and which have built up experience. The Aqaba Water Company (AWC) was established in August 2004, and the Jordan Water Company, Miyahuna, set up in 2008 for the Amman area. Following the success of these arrangements, Yarmouk Water Company (YWC) was set up in 2010 and replaced the Northern Governorates Water Administration (NGWA).

The current draft PPP law, as at March 2013, proposes to introduce new key institutions (such as the Economic Development Committee (EDC) (previously known as the Ministerial Committee) and a new unit having similar function to the previous Projects Administration. It is intended that the EDC will play a central role in the PPP policy process. The EDC will therefore have much potential in being able to build on the existing roles of the Executive Privatization Commission (EPC) (which ensures that transaction advisors follow the requirements of, and achieve the objectives set out in, a project's terms of reference) and improve overall performance. The future success of these institutions will depend to a large degree on how they are able to build upon the relevant expertise developed during previous PPP projects in Jordan, so as to ensure that the relevant institutions have sufficient capacity to support an increasing pipeline of projects. The procurement of the Project will be a step towards increasing the skill base, both in terms of size and expertise by providing the opportunity to recruit and train additional capacity within the PMU which can benefit from the experience of existing staff and also that of external advisors.

## **...BUT ENACTMENT OF THE DRAFT PPP LAW WOULD BE WELCOMED.**

A draft PPP Law has been prepared by the EPC and is currently under consideration by the House of Representatives (the lower house of Parliament). The PPP law is intended to be an umbrella legislation for all PPP initiatives in Jordan. Although enactment of the draft PPP law is not a strict requirement for the Project to be procured as a PPP, having an express legal provision for project financed structures will serve to establish clear legal authority for the procurement of the Project and PPPs in general.

However, there is one element of the draft PPP law as currently drafted that could be problematic for funders, although not insurmountable. As at the version of March 2013, it appears that the draft PPP law stipulates that any agreement which proposes to subject a Project SPV to foreign law or settle disputes outside of Jordan will be prohibited, except to the extent that the prior consent of the Council of Ministers is obtained. Although international lenders will have no issue with the Project Agreement being subject to Jordanian law, they will require that disputes can be resolved under internationally recognised rules of binding arbitration, which is permitted to and does take place outside of Jordan. To facilitate the progression of the Project as a PPP, this part of the draft PPP law would either need to be amended before being enacted, or the permission of the Council of Ministers is sought and obtained in advance of procurement for disputes to be resolved by arbitration having a seat outside of Jordan.

## **CONCLUSIONS**

Water scarcity is a key national issue for Jordan that is being addressed through the Government's Water Sector Strategy. The Ministry of Water and Irrigation (MWI) and the Water Authority of Jordan (WAJ) have identified an urgent need for further water resources in the Northern Governorates to address a current (and increasing) water supply deficit of around 30 million cubic metres (MCM) per year.

The proposed Project, the Wadi Al Arab Water Supply PPP Project, consists in developing a new bulk water supply for Irbid and the surrounding area. Up to 25 MCM/yr will be treated and conveyed through an 800mm cross country pipeline approximately 32km to the outskirts of the city to meet the immediate water supply deficit in Irbid and significantly improve the balance of supply and demand in the Northern Governorates. This Report concludes that, if procured as a PPP, the technical and financial viability of the Project are sufficiently clear to recommend undertaking further project design feasibility, planning work, and procurement preparation.



The estimated financing requirement is just over USD 100 million (allowing for inflation from 2013 until the start of construction) yielding an annual cost to WAJ (in 2013 prices) of JOD 15.7 million, equivalent to JOD 0.75/m<sup>3</sup> assuming an average annual throughput of 21 MCM. This is lower than the current tariff for the Disi water conveyance project, which is the nearest benchmark to assess whether the Project cost is in line with that of other new or upgraded water supply infrastructure procured by WAJ.

Procuring the Project as a PPP is likely to provide better value for money than conventional public procurement, resulting in a lower whole life cost to MWI/WAJ. The contractual disciplines of the PPP approach provide greater certainty of cost and performance standards, and help to avoid the risk of cost overruns during the life of the Project. International comparisons of PPP and conventional procurement indicate that the financial benefits of transferring the key project risks to Project SPV are likely to outweigh the effect of Project SPV having a higher cost of capital than the government's cost of funding. In addition, when appropriately managed, procurement as a PPP can catalyse sufficient capacity building for the PPP procurement phase, which would serve to free up some MWI and WAJ management and supervisory resources in the implementation and operations phases – which could then be concentrated on other parts of MWI/WAJ's reallocation and improvement strategy. However, PPP procurement also requires that the government puts in place strong supervision, monitoring and liaison capacity for the Project, to ensure that the private sector delivers as stipulated.

The impact of the Project on the cost of supplying water from the Wadi Al Arab area to Irbid can be readily recovered from small increases in customer tariffs, with limited impact on average household budgets. Increasing Yarmouk Water Company's (YWC's) average user charges by 35% in real terms by 2020 (i.e. 4.4% per year from 2013 to 2020) would allow full recovery from end-users of the annual cost of this Project and of expected Non-Revenue Water (NRW) measures in the region, and also enable a 25% reduction in the WAJ subsidy of YWC in real terms from 2013 levels. Even after such increases – which would require changes to MWI and WAJ water pricing policies – average household water bills in the region would still be less than 2.6% of median annual household expenditures in the Irbid governorate. Whilst the effect is greater on poorer households, the low share of water bills in household spending indicate a capacity for customers to bear a higher proportion of the total cost of water, and for government subsidies to be reduced.

The two alternative technical solutions put forward by MWI/WAJ for consideration in this Report were: Alternative 1 – taking groundwater directly from the Mukheiba well field and pumping this using a 35 km pipeline and four pump stations; and Alternative 2 – taking surface water from the

King Abdullah Canal (KAC) and pumping this using a 32 km pipeline and four pump stations to Zabda reservoir, which is located on the western side of the city of Irbid.

Based on the pre-feasibility review undertaken for this Report, we conclude that Alternative 2 is, on balance, the recommended solution to be taken forward for development. This finding takes into account: (i) the potential availability of further water resources: The Mukheiba water already flows into the Mukheiba canal and then into the KAC; thus, siting a new Water Treatment Plant on the KAC will provide much more resource and treatment flexibility if/when further water is made available from water resource sharing agreements with Israel. A similar argument can be made for increased releases from the Al Wehdeh dam into the Yarmouk River and ultimately the KAC; and (ii) uncertainty over quality and quantity of water resources in Mukheiba: The recommended solution provides greater flexibility of treatment options than the alternative of abstraction from the Mukheiba Wells, especially if any possible future degradation in wellfield water quality is taken into account.

The opportunities for a hybrid scheme combining the existing pipeline infrastructure with the recommended scheme should be considered further. Integrating the new Project's transfer and pumping system with the existing system could provide some Capex and fixed Opex savings. In particular, constructing the new pump stations at the sites of the current stations and laying the new main next to the existing main could provide some efficiencies, particularly for infrastructure, such as power supplies and land and pipeline route acquisition. A detailed survey and review of the existing system would be necessary to define the potential extent of these efficiencies and the costs and benefits of combining the two systems.

The Project is technically similar to a number of successful water supply PPP projects internationally and also to the Disi water conveyance project. The Project can therefore be contractually and financially structured in ways which can benefit from transfer of know-how and precedents for technical design and similar contractual drafting or risk allocation that have been already used in the Jordanian water sector, helping to reduce transaction costs. Adopting an approach to risk allocation similar to that used on the Disi project will mean that investors and lenders will be familiar with the key contractual approaches dealing with areas such as quantity and quality of influent water, political risk events, changes in law and supervening events causing delay in the construction or disruption to the operating phase. The scale of the Project would have a funding requirement that would fit local lenders' typical individual loan amounts (including subsidiaries of foreign banks) and encourage them to lend alongside IFIs. The Project could therefore be used as a platform for initiating and increasing capacity within MWI, WAJ and the Performance Management

Unit, to support the procurement of further bulk water supply projects of a similar size within Jordan.

This pre-feasibility study is the first stage of the wider development of the Project and highlights the issues that are key in making the Project a success – providing the foundation for a subsequent full feasibility study. The detailed development and scoping of the Project requires a feasibility assessment to be carried out prior to launch of procurement. Further engineering studies will be needed to develop the information for the project feasibility stage and transaction advisors will need to be appointed to take the Project to financial close. As part of the feasibility and planning, informal market soundings should be carried out with potential financiers such as IFIs, ECAs and local commercial banks. This would help establish the loan periods they might offer (which would affect the optimal project operating period) and the extent to which commercial lenders might require ECA loan or other guarantees, which would affect the cost of debt.

The indicative timeline we foresee for the Project under current circumstances is as follows:

Conclusion of the Phase 2 Study	December 2013
Feasibility and Project Specification	2014 to 2015
Procurement	2015 to 2016
Estimated Contract Signing	Mid 2016 – Beginning 2017
Financial Close	Mid 2017

As in all PPPs, a well-designed, comprehensive project that is part of a wider country strategy, coupled with a transparent and competitive procurement process and balanced contract risk allocation will all be crucial factors for a successful PPP project. Furthermore, political will and stability combined with a viable pipeline of PPP projects will contribute to a successful PPP launch in the Jordanian water sector.







# FEMIP for the Mediterranean



Facility for Euro-Mediterranean Investment and Partnership



The study is focused on providing recommendations from a technical, legal and financial perspective, for structuring a new proposed PPP transaction in the water sector put forward by the Jordanian governmental authorities: the Wadi Al Arab Water Supply PPP Project. The Project is intended to be the first of a programme of similar PPPs to be implemented to help initiate further private sector investment in the Jordanian water sector and increase capacity for wider private sector involvement in Jordan.

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