ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR AWALI-BEIRUT WATER CONVEYER PROJECT (STUDY UPDATE)

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

INTRODUCTION

Greater Beirut has been facing a deficit in potable water for the past forty years. Shortage in water is estimated today at 145,000 m^3/d and 275,000 m3/day for the wet and dry season respectively.

In 1970 the Lebanese Government of the day passed a decree (Presidential Decree No. 14522, May 1970) in which it allocated water from the Litani and Awali river catchments to different regions in Lebanon.

The proposed Beirut-Awali Project will secure a sustainable source of potable water to Greater Beirut to overcome the existing deficit and meet the city's potable water requirements on the short and medium term.

The CDR has initiated the Project following the request of the Ministry of Energy and Water (MoEW) and is seeking to secure financing of the project from the World Bank (WB) whereas the Beirut and Mount Lebanon Water and Wastewater Establishment (BMLWWE) will be covering the local counterpart financing needs.

The Project will be implemented on conventional contract basis with expected construction duration of four years and one year operational maintenance.

The Project has a World Bank (WB) "Category A" status and therefore a full Environmental and Social Impact Assessment (ESIA) has been required.

This report provides an updated ESIA which identifies potential environmental and social impacts associated with the proposed Project and proposes relevant mitigation measure and management plan.

LEGAL AND INSTITUTIONAL FRAMEWORK

This ESIA complies with the Lebanese Legislative requirements as well as with that international (WB/IFC) and European Union standards.

The overall control of water supply and quality is under the Beirut and Mount Lebanon Water and Wastewater Establishment acting under the Ministry of Energy and Water (MoEW) while the Ministry of Environment and various line Ministries are charged with specific regulatory duties.

Regionally the Project area is under the Governorate of Mount Lebanon and its subordinate cazas and Municipalities

PROJECT DESCRIPTION

The Project is divided into two main components:

1. The Awali-Beirut Water Conveyor
2. Improvement and rehabilitation of the water distribution network in Beirut and its suburbs

The Awali- Beirut Water Conveyor includes the following sub-components:

- **Joun Regulation Structure:** set into the hillside by the existing adit access from the Joun tunnel to the hydro-electric power station.
- **Joun to Ourdaniye Tunnel:** running underground throughout its length of 4.1 Km.

- **Wadi Abou Yabes washout:** (discharge point) for emergency discharge or routine maintenance
- **Ourdaniye Water Treatment Works:** including tunnel inlet and outlet portals and the water treatment works. Sludge treatment and disposal facilities will be associated with this works. A washout will be provided for emergency discharge.
- **Ourdaniye to Khalde tunnel:** underground throughout its length of 19.7 km.
- **Inverted Siphon:** in the Damour river with ventilation shafts at the hills to the south and north of the valley. A washout will be provided for use in emergencies and for maintenance.
- **A surge shaft in the hillside above Khalde:** 2,800 mm diameter shaft in reinforced concrete with surface venting structure 7 m diameter in reinforced concrete, including improved access road.
- **Outlet portal in the hillside above Khalde:** termination structure in reinforced concrete and upgraded access road
- **Flow measurement and sampling chamber** on the hillside above Khalde.
- **Twin Pipeline from Khalde portal to Khalde distribution chamber:** 1.9 km long and 1,400 mm diameter
- **Khalde distribution and connection chamber:** in reinforced concrete containing isolating and regulating valves. Provides washout to local stream.
- **Twin Pipeline form Khalde distribution chamber to Hadath 90 and 125 reservoirs:** 7.6 km long, 1,400mm diameter pipelines in ductile iron with connections to Hadath 90 and 125 reservoirs and local supply.
- **Hadath 125 reservoir:** Storage reservoir, two compartments, effective volume 30,000 m^3 in reinforced concrete with isolating valves and small surface kiosk, including access road. Connection to local distribution system.
- **Hatdath 90 reservoir:** Storage reservoir, two compartments, effective volume 50,000 m^3 in reinforced concrete with isolating valves and small surface kiosk, including access road. Connection to local distribution system.
- **Pipeline from Hadath reservoirs to Hazmieh reservoir:** 2.7 km long twin 1,300 diameter pipelines in ductile iron, with option for further extension for supply of treated water to Beirut.
- **Hazmieh 90 reservoir:** Storage reservoir, two compartments, effective volume 20,000 m^3 in reinforced concrete with isolating valves and small surface kiosk, including access road. Connection to local distribution system.

Component 2 will comprise:

- The construction of 16 reservoirs (between 500 m^3 and 1000 m^3 storage capacity each) and associated pumping stations distributed across the various distribution zones in the project area;
- The replacement and/or installation of approximately 187 km of distribution network across the project area in Ein El Delbi, Southern Beirut and parts of the Metn area;

Installation of 200,000 household meters in portions of the project area to be selected by the GBMLWWE and to operate on a volumetric tariff basis;

- Installation of bulk meters at the reservoirs and distribution chambers;

Analysis of Alternative

The No Project Option and other scheme alternatives were addressed in this report.

The No Project alternative is considered to be not viable, as it would have severe environmental and socio-economic impacts in Beirut.

Five overall project options were identified and are illustrated in Table 1below:

Table 1 Overall Project Options

OPTION	OPTION NAME	DESCRIPTION
1	Tunnel 1	Tunnel form Joun direct to a WTW at Khalde with pipeline transfer to reservoirs in Beirut
2	Tunnel 2	Tunnel form Joun direct to Khalde via a WTW in Ouardaniye, with pipeline transfer to reservoirs
3	Concrete Pipeline	Tunnel from Joun to a WTW at Ouardaniye thence by concrete pipeline to Khalde with pipeline transfer to reservoirs in Beirut
4	Ductile Iron Pipeline	Tunnel from Joun to a WTW at Ouardaniye thence by ductile iron pipeline to Khalde with pipeline transfer to reservoirs in Beirut
5	Steel Pipeline	Tunnel from Joun to a WTW at Ouardaniye thence by steel pipeline to Khalde with pipeline transfer to reservoirs in Beirut

Option 2, Tunnel 2 was preferred for the following reasons:

- Lowest overall cost
- Greatest security in terms of:
- Least vulnerability to deliberate damage
- Best resistance to earthquakes
- Least risk of leakage and consequential damage
- Greatest durability and design life
- Lowest maintenance requirements (and thus minimized supply disruption)
- Easier to supply the coastal strip from Ouardaniye WTW rather than a Khalde WTW
- Spare hydraulic capacity available:
- To supplement inadequate reservoir capacity in Beirut
- To allow for future expansion of required; and
- Least environmental impact during construction

ENVIRONMENTAL AND SOCIAL BASELINE STUDY

This section sheds light on the existing physical environment and socio-economic status.

The Climate conditions in the project area are those of a typical eastern Mediterranean climate; the rainfall is low and restricted to the period between November and March, and the temperatures are high in summer, but the area is not subject to the cold winter that occurs in Lebanese mountains.

The existing ambient noise levels recorded near most of the surface structure components averaged between 60 and 65 dB (A). Therefore ambient noise levels already exceed allowed noise levels as per Lebanese legislation (Decision 52/1 of 1996).

The tunnel passes mainly through the upper and the middle Sannine-Maameltein Formation of Cenomanin and Turonian ages respectively. This formation is mainly composed of hard massive limestone and dolomitic limestone rocks. Exposures of this formation cover most of the study area with a total thickness of around 800 m. Only the upper part of this formation is exposed in the study area.

Conformably overlying this formation is the Chekka Formation of Senonian age. It is mainly composed of thinly bedded soft marl and marly limestone rocks. It is mostly exposed in the areas surrounding Joun village.

Structurally the area is located few kilometers west of the Coastal Flexure which is the possible extension of the Roum Fault (Nemer, 1999). The flexure extends from Chhim in the southern part to Baawerta and Aaramoun in the central and northern parts of the study area respectively. The Flexure has steeply dipping beds which gentles as we approach the study area. The general inclination of the beds in the study area is around 20˚ dipping towards the west.

The Sannine-Maameltein Formation is the major coastal aquifer in the study area. It is karstic in nature with tertiary porosity meaning that groundwater is flowing mainly in fissures, fractures and conduits. There are no permanent springs issuing from this formation except close to the coastal area and mainly below sea level in the form of submarine springs (Feasibility Report, 1994).

The position of the water table is closely related to the base level which is the sea level and it gently rises inland with a mean gradient of 11.5 m/km. The depth of the water table was determined from groundwater wells (Feasibility Report, 1994).

The raw water will be delivered to the plant by the use of tunnels that belong to the existing hydroelectric system. There are two main sources of water:

1. Karaoun Lake;
2. Awali River.

Raw water quality has been analyzed several times in the past with the first one being in 1968/1972, the second one in August 1984 and the third one in 1994/1995. The most recent water quality analysis was conducted in 2001. The first two can be considered outdated as it is suspected that the condition and status of the tunnels, hydroelectric power plant and dams may have changed during the proceeding period. The analysis conducted in 1994/1995 contained some information on the most important parameters; however the feasibility report and the preliminary design report of Montgomery Watson did not cover comprehensive water quality information on a seasonal basis for both the Karaoun and Awali sources. It is not possible to immediately verify the conclusions and assumptions which were the basis of the 1994 feasibility study or the subsequent preliminary design. This is due to lack of recent detailed water quality monitoring data at the points of concern to this project, and the fact that new data would need to be collected over long periods to capture seasonal variations.

The landscape along the areas of the Awali project varies between the hills and the coastal planes. A summary of nature of landscape and existing biodiversity is given in Table 2 below

Table 2 Summary of Landscape and Biodiversity

STRUCTURE	LANDSCAPE	BIODIVERSITY
Joun flow regulation	Relatively steep valley (degraded site)	very common species including *Calicotome villosa* (Vahl) Link, *Poterium spinosum* L., *Phlomis viscosa* Poir., *Nerium oleander* L., *Inula viscosa* (L.) Aiton, *Echinops viscosus* DC. and *Notobasis syriaca* (L.) Cass.
Wadi Abou Yabes Washout	Isolated hillside location	Significantly degraded environment
Ouardaniye WTW	open hillside location	Several species were found and identified, including one specimen of *Rhus tripartita* (Ucria) D.C. and one of *Quercus calliprinos* Webb, 5 species of orchids in large quantities and many species of butterflies.
Nahr Damour Inverted Siphon	Deep, narrow valley	Several types of vegetation cover composed mainly by *Platanus orientalis* L. (Oriental Plane), *Alnus orientalis* Decne (Oriental Alder), *Acer syriacum* Boiss. et Gaill. (Syrian Maple), *Pistacia lentiscus* L. (Mastic), *Pistacia palaestina* Boiss. (Wild Pistachio), *Quercus sp.* (Oak), *Salix acmophylla* Boiss. and *Salix alba* L. *var. micans* And. (Willow) were found.
Khalde surge shaft and outlet	R hillside sites having a steep slope to the west	Highly degraded and/or with no important floral biodiversity.
Khalde flow measurement and samplignchamber		This location is characterized by the richness of its flora and the aged specimens of the trees found. This was by far the most important ecosystem visited among the 12 selected sites. This site is on the *Pinus brutia* Ten series, where the conifers *Pinus brutia* Ten., *Pinus halepensis* Mill. and *Cupressus sempervirens* L. are

STRUCTURE	LANDSCAPE	BIODIVERSITY
		the most abundant formation.
Distribution Chamber	Between the new highway and the old coastal road. Offshore, the coastal beach is used for some recreational activities	Highly degraded and/or with no important floral biodiversity.
Hadath 125 reservoir	Terraced sloping valley	Highly degraded and/or with no important floral biodiversity.
Hadath 90 reservoir	Waste ground	Highly degraded and/or with no important floral biodiversity.
Hazmieh 90 reservoir	Flat to gently sloping ground	Highly degraded and/or with no important floral biodiversity.

Archaeological and historical interests are limited at the locations of surface features of the Project, and no remains were uncovered during site investigations. Khalde has yielded some archaeological finds but not directly in the project area.

A summary of social survey conducted at relevant main villages is given in Table 3 below:

Table 3 Summary of Socio-Economic situation in main villages

VILLAGE/TOWN	GENERAL DESCRIPTION	LIVELIHOOD ACTIVITIES	EDUCATION, CULTURE, COMMUNITY & PUBLIC INFRASTRUCTURE	WATER & WASTEWATER SERVICES	OTHER INFORMATION
Joun	Population: 7500-8000 Altitude: 350-400 m Surface area: 12 km^2 Land ownership: 20-30% publicly owned, and the remaining is privately owned Land use: 80% is designated for agricultural use	Agriculture: Olive groves; Citrus orchards; Vegetables and Flowers in greenhouses; the majority of designated agricultural lands remain uncultivated due to the lack of irrigation water Industry: Agro-food (Olive oil; Orange Blossom water; Rose water; Carob molasses); Manufacture of Nylon, Tyres and concrete building blocks Commerce: Small shops and garages	High literacy rate (95%) Two public & two private schools Public Library Afforestation campaigns Sports facilities Monastery of Saint Saviour Archaeological features Old stone houses One dispensary & resident doctors	Drinking, service and irrigation water is supplied by the Barouk Water Authority and distributed through a public network A public, municipal well supplements the supply in addition to many private wells in privately-owned lands Small hillside reservoirs for rain water harvesting No sewage network; septic tanks are used	A land survey is underway 60-70 building permits were handed out in the last three years 60% of the population are seasonal residents
Ouardaniye	Population: 4000 Altitude: 350 m	Agriculture: Vegetable production in greenhouses Industry: A grain mill and building blocks factories Commerce: Restaurant/Café	One public & one private school One dispensary	Water is supplied through public wells, at depths of 452m and 369m, managed by the municipality, which also manages a distribution network Up to 150 private wells are drilled in the village No sewage network; septic tanks are used	
Al-Damour	Population: 30,000 Resident population: 10,000 (due to displacement & emigration) Land ownership: The majority of lands are privately owned Land use: 20% are in agricultural use	Agriculture: 100 ha of banana plantations and vegetable production Commerce: Restaurants/Cafés; Small shops and garages	Two public & three private schools Archaeological features One dispensary & resident doctors	The Damour River waters are used for irrigation Drinking and service water are supplied through municipal public wells and private wells A sewage network is present but is not operational; septic tanks are used	A land survey has been carried out Around 30 building permits were handed out in the last three years

Khalde	Residential and touristic area, It is a coastal area that is rapidly urbanizing with 15,000-20,000 residents.	Very little agricultural activities		A water distribution network runs through Khaldeh and is supplied from the Mechref village. Water pipes have all been repaired this year. Also, several privately drilled wells exist in the village with a depth ranging from 30-60 m but water is slightly salty. A sewer network is present and is connected to the collector in Khaldeh.	residential and touristic area rapidly urbanizing
Hadath	Population: 150,000	Industry: Light industries – Elevators, towels, tiles Commerce: Banks & shops	Many public service institutions Four public, 10 private & two vocational schools; three universities, including the largest Lebanese University campus Two hospitals, three dispensaries and many resident doctors	Water is supplied through the Ain El-Delbeh water authority and distributed through a municipally-owned and managed network A sewage network is present and operational	
Hazmieh	Population: 6,500	Commerce: Over 10 banks and numerous offices	Many public service institutions One public & six private schools; three universities Two hospitals, one dispensary and many resident doctors	Water is supplied through the Ain El-Delbeh water authority from the Daichouniyeh Spring and distributed through a network A sewage network is present and operational	

PUBLIC CONSULTATION

Lack of consultation with the directly affected local communities in the earlier EIA report posed a necessity to target these in the updated study in aim to ensure that adequate and timely information is provided to them and other stakeholders, and that they are given the chance to voice their opinions and concerns.

Based on an agreed plan with MoE's representatives, ELARD team has consulted potentially affected local people and concerned Municipalities during the socio-economic survey. Project leaflets, prepared in Arabic, were distributed during the survey. These aimed at introducing the project while serving as an invitation to participate in a public consultation meeting.

The public participation event was held in the Lebanese University in Hadath at the Institute of Fine Arts on the 12th of May 2010.

ELARD consultants presented the project details, potential impacts and mitigation measures in a 45-minute presentation and opened the floor for one hour of open discussions with the attendees.

Various environmental impacts were discussed during the open session and some concerns rose up by the attendees. The two main serious concerns raised by the public are summarized in Table 4 with an explanation of how the concern is addressed by the project proponents.

Table 4 Main Public Concerns

CONCERN	DESCRIPTION	ACTION/ANSWER
Retrieval of 3m³/s of water	Concerns were raised regarding type and magnitude of impact that could potentially affect the natural flow of water in the Awali River section downstream the Joun HEP after retrieval of the required amount of water for the Conveyor Project	CDR representative pointed out that the impact would be negligible. ELARD to investigate the issue and address it in its Environmental and Social Impact Assessment Report
Structural impact from TBM activity	Concerns on adverse impacts on the structural stability of the St. Joseph Carmel School were expressed by the chairperson since the tunnel is passing beneath the school.	CDR to provide adequate geotechnical reports proving that there will be no direct impacts resulting from the tunnel boring activity.

A second Public Consultation covering both components of the project was held for the purpose of disclosing the results of the ESIA study on 27 July 2010 and has targeted the same audience including all related stakeholders as for the first consultation.

ENVIRONEMNTAL AND SOCIAL IMPACT ASSESSMENT

A summary of the
impacts of the Project on its surrounding environment assuming no mitigation measures are undertaken is given in Table 5 in an Environmental Impact Severity Matrix (EISM) whereas Table 6 presents the EISM of the project when control and mitigation measures are adopted.

With no mitigation measures being implemented, significant impacts would be attributed to the following activities:

- Dust generation
- Construction works
- Excavation and tunneling
- Blasting
- Solid and Liquid waster generation
- Accidental fuel and chemical spills
- Traffic (during construction phase)
- Land Expropriation

Table 5 Impacts of the Project on its surrounding with no mitigation measures

Activity / Source of the Impact	Unmitigated Impacts – Receptor: Air Quality	Landscape and Soil QUALITY	water RESOURCES	Biodiversity	Noise	Archeological	Socio-Economic & Public health
Construction Phase							C
Combustion and Exhaust Emissions	3C						3C
Dust Generation	4C						4C
Open Burning of solid waste	2A						2A
Project Footprint		2C				1A	2B
Construction works	4C				2C		2B
Excavation and tunneling works	4C	4C	4C	3C	2C	1A	2B
Blasting		4C		4C	4C		
Solid and Liquid waste generation		4C					4C
Accidental Spill of Fuel, Oil and Chemicals		4B	4C				
Land Expropriation							4C
Traffic					4C		4C
Operation Phase							C
Combustion and Exhaust Emissions							
Open Burning of solid waste							
Solid and Liquid waste generation		4C	3C				4C
Accidental Spill of Fuel, Oil and Chemicals			3C				
Sludge Generation			1C				
Water Pumps					3C		3C
Retrieval of 3m³/s of water upstream Joun HEP			1C				1C
Trafffic					2B		2B

LEGEND

Consequences		Likelihood	Acceptability
1 - Negligible	4 – Significant	A – Low	Beneficial
2 - Minor	5 – Catastrophic	B – Medium	Negligible with minor mitigation
3 - Moderate	Beneficial	C – High	Minimize Impacts
			Unacceptable

Table 6 Impacts of the Project on its surrounding with mitigation measures

Activity / Source of the Impact	Mitigated Impacts – Receptor: Air Quality	Landscape and Soil QUALITY	water RESOURCES	Biodiversity	Noise	Archeological	Socio-Economic & Public health
Construction Phase							C
Combustion and Exhaust Emissions	2C						2C
Dust Generation	2C						2C
Open Burning of solid waste	2A						2A
Project Footprint		1C				1A	1B
Construction works	2C				1B		1B
Excavation and tunneling works	2C	2C	2B	2B	1B	1A	1B
Blasting		2C	2C		2B		
Solid and Liquid waste generation		2A					2A
Accidental Spill of Fuel, Oil and Chemicals		2A	2B				
Land Expropriation							3B
Traffic					3B		3B
Operation Phase							C
Combustion and Exhaust Emissions							
Open Burning of solid waste							
Solid and Liquid waste generation		2A	1C				2A
Accidental Spill of Fuel, Oil and Chemicals			1C				
Sludge Generation			1C				
Water Pumps					1B		1B
Retrieval of 3m³/s of water upstream Joun			1C				1C
HEP							
Trafffic			1C				1C

LEGEND

Consequences		Likelihood	Acceptability	
1 - Negligible	4 – Significant	A – Low		Beneficial
2 - Minor	5 – Catastrophic	B – Medium		Negligible with minor mitigation
3 - Moderate	Beneficial	C – High		Minimize Impacts
				Unacceptable

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Table 7 Summary of Environmental and Social Management Plan

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
CONSTRUCTION ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (CESMP)				
Site Clearance/ Excavation Drilling/blasting, pipeline construction and tunnel boring works *(to a lesser extent)* Solid and liquid waste generation from camp operations (such as sanitary facilities and kitchen) and pipelines pressure testing) Accidental chemical / oil spills or leaks (from excavators and tunnel boring machine)	Disturbance to land/landscape (Land scaring from Project Footprint) Compromised Visual Amenity Contamination of soil quality.	Limiting the land clearance area required for pipelines in the vicinity of forested areas of Khalde; Planning and marking access routes and adopting minimum safe operating width Using existing tracks/ routes to reduce the size of the impacted area; Minimizing (whenever possible) the time and space of heavy machinery use and constructing intensive activities and using whenever possible existing and previously disturbed land and roads to access site and avoiding off-road driving, areas crossing wadis or that are prone to erosion; Avoiding excessive removal of topsoil and minimizing grading and clearing of vegetation; Stabilization of topsoil and spoil stockpiles along the pipelines previously removed during excavation works and using it as cover material whenever possible during backfilling and site restoration; A preliminary project handover and restoration plan should be developed that identifies disposal options for all equipment and materials, including products used and wastes generated on site; Project handover (end of Construction) should comprise the complete closure of the labor camps including the removal of all equipments and vehicles and other fixtures and infrastructures and covering of trenches and restoring of all sites to original state. Reduce the use of blasted debris as much as possible and allow backfilling and site restoration from topsoil and spoil excavated by conventional methods (such as drilling) and generated by the tunnel boring works;	Implementation: Contractor. Supervision: ESM	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
		Perform a soil sampling campaign in the Project affected areas, specifically where blasting activities took place, in order to document the soil conditions (physic-chemical characteristics, petroleum contamination, etc.) following the cessation of construction works	Environmental Consultant (to be hired by CDR)	1500
Loading and Unloading operations (at construction sites and spoil handling facilities) Truck transportation (haulage) Operation of on-site diesel-fuelled generators	Increase in ambient dust levels (fugitive dust emissions) Increase in combustion/exhaust emissions (release of combustion gases, NOx, CO2,SO2, CO)	All vehicles, plant and equipment engines shall be properly maintained in accordance with the manufacturer's instructions to maximize combustion efficiency and minimize emissions; Usage of vehicles/machines equipped with exhaust emission control units; All trucks transporting material likely to generate dust should be properly covered according to Lebanese requirements; Maintenance and reporting of monthly fuel consumption records; Any machinery, which is intermittent in use, should be shut off in periods of non use or, where this is impracticable to be throttled back to a minimum; Small combustion source emissions (with a capacity of up to 50 megawatt hours thermal (MWth)) should adhere to the IFC emission standards for exhaust emissions in the General EHS Guidelines and MoE Decision 8/1 of 2001, whichever stricter; Combustion source emissions with a capacity of greater than 50 MWth should comply with the IFC EHS Guidelines for Thermal Power; Implement proper dust control measures. Measures will include the damping down of dust if excavations are occurring in high winds, rig dust suppression units and the covering piles of excavated material to prevent mobilization (with nets or matting); Efficient scheduling of deliveries as well as establishing and enforcing appropriate speed limits over all paved and unpaved surfaces (< 40 km/h) via a Traffic Management Plan (TMP) approved by the Project Proponent.	Implementation: Contractor. Supervision: ESM	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
Drilling/blasting, pipeline construction Vehicular movement and Equipment operation	Increase in ambient noise level	Fitting all machinery and vehicles with effective exhaust silencers; Maintaining all machinery and vehicles in good repair and in accordance with the manufacturer's instructions; Limit the working hours when near sensitive sites (schools, health care unit, etc.); Proper selection of equipment for the specific tasks considering the lowest sound power level; Maintenance of equipment as not to create unnecessary noise owing to mechanical problems; Operation of equipment in a manner considerate to the ambient noise background; Avoidance of leaving equipment idling unnecessary; Elimination of tonal, impulsive or low frequency noise through noise control engineering techniques where feasible (e.g. dampers, fitting of mufflers, etc.) Provision of alternative methods if necessary (substituting hammering actions with hydraulics); Provision by the Contractor of adequate buffer zone with sensitive populations in the Project Area; Mandatory use of noise plugs during noisy activities and Proper communication with receptors whenever highly noisy events are planned	Implementation: Contractor. Supervision: ESM	No cost incurred
Vehicular movement & Truck Trips/Haulage	Traffic congestion	Liaising with community and government by a dedicated resource in the field throughout the duration of the project (i.e. establishing a complaint register to document potential public complaints. Clearly identify the project footprint to avoid accidents during further development of the area particularly in the designated and construction sites. Having a Traffic Management Plan (TMP);	Implementation: Contractor. Supervision: ESM	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
		Allowing only certified and trained drivers to carry out transportation related activities; Having an Emergency Response Procedures in place; and Having a maintenance program to all vehicles associated with construction activities.		
Fuel, Oil and Chemical Handling and Storage	Contamination of soil quality and groundwater resources	Storage Where appropriate, fuel, oil and chemicals stores will be sited in specific designated areas on site on an impervious base within a suitably contained area; The fuel storage facilities will have a secondary containment, such as a berm, capable of holding the capacity of the largest container plus 10% to accommodate rainfall; Fresh oil and waste oil will be segregated and stored separately to prevent a potential risk of mixing; All storage tanks will be positioned to minimize the risks of damage by impact; All storage tanks will be of sufficient strength and structural integrity; No storage tank will be used for the storage of fuel, oil or chemicals unless its material and construction are compatible with the type of materials to be stored and storage conditions (e.g. pressure and temperature); Drip trays will be installed underneath equipment such as diesel generators, transformers to contain leakage. The drip trays will be maintained and kept drained of rainwater; and All fuel and oil will be inventoried and use recorded. Refueling Supervision of refueling at all times by appropriate personnel: Checks to fill hoses, valves and nozzles for signs of wear and tear prior to operation; Checks to tank levels prior to delivery to prevent overfilling through side glass	Implementation: Contractor. Supervision: ESM	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
		or manually by dipstick logs; Locating fill pipes within the containment (unless shut-off valves are fitted); Grounding of tanks and grounding of vehicles during fuel transfers; and Ensuring a supply of suitable absorbent materials is available at re-fuelling points for use in dealing with minor spills. If a leak or spill occurs during loading or offloading operations, the operations will be stopped and the spill will be contained, cleaned up and collected based on the Spill Response Plan. Chemicals Personnel handling chemicals will be trained in their handling and use and aware of the associated hazards including the personnel protective equipment (PPE) requirements through pre-task instruction. Material Safety Data Sheets (MSDS) for all chemicals supplied will be held at the storage area, the point of use and by the site medical staff and site ES&SR representative; Safety signage will be in place; All chemical deliveries (loading and unloading operations) will be supervised at all times and will be transferred to a secure storage area without delay; Storage of chemicals will be sited on designated areas at the site; an inventory of all chemicals on site will be kept and use will be recorded. Chemicals will be properly packaged, labeled and stored; Dangerous/hazard chemicals will be stored separately; Chemical storage drums will be in good condition and with sealed bungs. All used drums will be washed / flushed with water and pierced before leaving the site to prevent local use and subsequent exposure to contaminants if they are not able to be returned to the original supplier. All tanks and containers will be clearly labeled with the nature of the contents and placarded with the MSDS. The storage of chemical products in containers or on palettes equipped with plastic dust cover against severe weather. Chemicals will be shaded. Chemical storage drums and		

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
		packaging are to be returned to the original supplier in an orderly fashion i.e. palletized and shrink wrapped.		
Waste Management	Contamination of soil quality and groundwater resources	CDR shall promote the use of a Licensed Municipal Waste Facility in coordination with MoE. All personnel shall be responsible for ensuring that standards of "good housekeeping" are maintained. This will include clearance of all rubbish and work associated debris; Contractors to include a waste management plan as part of CEMP. And CDR to ensure that solid waste management is included in the contractor's agreement.	Implementation: CDR/Contractor. Supervision: ESM	No cost incurred
OPERATION ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (OESMP)				
Site clearance /excavation and spoil stockpiling activities Accidental spills Tunneling activities	Contamination of groundwater Quality	Clean up spills if any with an absorbent material such as cat litter. Develop a contingency plan to prevent potential groundwater contamination. Passing water resulting from tunneling and excavation through oil separator prior to discharge in the event that it has been contaminated with oily residues. Minimize the planned amount of land to be disturbed as much as possible. Use special construction techniques in areas of steep slopes, erodible soils, and stream crossings. Reclaim or apply protective covering (e.g., vegetative cover) on disturbed soils as quickly as possible. Avoid creating excessive slopes during excavation and blasting operations since these activities accelerate water percolation into ground. Monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer. Disposal of excess excavation materials in approved areas to control erosion	Implementation: Contractor. SUPERVISION: ESM	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
		and minimize leaching of hazardous materials. Impose site-specific Best Management Practices, potentially including silt fences, hay bales, vegetative covers, and diversions, to reduce impacts to surface water from the deposition of sediments beyond the construction areas. Immediate implementation of the Oil spill response plan in case of accidental events.		
Site clearance /Excavation Vehicular movement	Destruction of natural habitat (loss of forested areas and few native flora species)	Develop a detailed plants Inventory at the 3 identified sensitive sites (Ouardaniye WTW, Nahr Damour Siphon/Washout and Khalde Flow measurement and sampling chamber) prior and post construction activities commencement as part of CEMP; Developing an ecosystem rehabilitation plan to regenerate and reintroduce some of the native species of trees (especially at the most degraded areas) present in the studied area, therefore leading to positive impacts on biodiversity.	Implementation: Biodiversity expert	1200
		Special effort and attention should be given to the 4 sensitive sites Limiting vehicular transport to defined roads as to prevent unnecessary damage to vegetation; Preserving top soil excavated by conventional methods (such as drilling); Avoiding introducing invasive plant species (e.g. weeds). All affected areas must be replanted with indigenous species appropriate to the respective sites; and	Implementation: Contractor. Supervision: ESM Biodiversity expert	No cost incurred
Physical excavation (blasting, site clearance, trenching)	Demolition, alteration of or damage to archaeological resources, whether on surface or below-ground	Prepare a brochure to help crew members recognize any discovery of buried antiquities; and	Archaeologist	500
		Direct reporting to local authorities (DGA) in case of new findings during Construction and proper documentation of historic sites.	Implementation: Contractor. Supervision: ESM	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
Land Expropriation	Permanent and irreversible loss of land and some loss of agricultural greenhouses (agricultural business) Temporary severance / disturbance of public rights-of-way and access to community resources and services.	Consultation with potentially affected communities prior to expropriation procedures. Fair and full compensation for land and other assets expropriated for the project in the public interest as stated in the Lebanese expropriation law (Law No. 58/1991 and its amendments (2006)). Compensation to local farmers who lost their agricultural lands (loss of livelihood); Preparation of a Resettlement Action Plan (RAP) (ongoing) as per the World Bank standards.	ESM	No cost incurred
Fuel and Chemicals handling & storage	Contamination of soil quality and groundwater resources	Selecting appropriate locations for septic tanks installation as to avoid leakage and contamination of groundwater. Immediate cleaning of a spill by removing affected top soil layer by trained employees Continuous in-situ sampling of soil in the vicinity and underneath the spill for potential contaminant; and Stopping the source of spill (close valve, seal pipe, seal hole etc…); Refueling in a designated fueling area that includes a temporary berm to limit, if not prevent, the spread of any spill.	Implementation: WTW operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred
Wastewater generation (sanitary/process)	Contamination of soil quality and groundwater resources	CDR should commission local contractor for the collection of domestic wastewater and disposal to nearest public sewerage network (Frequency will be based on septic tank volume)	Implementation: Local contractor Supervision year of operation: ESM After project handover:	200 (unit cost)

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
			Environmental representative from BMLWWA	
		Adopting as much as possible dry cleaning techniques to decrease resultant wastewater, and to avoid flushing of spills to deeper soil layers. Develop a stormwater management plan to ensure compliance with regulations and prevent off-site migration of contaminated stormwater.	Implementation: WTW Operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred
Leaching from Naameh landfill	Contamination of groundwater quality	Regular monitoring wells data inspection for the section of the tunnel lying downstream the land fill Giving additional consideration for the subject strip during maintenance of the tunnel Checking for any fissures or fractures in the tunnel wall during maintenance	During the first year of operation: ESM After project handover: Environmental representative from BMLWA	
Sludge handling and disposal	Contamination of groundwater resources	Design considerations for sludge management include dewatering and thickening processes prior to disposal. Re-use of separated water at the inlet of the WTW instead of discharge of liquid effluent to wadis. In the event of effluent discharge into the Wadi (following sludge dewatering), the former should comply with the Lebanese new standards for discharge into receiving water bodies (Decision No. 8/1). Investigate the disposal of sludge cake to the Naameh landfill instead of quarry rehabilitation. *(In the latter case, potential for percolation/leaching into groundwater)*.	Implementation: WTW Operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from	No cost incurred

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE
			BMLWWA	
Operation of pumping stations	Nuisance to noise-sensitive receptors	Fitting all equipment and pumps with effective exhaust silencers Proper selection of pumps for the specific task considering the lowest sound power level; and, Maintenance of pumping stations as not to create unnecessary noise owing to mechanical problems Insulating generator rooms and engines.	Implementation: WTW Contractor Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred

Greater Beirut Water Supply Project Additional Finance

Addendum to the Environmental and Social Impact Assessment

I. Introduction

The Greater Beirut Water Supply Project (GBWSP; Project ID: P103063) was approved on December 16, 2010 and was effective on December 4, 2012. The current closing date is June 30, 2019. There are two implementation agencies – Beirut Mount Lebanon Water Establishment (BMLWE) and Council for Development and Reconstruction (CDR). The total project amount is US$370 million, of which the IBRD credit amount is US$200 million and the co-financing from BMLWE and the Government of Lebanon is US$ 140 million and US$ 30 million, respectively. 51.19 percent of the IBRD credit is already disbursed.

Project Description

GBWSP's Project Development Objective (PDO) is to 'increase the provision of potable water to the residents in the project area within the Greater Beirut region, including those in the low-income neighborhoods of Southern Beirut, and to strengthen the capacity of the BMLWE in utility operations".

The GBWSP has three components:

1. Bulk Water Supply Infrastructure (total cost: $236 million; IBRD contribution $187.55 million). This component comprises *(a) the construction and construction supervision of bulk water supply infrastructure consisting of* (i) two water tunnel conveyors of 3 km and 21 km respectively; (ii) two transmission twin pipelines of 7.6 km and 2.7 km respectively; (iii) three storage reservoirs of 35,000 cubic meters (cum), 50,000 cum, and 20,000 cum; *(b) design, construction and construction supervision of a water treatment plant (WTP) of 250,000 cum a day capacity; (c) all related equipment, including pumps and valves; and (d) support to CDR for project management related to the above.*
2. Supply Reservoirs, Distribution Network and Metering (total cost: $61 million; IBRD contribution $2.55 million). This component comprises: *(a) Design, construction and construction supervision of 16 supply reservoirs of storage capacities varying between 500 and 1,000 cum each; (b) design, construction and construction supervision of water supply distribution network of about 187 km of pipelines; (c) installation of 200,000 household meters in selected areas; and (d) installation of about 30 bulk water meters at reservoirs and distribution chambers.*
3. Project Management, Utility Strengthening and Studies (total cost: $15 million and IBRD contribution $9.9 million). *This component focuses on capacity strengthening for the utility and Ministry of Energy and Water.*

The location of key project interventions is included in Annex 1.

Project Status

The GBWSP is rated Moderately Satisfactory (MS) for development objective implementation progress, and is on track to achieve its PDO. The first part of the PDO, related to increasing provision of potable water in the project area within greater Beirut including in the low-income neighborhoods, is likely to be achieved by the current closing date. Full achievement of the second part of the PDO related to strengthening the capacity of the BMLWE in utility operations is also expected. The BMLWE is issuing performance-based contracts (PBC) to facilitate a shift towards continuous water supply, which is an indicator of improved utility operations.

The GBWSP was rated moderately satisfactory for achievement of the Development Objective (DO) and Implementation Progress (IP) until June 7, 2017. At that time, the decision of the region was to downgrade the DO until the signing of the contract for the Wardanieh WTP. The signing of the contract took place in September and the order to commence issued in November 2017. Based on this, the Bank team upgraded the DO to MS in November 2017.

The GBWSP implementation is progressing well. The tunnel and the Wardanieh WTP are expected to be completed by the closing date and the rehabilitation of the network and supply reservoirs are expected to be completed before the end of the FY18. The tunnel work is also progressing well. The two Tunnel Boring Machines (TBMs) are operational, and the excavation progress to date (end of 2017) is around 64.5 percent (i.e., about 14.9 km). The excavation is expected to be completed by June 2018. The works on the two transmission twin pipelines are well underway, with around 2km completed from Khaldeh to Choueifat area. At this stage, the works are ahead of schedule. 421km of the network has been completed, surpassing the target of 187km. 20 reservoirs have been substantially completed compared to a target of 24. The distribution reservoirs and the network rehabilitation work are expected to be completed by April 2018.

The utility operations have also been strengthened by the BMLWE implementing agency. The project has included technical assistance to support the transition to continuous water supply, and the implementation of flow meters and SCADA system in pilot project areas in Beirut. This pilot project area is situated in Ashrafieh District (see map in Annex 1, Figure 3) which has been operational for a period of 1 year and which will continue for a period of another 2 years. It includes 4 phases as follows:

1) phase 1: supply and installation of 1,000 water meters;
2) phase 2: supply and installation of 9,000 water meters; and
3) phases 3 and 4: framework agreement for the next subsequent 2 years: annual supply and installation of 10,000 water meters.

It is to be noted that phases 3 and 4 have not yet commenced. The main objective of this pilot project is to reduce water losses in already established District Metered Areas (DMAs) in Ashrafieh District and supply and install 30,000 water meters. These interventions have led BMLWE to issue two bidding documents to establish contracts for continuous water supply and for reduction of losses in West and South Beirut during a period of three years. The BMLWE will

also issue the bidding documents for a performance based contract in downtown Beirut in three months. These contracts are allowing the BMLWE to prepare the ground to move towards continuous water service for all customers. Currently, some of these customers are receiving water for only three hours a day in the summer time and are relying on water tankers that cost between US$20 to US$60 per cum, depending on water shortages at the time. These biddings are funded by BMLWE with technical guidance and support from the Project and through Trust Funds as appropriate. These interventions not only improve the utility's ability to perform its functions, but have also improved BMLWE's ability to partner with the private sector in its operations to deliver a better service to customers. Ultimately, these interventions will lead to improved and inclusive water supply to all residents in the BMLWE's service area, with significant reductions in water losses, invaluable data on the daily water consumption patterns of customers, as well as significant improvement in water supply hours and quality of service (see Annex 1, Figure 2 for a map showing the additional financing location under BMLWE).

II. Rationale for Additional Financing

Due to the Syrian refugees' influx in the country since 2014, the country has lower liquidity availability and as such the additional financing is to cover the cost of expropriation for two regional reservoirs (note: the land for Hadath 125 reservoir is already expropriated), for US$15 million, part of the optional cost of the tunnel and the twin pipelines ongoing contract, for US$10 million, and supervision costs and contingency, for US$5 million. It is worth noting that until 2016, CDR was planning to use government funds to cover some of these activities, mainly the costs of expropriation as well as the cost of the optional part of the tunnel contract. However, the refugees' influx has affected the government's liquidity, resulting in CDR requesting additional project funds to cover these critical activities.

The current Project financing will not be able to cover the storage of water from the conveyor. The lack of storage will result in a very complex and inefficient use of the water provided through the tunnel. Moreover, technically and practically, no connection could be provided directly between the conveyor and distribution systems, without bulk storage reservoirs. The Hadath and Hazmieh reservoirs, with their designed capacities, are mandatory needed to ensure a proper functioning of the system around normal cycle of 24 hours / day for conveying – treating – distributing, as per the best practice and design requirements. Even though the access to water will improve, and the project objective can be achieved, the efficiency, operation and sustainability of the system would be affected. Hence, the regional reservoirs are critical to improve the water supply systems and utility operations.

Based on this assessment, CDR has requested and additional financing of US$ 70 million to cover the projected cost overrun and scale-up for the three regional reservoirs.

Changes under the Proposed Additional Financing Project

a. For CDR Component:

Currently, the total volume of the three regional reservoirs storage is 100,000 cum. The additional financing request is to increase the total volume of the regional reservoirs by 20 percent, i.e.

120,000 cum. The water storage in the three regional reservoirs in Hadath and Hazmeih will be as follows:

(i) The first reservoir in Hadath (at level 90 ASL - referred to as Hadath 90) – current proposed volume 54,600 cum, compared to the original conceptual design of 50,000 cum.
(ii) The second reservoir in Hadath (at level 125 ASL - referred to as Hadath 125) – current proposed volume 37,800 cum, compared to the original 35,000 cum.
(iii) The reservoirs in Hazmeih (at level 90 ASL - referred to as Hazmieh 90): current proposed volume 29,400 cum compared to the original 20,000 cum.

The proposed additional financing will bridge a financing gap of US$70 million resulting from an increase in the following: (i) construction costs for the three regional reservoirs (two reservoirs in Hadath area, and one reservoir in Hazmeih); (ii) the expropriation cost of two of the reservoirs (Hadath 90 and Hazmeih 90); (iii) financial gap for half of the optional part of the tunnel and the twin pipeline contract[1] (1st half of the optional part is already ensured by the CDR local funds), for US$10 million; and (iv) supervision and contingency costs.

b. For Beirut and Mount Lebanon Water Establishment (BMLWE) Component:

Based on the positive outcomes of the pilot project including significant reductions in water losses, provision of invaluable water consumption pattern data, and continuous water supply (24/7), BMLWE intends to expand this successful experience to the whole city of Beirut via the following changes, under component 3 of the Greater Beirut Water Supply Project:

(i) Implementation of 40 District Meter Areas (DMA) including chambers equipped with inflow meters, pressure reducing valves, data loggers, etc.
(ii) Leak detection for around 1,000 km of network, including all the necessary and associated repair works (networks, house connections, reservoirs, etc.)
(iii) Supply and installation of around 60,000 meters, in addition to the 30,000 currently under construction within the first project;
(iv) Loss reduction management, and maintaining the achieved level of water reduction for a period of 3 years

In order to reach these objectives for all customers in the project area, the BMLWE is requesting additional financing in the total amount of US$20 million. As previously applied, the World Bank will finance 66% while the remaining 34% will be financed by the BMLWE.

III. Assessment of Environmental and Social Impacts under Parent Project

The ESIA for the parent project was disclosed on August 6, 2010. The original ESIA is available at http://documents.worldbank.org/curated/en/592071468055502020/Environmental-and-social-impact-assessment-ESIA-for-Greater-Beirut-Water-Supply-Project-executive-summary (Arabic) and http://documents.worldbank.org/curated/en/869101468055499563/Environmental-and-social-impact-assessment-ESIA-for-Greater-Beirut-Water-Supply-Project-executive-summary (English).

[1] The financial gap in the current tunnel and twin pipe contract, referred to as optional part under the contract, is for the works of the end stretch of the pipeline (final kilometers) and does not relate to any works for the tunnel. The financing of the tunnel works is available.

The ESIA for the parent project found that the project interventions would not have any significant social and environment impacts if appropriate control and mitigations measures are adopted. Annex 2 indicates the list of potential impacts and the recommended mitigation measures. It also indicates status of implementation of the related ESMP and associated mitigation measures. The project has so far successfully integrated those requirements into Contractor's contracts being monitored by the Engineer whom are both on board since late 2015. The Contractor had prepared the Construction Environmental and Social Management Plan (CESMP) in line with the ESIA and tailored to the actual construction methods and site conditions CESMPs are approved by the Engineer and later- on reviewed by the Bank, and quarterly CESMP audits are being prepared by the contractor indicating status of implementation of mitigation measures and environmental requirements. This is a very successful model which will serve as best practice for future implementation of ESMPs by the Lebanese authorities.

The parent project ESIA also conducted an analysis of alternatives. It was found that the project interventions provided the least vulnerability, the least environmental impacts, best resistance to earthquakes, greatest durability and design life, lowest maintenance requirements, and were essential to supplement the inadequate reservoir capacity in Beirut. All these advantages also apply to the proposed additional financing project.

The implementing agencies, CDR and BMLWE, have applied all the mitigation measures indicated in the ESMP adequately. There are no significant changes in baseline conditions to report at this stage under either CDR or BMLWE components and therefore the 2010 baseline conditions against the current baseline conditions is adequate. The baseline conditions for the BMLWE component of the AF will be in Ashrafieh, Southwest Beirut and Northwest Beirut, which is a highly urbanized area that does not include any natural habitats or floral areas of biodiversity importance. The implementing agencies have submitted quarterly progress reports regularly. These reports adequately reflect the measures taken to address environmental and social issues in the ESMP. However, the regular reviews found that the Occupational Hazard and Safety (OHS) measures needed to be improved. For example, under the BMLWE component, activities that involve accessing high elevation and enclosed spaces need to follow proper OHS measures. This has been added to the ESMP for the proposed project and adequate mitigation measures have been proposed (see Annex 2). For the CDR component the international contractor prepared a comprehensive Health and Safety Plan (including permit to work system for high risk activities) for high and assigned a full-time HSE specialist who makes sure that the plan is adequately implemented. The implementation of OHS plan, for the CDR component, is progressing well and no major observations were recorded.

It is also worth noting that Grievance Redress Mechanisms (GRM) have been implemented for both CDR and BMLWE components.

For example, the GRM at CDR works by receiving a complaint or concern either by a phone call, by an official letter registered at CDR, or verbally at CDR. Some of these are simple clarifications and are directly responded on (verbally), yet many of them are received in official written formats and are mainly related to expropriation, questioning the area of the plot, the number of trees and requesting to undertake corrections if needed and so forth. These complaints are compiled and sent to the Consultant for further review (including re-survey and further inspection), and recorded

accordingly, noting if any case requires remedial correction, and how, or whether such issue is not needed.

As for the BMLWE component, all contractors implemented a GRM in the form of a project sign with details including: (i)project name, (ii) responsible authority, and (iii) PMU and Contractor contact numbers. These were placed at all reservoir/pumping station and pipe-laying project locations in all 4 zones of the project under the BMLWE component. Any complaints received are fully documented and addressed as necessary. It is worth noting that the complaints are generally minor in nature and involve concerns such as duration of time until road access will be provided again or questions regarding nature of project.

IV. Assessment of Environmental and Social Impacts under Financing Project

a. For CDR Components:

The overall components under the CDR proposed additional financing project remain unchanged, since the reservoirs were before included in the component 1-a (iii) mentioned above. The volume of the reservoirs will be increased, without the need to expend the anticipated expropriation areas. This will be accomplished through an increase in the dimensions (heights) of the reservoirs that remain within the same expropriation boundaries. As there will be no change in the footprint of the reservoir, no additional environment and social impacts are expected nor triggered. The parent project's ESMP will also apply for the proposed additional financing project. Annex 3 includes original (Hadath 125) and updated drawings of the Hadath & Hazmieh reservoir to indicate the overall changes.

It is worth noting that the identified sensitive sites (in terms biodiversity): WTP and some tunnel alignments (Nahr Damour, siphon/washout and Khalde measurements and sampling chamber) are not included under the scope of the additional financing project.

b. For BMLWE Component:

As for the overall components under the BMLWE proposed additional project financing, there are some minor environmental as well as social impacts that are expected mainly during implementation of the additional requested meters, and maintenance works that may be required upon detection of any leaks if any (such as digging, excavating and repairing which are all included in the parent Project). Furthermore, the baseline conditions at the new area of the AF are similar to those for the BMLWE component of the parent Project, therefore original ESMP will apply for the proposed additional financing project with emphasis on potential impacts and respective mitigation measures as reflected in both the construction and operational phases of the ESMP in Annex 2 of this addendum. It is to be noted that the land uses under the new additional financing project do not include any natural conserved or sensitive areas; the land uses are mainly categorized as dense artificial areas comprised of mixed urban residential and commercial. It should also be noted that no asbestos contact is expected during the additional financing project as all old piping was replaced in the 1990s in proposed project areas.

V- Public consultations

For BMLWE Component:

The PMU of the Beirut and Mount Lebanon Water Establishment held a consultation session on April 12, 2018 at the hall of the Municipality of Dekwaneh in Mount Lebanon (see Figure 1). The purpose of this consultation session was to relay to the stakeholders the main objectives of the proposed components of the additional financing as listed in section II b) and to highlight the main associated environmental and social impacts.

A total of 18 mayors (heads of municipalities) were invited to this consultation session out of which 16 confirmed; however, only 7 showed up (see Annex 4 of this addendum for a list of the attendees and Annex 5 for a list of the invitees in Arabic). In general, the PMU presented an outline of the works carried out in the pilot project area, its positive outcomes, as well as the associated advantages. The main environmental and social impacts were also presented including the temporary noise pollution, air/dust pollution, excavation works and associated traffic constraints during construction works; furthermore, it was explained that there would be no land acquisitions or expropriations associated with this project.

The main comments from the attendees were as follows:

1. **Comment 1:** Are additional networks, reservoirs, or pumping stations available?

Answer: not in the proposed project components.

2. **Comment 2:** When is Bisri dam to be completed?

Answer: Works Contract has been signed, and expected completion of works is in 2023.

3. **Comment 3:** Does the possibility of water theft remain?

Answer: it will be reduced, but not eradicated.

4. **Comment 4:** There is a lot of water leakage, how will this issue be addressed?

Answer: leaking detections and repairs are 2 of the main objectives of this proposed project.

In general, the outcome of the consultation session was positive with no significant issues of concern.

Figure 1. General view of attendees for the consultation session at Dekwaneh Municipality held on 12 April 2018

Annex 1-

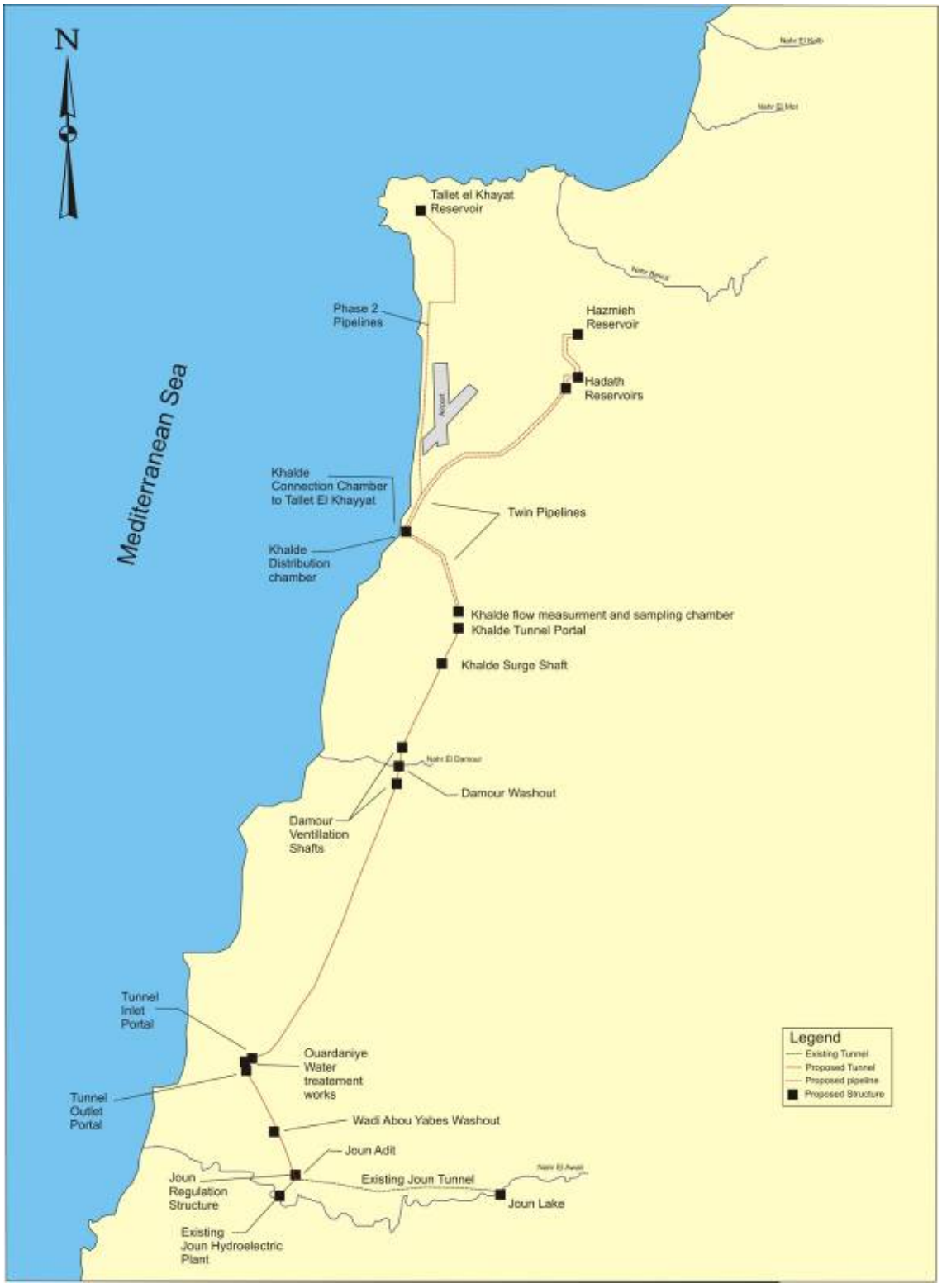


Figure 1. Geographic Location of Project Components (Parent Project and Additional Financing Project) - CDR

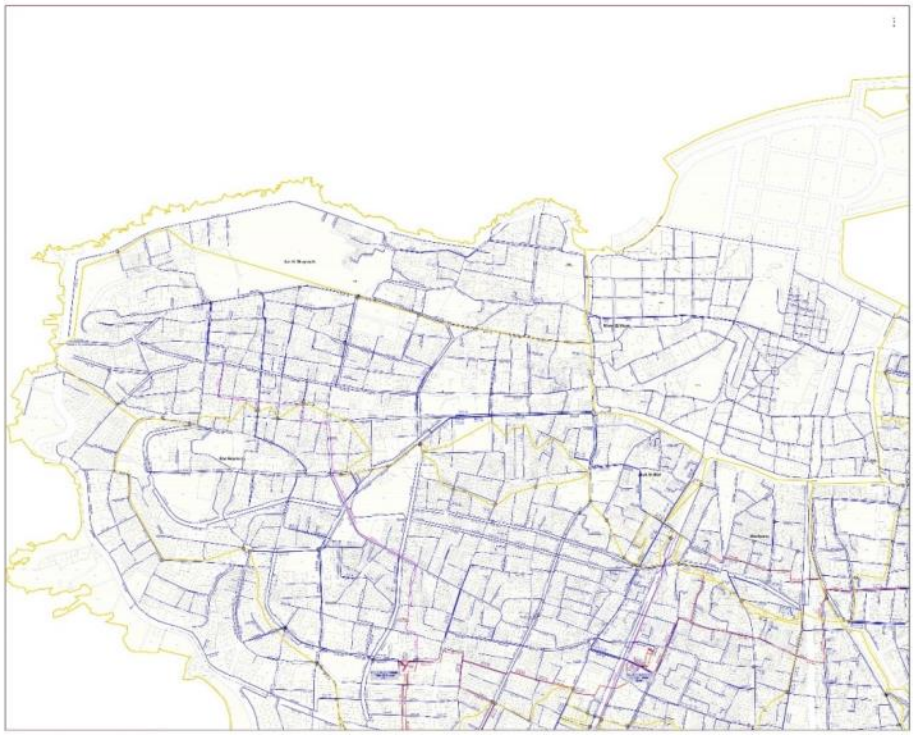


Figure 2. Geographic Location of the Project Components for the Additional Financing – BMLWE – West Beirut South

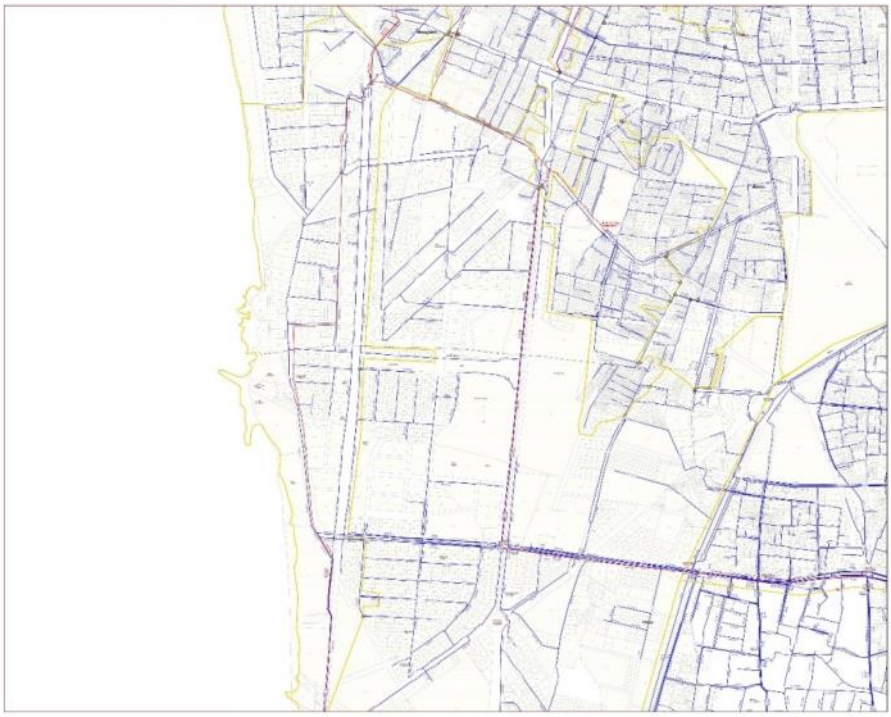


Figure 3. Geographic Location of the Project Components for the Additional Financing – BMLWE – West Beirut North

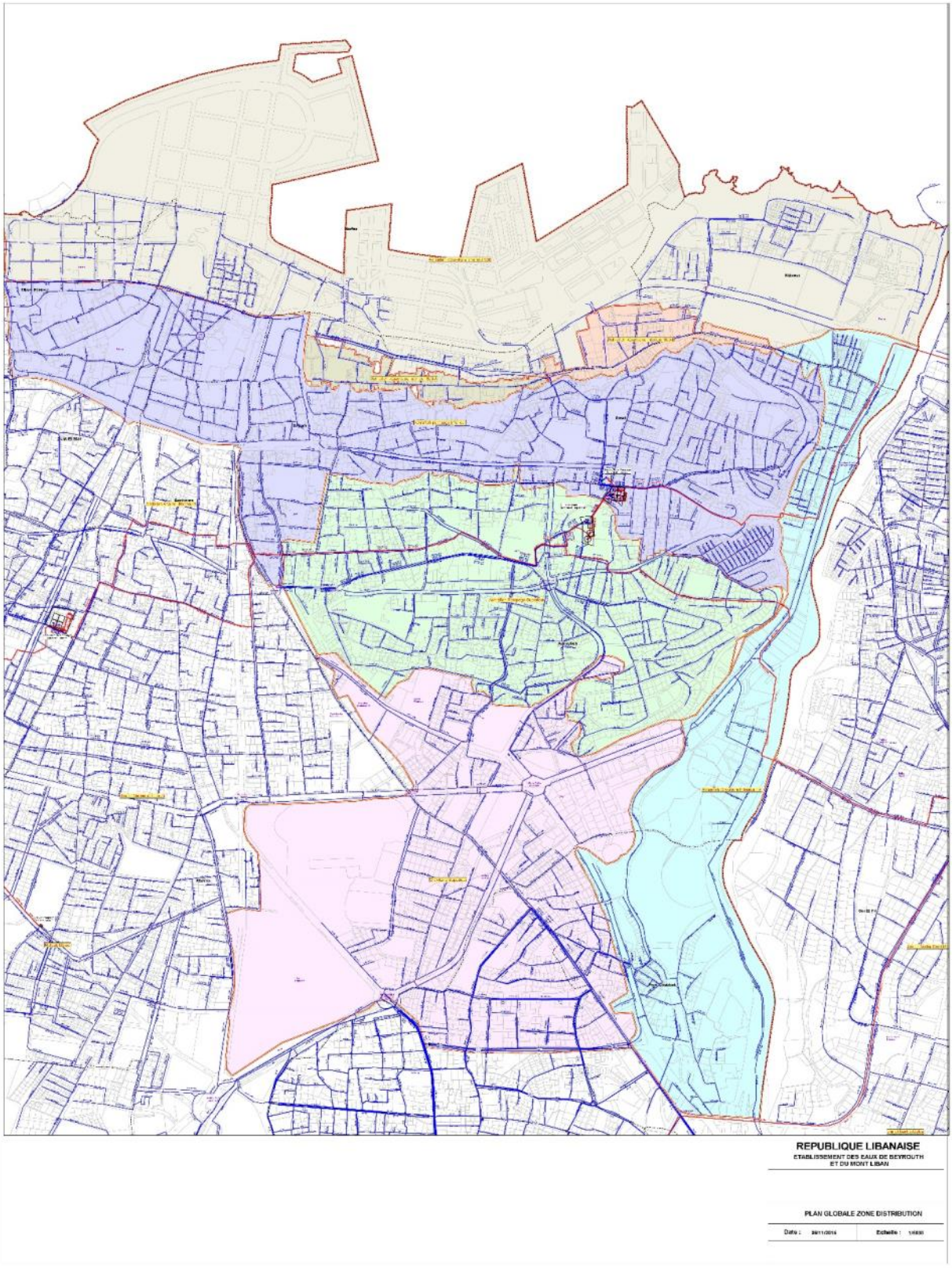


Figure 4. Map showing pilot project location - Ashrafieh

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
CONSTRUCTION ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (CESMP)					
Site Clearance/ Excavation Drilling/blasting, pipeline construction and tunnel boring works *(to a lesser extent)* Solid and liquid waste generation from camp operations (such as sanitary facilities and kitchen) and pipelines pressure testing) Accidental chemical / oil spills or leaks (from excavators and tunnel boring machine)	Disturbance to land/landscape (Land scaring from Project Footprint) Compromised Visual Amenity Contamination of soil quality.	Limiting the land clearance area required for pipelines in the vicinity of forested areas of Khalde; Planning and marking access routes and adopting minimum safe operating width Using existing tracks/ routes to reduce the size of the impacted area; Minimizing (whenever possible) the time and space of heavy machinery use and constructing intensive activities and using whenever possible existing and previously disturbed land and roads to access site and avoiding off-road driving, areas crossing wadis or that are prone to erosion; Avoiding excessive removal of topsoil and minimizing grading and clearing of vegetation; Stabilization of topsoil and spoil stockpiles along the pipelines previously removed during excavation works and using it as cover material whenever possible during backfilling and site restoration; A preliminary project handover and restoration plan should be developed that identifies disposal options for all equipment and materials, including products used and wastes generated on site; Project handover (end of Construction) should comprise the complete closure of the labor camps including the removal of all equipment and vehicles and other fixtures and infrastructures and covering of trenches and restoring of all sites to original state. Reduce the use of blasted debris as much as possible and allow backfilling and site restoration from topsoil and spoil excavated by conventional methods (such as drilling) and generated by the tunnel boring works;	Implementation: Contractor. Supervision: ESM	No additional cost incurred	The ESMP requirements for the component 1(a) (i) & (ii) mentioned above, that is under implementation, were included as part of Contractors tender documents. Contractors have prepared CESMP related to their scope of work and in line with the parent ESIA study as well as the actual proposed work methods to be adopted by the contractor and site conditions. Mitigation measures were further detailed to inform Contractor's methods to minimize environmental and social impacts in line with the ESIA study. CESMPs are being audited on a quarterly basis to monitor implementation of the mitigation measures and identify corrective measures as needed. Latest CESMP audit reports indicate a satisfactory level of compliance with mitigation measures.
		Perform a soil sampling campaign in the Project affected areas, specifically where blasting activities took place, to document the soil conditions (physic-chemical characteristics, petroleum contamination, etc.) following the cessation of construction works	Implementation: Contractor. Supervision: ESM	No additional cost incurred	

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
Loading and Unloading operations (at construction sites and spoil handling facilities) Truck transportation (haulage) Operation of on-site diesel-fueled generators	Increase in ambient dust levels (fugitive dust emissions) Increase in combustion/exhaust emissions (release of combustion gases, NOx, CO2, SO2, CO)	All vehicles, plant and equipment engines shall be properly maintained in accordance with the manufacturer's instructions to maximize combustion efficiency and minimize emissions; Usage of vehicles/machines equipped with exhaust emission control units; All trucks transporting material likely to generate dust should be properly covered per Lebanese requirements; Maintenance and reporting of monthly fuel consumption records; Any machinery, which is intermittent in use, should be shut off in periods of non-use or, where this is impracticable to be throttled back to a minimum; Small combustion source emissions (with a capacity of up to 50 megawatt hours thermal (MWth)) should adhere to the IFC emission standards for exhaust emissions in the General EHS Guidelines and MoE Decision 8/1 of 2001, whichever stricter; Combustion source emissions with a capacity of greater than 50 MWth should comply with the IFC EHS Guidelines for Thermal Power; Implement proper dust control measures. Measures will include the damping down of dust if excavations are occurring in high winds, rig dust suppression units and the covering piles of excavated material to prevent mobilization (with nets or matting); Efficient scheduling of deliveries as well as establishing and enforcing appropriate speed limits over all paved and unpaved surfaces (< 40 km/h) via a Traffic Management Plan (TMP) approved by the Project Proponent.	Implementation: Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is audited on a quarterly basis. The results of its latest audit report are summarized here below. Dust: - All loaded trucks & vehicles are properly covered - Maximum speed limits (20km/hr.) - Operators loading & unloading excavated material are carrying out their work at a slow pace to minimize stirring dust → Roads and portals are periodically sprayed with water in order to reduce dust in the air. - Dust-generating activities (stockpiles, equipment, generators, vehicles...) are located as per the CEMP requirements (downwind) → Stockpiles are located in designated areas and are covered or watered in order to minimalize dust. - Water spraying to suppress dust → Sites are periodically sprayed with water. - Clear signage to guide vehicles→ Signs have been put up in order to direct traffic more effectively. - Maintenance of access roads → Maintenance is performed by site personnel when required. - Dust monitoring is undertaken in accordance to CEMP requirements → Contractor is performing daily control. Air Quality: - Engines are switched off, or throttled down, when vehicles & plant are not in use. → Equipment is turned off and parked in a designated area when not in use. - Calibration checks for the TBMs methane gas monitoring systems are updated. → Four gas detectors are installed on the TBM and periodic controls of gas inside the tunnel are performed by HSE officers in order to verify the accuracy of fix detectors - Records of inspection of machinery and generators are available and updated. → Maintenance and inspection are performed, and periodical controls are registered and available upon request. BMLWE: Fugitive dust emissions are being controlled mainly during excavation works for pipe-laying, manhole works and at the start of local reservoir works and minimal watering activities are being implemented by Contractor to control dust emissions especially in residential neighborhoods. All machines not in use are shut off so as to avoid noise and dust and air polluting emissions and overall nuisances (see quarterly ESIA report)

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
Drilling/blasting, pipeline construction Vehicular movement and Equipment operation	Increase in ambient noise level	Fitting all machinery and vehicles with effective exhaust silencers; Maintaining all machinery and vehicles in good repair and in accordance with the manufacturer's instructions; Limit the working hours when near sensitive sites (schools, health care unit, etc.); Proper selection of equipment for the specific tasks considering the lowest sound power level; Maintenance of equipment as not to create unnecessary noise owing to mechanical problems; Operation of equipment in a manner considerate to the ambient noise background; Avoidance of leaving equipment idling unnecessary; Elimination of tonal, impulsive or low frequency noise through noise control engineering techniques where feasible (e.g. dampers, fitting of mufflers, etc.); Provision of alternative methods if necessary (substituting hammering actions with hydraulics); Provision by the Contractor of adequate buffer zone with sensitive populations in the Project Area; Mandatory use of noise plugs during noisy activities and Proper communication with receptors whenever highly noisy events are planned	Implementation: Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: - Records of maintenance of equipment and vehicles → Maintenance and inspection of equipment are performed and periodical controls are registered and available upon request. - Use of hearing protection (earmuffs & earplugs) in designated areas→ hearing protection is enforced and workers are wearing ear defenders in areas with activities that generate loud noise. - Employment of noise suppression or abatement equipment such as mufflers, silencers or enclosures in designated areas BMLWE: Works take place during the day time and on weekdays in compliance with MOE Dec. 52/1 for noise and nature of area in which works are taking place (residential/industrial/commercial/road etc.). Noise buffers are not typically used as pipe works are temporary and progress speedily whereas manhole works typically last for 4-5 days. At local reservoir works, levels of noise generation are low. Excavator operators are observed to be wearing ear protectors as necessary as well as other works exposed to high noise levels especially during excavation works (see quarterly progress ESIA report)
Vehicular movement & Truck Trips/Haulage	Traffic congestion	Liaising with community and government by a dedicated resource in the field throughout the duration of the project (i.e. establishing a complaint register to document potential public complaints. Clearly identify the project footprint to avoid accidents during further development of the area particularly in the designated and construction sites. Having a Traffic Management Plan (TMP); Allowing only certified and trained drivers to carry out transportation related activities; Having an Emergency Response Procedures in place; and Having a maintenance program to all vehicles associated with construction activities.	Implementation: Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: - Access routes respected by traffic → A traffic controller is assigned for this purpose - Limit deliveries to regular operating hours - Parking were assigned in designated areas - Speed limits within site - Minimal queuing and idle time of vehicles - Suitable access to buildings and facilities is provided - Maintenance and conditions of used roads - Traffic barricades, signs, and guardrails are in place - Public information signs - Records of vehicles maintenance are available and updated →Maintenance and inspection is performed, and periodical controls are registered and available upon request. - Records of drivers and their licenses are available and updated - Records of vehicles registration are available and updated - Records on interference and repair of existing infrastructure services are available and updated - Records of accidents, damages, and corrective actions are available and updated → any accident that takes place on site is recorded through an accident report and onto an incident register. BMLWE: Speed signs and project signs are properly placed at

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
					the pipe laying and manhole works and even around reservoir sites and there is full coordination with all relevant municipalities to help control traffic; all sites are properly fenced off to avoid and or minimize any accidents from passing traffic with jersey barriers as well as caution tapes
Fuel, Oil and Chemical Handling and Storage	Contamination of soil quality and groundwater resources	Storage Where appropriate, fuel, oil and chemicals stores will be sited in specific designated areas on site on an impervious base within a suitably contained area; The fuel storage facilities will have a secondary containment, such as a berm, capable of holding the capacity of the largest container plus 10% to accommodate rainfall; Fresh oil and waste oil will be segregated and stored separately to prevent a potential risk of mixing; All storage tanks will be positioned to minimize the risks of damage by impact; All storage tanks will be of sufficient strength and structural integrity; No storage tank will be used for the storage of fuel, oil or chemicals unless its material and construction are compatible with the type of materials to be stored and storage conditions (e.g. pressure and temperature); Drip trays will be installed underneath equipment such as diesel generators, transformers to contain leakage. The drip trays will be maintained and kept drained of rainwater; and All fuel and oil will be inventoried and use recorded. Refueling Supervision of refueling at all times by appropriate personnel: Checks to fill hoses, valves and nozzles for signs of wear and tear prior to operation; Checks to tank levels prior to delivery to prevent overfilling through side glass or manually by dipstick logs; Locating fill pipes within the containment (unless shut-off valves are fitted); Grounding of tanks and grounding of vehicles during fuel transfers; and Ensuring a supply of suitable absorbent materials is available at re-fueling points for use in dealing with minor spills. If a leak or spill occurs during loading or offloading operations, the operations will be stopped and the spill will be contained, cleaned up and collected based on the Spill Response Plan. Chemicals	Implementation: Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: - Fuels and chemicals are stored away from drains and in designated bounded areas → In sites where chemicals are present, a chemicals storage area is established with bounds to collect eventual leakages - Chemicals and fuel are stored within designated bonded areas → A proper storage system with bounds and covers has been prepared for all sites where chemicals are present. - Records of inspection and maintenance of fuel tanks and their leakage detection system → Daily inspections are performed by the Contractor. - Immediate implementation of the Spill Contingency Plan in case of spill or leak & keeping records of Spill/Leak incidents and corrective measures taken - Material Safety Data Sheets are collected. BMLWE: There is no direct contact with fuel, oil and chemicals except during maintenance works that involve oil/lubricants and typically this is carried out by placing drip trays underneath such works to avoid any leakage and therefore contamination of soil and underground water resources

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
		Personnel handling chemicals will be trained in their handling and use and aware of the associated hazards including the personnel protective equipment (PPE) requirements through pre-task instruction. Material Safety Data Sheets (MSDS) for all chemicals supplied will be held at the storage area, the point of use and by the site medical staff and site ES&SR representative; Safety signage will be in place; All chemical deliveries (loading and unloading operations) will be supervised at all times and will be transferred to a secure storage area without delay; Storage of chemicals will be sited on designated areas at the site; an inventory of all chemicals on site will be kept and use will be recorded. Chemicals will be properly packaged, labeled and stored; Dangerous/hazard chemicals will be stored separately; Chemical storage drums will be in good condition and with sealed bungs. All used drums will be washed / flushed with water and pierced before leaving the site to prevent local use and subsequent exposure to contaminants if they are not able to be returned to the original supplier. All tanks and containers will be clearly labeled with the nature of the contents and placarded with the MSDS. The storage of chemical products in containers or on palettes equipped with plastic dust cover against severe weather. Chemicals will be shaded. Chemical storage drums and packaging are to be returned to the original supplier in an orderly fashion i.e. palletized and shrink wrapped.			
Waste Management	Contamination of soil quality and groundwater resources	CDR shall promote the use of a Licensed Municipal Waste Facility in coordination with MoE. All personnel shall be responsible for ensuring that standards of "good housekeeping" are maintained. This will include clearance of all rubbish and work associated debris; Contractors to include a waste management plan as part of CEMP. And CDR to ensure that solid waste management is included in the contractor's agreement.	Implementation: CDR/Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: - No burning of waste - Adequate housekeeping practices are enforced onsite to reduce material losses → Toolbox Talks (TBTs) have improved this immensely. - Waste skips are clearly marked and placed in designated areas → Labelled waste bins are placed in designated areas for the sites. - Record of all waste disposal activities are maintained onsite → Contractor has an agreement with certain municipalities in order to collect and dispose waste. Collection of grey water is also performed by an authorized company. - Waste regularly collected by transporter → Contractor has implemented a waste pickup schedule in order to manage garbage collection at all sites. As for the hazardous materials: - Hazardous materials properly marked and segregated in designated bounded areas. - MSDS sheets readily available by stored material - Updated inventory maintained onsite → the warehouse keeps record of all inventory that is maintained on all sites.

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
					- All fuel storage are placed above ground within a lined & bonded area - Safe operating procedures are followed during the loading & unloading of fuel - Flammable substances are kept away from sources of ignition - No leaking or damaged containers onsite - Contaminated soil or material placed in segregated areas pending collection offsite BMLWE: Wastes generated including construction wastes and general refuse are collected and transferred to licensed municipal waste facilities e.g. in Zone D Contractor Lindenberg Emirates transfer wastes to Monte Verde waste facility while in Zone C Contractor VMI transfers to concerned municipalities it is working in like Khalde, Aramoun, Naameh and so on. All site waste management data sheets can be found in quarterly ESIA reports
Physical excavation (blasting, site clearance, trenching)	Demolition, alteration of or damage to archaeological resources, whether on surface or below-ground	Prepare a brochure to help crew members recognize any discovery of buried antiquities; and	Archaeologist	500	BMLWE: A meeting was held with Contractor CEA for Zone A (identified sensitive archaeological areas) and DGA representatives to obtain knowledge on identification of any archaeological buried sites in June 2017 and actions that need to be taken; Since then DGA expert has been present daily on site during pipe laying excavation works; daily logs are submitted to PMU to provide documentation of DGA daily presence on site (see ESIA quarterly report)
		Direct reporting to local authorities (DGA) in case of new findings during Construction and proper documentation of historic sites.	Implementation: Contractor. Supervision: ESM	No additional cost incurred	
Implementation of water meters	Digging, excavation, noise generation, dust emissions, and potential vehicular congestion especially along narrow roads in residential neighborhoods	Ensure minimal watering activities following best management practices to minimize potential dust generation Conduct works during the daytime and complete daily works as per the MOE Dec. 52/1 noise standards and regulations Ensure proper fencing and speed signs around the perimeter of the work areas Full coordination with all relevant authorities and municipalities to control road traffic and others	Implementation: BMLWE/Contractor. Supervision: ESM	No additional cost incurred	

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
		- Comply with WBG EHS Guidelines and CDR's Occupational Health and Safety Requirements - Limiting the pollution from dust by damping down work areas with water on a regular basis during dry climatic conditions; - Ensuring that all trucks leaving the site are properly covered to prevent discharge of dust, rocks, sand, etc.; - Adopting best practicable means of minimizing noise; - Maintaining all equipment in good mechanical order and fitted with the appropriate silencers, mufflers and acoustic covers where applicable;			
ALL (this row is added for the AF)	Occupational Health and Safety Impacts	- Ensuring that stationary noise sources are sited as far away as possible from noise-sensitive areas; - Protecting and maintain accesses to all properties affected by the works; - Providing safety barriers to both sides of trenches; and - Evacuating temporarily persons from occupied premises in case of danger; - Ensuring that all complaints are well documented and reported; - Developing an action plan to respond to all complaints; - Reporting, tracking and analyzing accidents and their causes, and act accordingly to prevent their occurrence	Implementation: CDR/Contractor. Supervision: ESM	No additional Cost incurred	CDR: Requirements integrated in tender documents of all contractors
Construction Environmental and Social Management Plan (CESMP) – Cont'd					
Site clearance /excavation and spoil stockpiling activities Accidental spills Tunneling activities	Contamination of groundwater Quality	Clean up spills if any with an absorbent material such as cat litter. Develop a contingency plan to prevent potential groundwater contamination. Passing water resulting from tunneling and excavation through oil separator prior to discharge if it has been contaminated with oily residues. Minimize the planned amount of land to be disturbed as much as possible. Use special construction techniques in areas of steep slopes, erodible soils, and stream crossings. Reclaim or apply protective covering (e.g., vegetative cover) on disturbed soils as quickly as possible.	Implementation: Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is audited on a quarterly basis. The results of its latest audit report are summarized here below: - Absorbent materials and oil spill kits are available at all active construction sites. - Records of inspection and maintenance of fuel tanks and their leakage detection system to avoid any leakage into the soil. - Water runoff diversion to avoid soil erosion. - Immediate implementation of the Spill Contingency Plan in case of spill or leak & keeping records of Spill/Leak incidents and corrective measures taken

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
		Avoid creating excessive slopes during excavation and blasting operations since these activities accelerate water percolation into ground. Monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer. Disposal of excess excavation materials in approved areas to control erosion and minimize leaching of hazardous materials. Impose site-specific Best Management Practices, potentially including silt fences, hay bales, vegetative covers, and diversions, to reduce impacts to surface water from the deposition of sediments beyond the construction areas. Immediate implementation of the Oil spill response plan in case of accidental events.			
Site clearance /Excavation Vehicular movement	Destruction of natural habitat (loss of forested areas and few native flora species)	Develop a detailed plants Inventory at the 3 identified sensitive sites (Ouardaniye WTW, Nahr Damour Siphon/Washout and Khalde Flow measurement and sampling chamber) prior and post construction activities commencement as part of CEMP; Developing an ecosystem rehabilitation plan to regenerate and reintroduce some of the native species of trees (especially at the most degraded areas) present in the studied area, therefore leading to positive impacts on biodiversity.	Implementation: Biodiversity expert / Contractor	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: - A plant inventory has been formulated for all active sites that are subject to removal of trees. - Permits for the removal of trees have been granted as reported by the Contractor.
		Special effort and attention should be given to the 4 sensitive sites Limiting vehicular transport to defined roads as to prevent unnecessary damage to vegetation; Preserving top soil excavated by conventional methods (such as drilling); Avoiding introducing invasive plant species (e.g. weeds). All affected areas must be replanted with indigenous species appropriate to the respective sites; and	Implementation: Contractor. Supervision: ESM Biodiversity expert	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is audited on a quarterly basis. The results of its latest audit report are summarized here below: - Detailed reports are formulated for sites that are significantly subject to ecological disturbances (e.g. the cutting of trees) or for sites that are protected by the government (natural reserves).
Physical excavation (blasting, site clearance, trenching)	Demolition, alteration of or damage to archaeological resources, whether on surface or below-ground	Prepare a brochure to help crew members recognize any discovery of buried antiquities; and	Archaeologist	No additional cost incurred	CDR/BMLWE: DGA is following the execution of works on the twin pipeline excavation, with a dedicated archaeologist from DGA monitoring the works. Also, DGA has done some awareness campaign to the contractors whom are executing the distribution networks for BMLWE. A further coordination with DGA is taking place as well on tunneling works being executed next to existing historical site in Damour.
		Direct reporting to local authorities (DGA) in case of new findings during Construction and proper documentation of historic sites.	Implementation: Contractor. Supervision: ESM	No additional cost incurred	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: - A supervisor from The Ministry of Culture oversees all the activities on the pipeline path. - The Contractor is constantly liaising with the Ministry of Culture, DGA and specialized companies in order to safeguard any historically valuable structures -

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
Land Expropriation	Permanent and irreversible loss of land and some loss of agricultural greenhouses (agricultural business) Temporary severance / disturbance of public rights-of-way and access to community resources and services.	Consultation with potentially affected communities prior to expropriation procedures. Fair and full compensation for land and other assets expropriated for the project in the public interest as stated in the Lebanese expropriation law (Law No. 58/1991 and its amendments (2006)). Compensation to local farmers who lost their agricultural lands (loss of livelihood); Preparation of a Resettlement Action Plan (RAP) (ongoing) as per the World Bank standards.	ESM	Please refer to the RAP addendum	CDR: Please refer to the RAP addendum BMLWE Component: Expropriations have been completed for all local reservoir site and compensations are well underway although there are still some landowners who have not yet collected their compensations due to missing inheritors documents or absentees but all landowners have been notified (see ESIA quarterly reports)
Fuel and Chemicals handling & storage	Contamination of soil quality and groundwater resources	Selecting appropriate locations for septic tanks installation as to avoid leakage and contamination of groundwater. Immediate cleaning of a spill by removing affected top soil layer by trained employees Continuous in-situ sampling of soil in the vicinity and underneath the spill for potential contaminant; and Stopping the source of spill (close valve, seal pipe, seal hole etc…); Refueling in a designated fueling area that includes a temporary berm to limit, if not prevent, the spread of any spill.	Implementation: WTW operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No additional cost incurred	CDR: Kindly refer to the aforementioned measures adopted by the Contractor in this regard.
Wastewater generation (sanitary/process)	Contamination of soil quality and groundwater resources	CDR should commission local contractor for the collection of domestic wastewater and disposal to nearest public sewerage network (Frequency will be based on septic tank volume)	Implementation: Local contractor Supervision year of operation: ESM After project handover: Environmental representative from BMLWWA	200 (unit cost)	CDR: The Contractor has indicated in its CESMP the below measures for implementation, which it is auditing on a quarterly basis. The results of its latest audit report are summarized here below: • All wastewater from sanitary facilities is collected and treated at the WWTPs → a company was hired to carry out the task of cleaning the wastewater from all sites and the camp. • Records of inspection and maintenance of the WWTPs are available and updated → A dedicated company provides a quarterly maintenance report.
		Adopting as much as possible dry cleaning techniques to decrease resultant wastewater, and to avoid flushing of spills to deeper soil layers. Develop a stormwater management plan to ensure compliance with regulations and prevent off-site migration of contaminated stormwater.	Implementation: WTW Operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred	NA
Leaching from Naameh landfill	Contamination of groundwater quality	Regular monitoring wells data inspection for the section of the tunnel lying downstream the land fill Giving additional consideration for the subject strip during maintenance of the tunnel Checking for any fissures or fractures in the tunnel wall during maintenance	During the first year of operation: ESM After project handover: Environmental representative from BMLWA		CDR: The tunnel lining design shall take into consideration possible leaching from the Naameh Landfill.

PROJECT ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS	MITIGATION MEASURES	INSTITUTIONAL RESPONSIBILITIES (INCL. ENFORCEMENT & COORDINATION)	COST ESTIMATE	UPDATE ON IMPLEMENTATION
Sludge handling and disposal	Contamination of groundwater resources	Design considerations for sludge management include dewatering and thickening processes prior to disposal. Re-use of separated water at the inlet of the WTW instead of discharge of liquid effluent to wadis. In the event of effluent discharge into the Wadi (following sludge dewatering), the former should comply with the Lebanese new standards for discharge into receiving water bodies (Decision No. 8/1). Investigate the disposal of sludge cake to the Naameh landfill instead of quarry rehabilitation. *(In the latter case, potential for percolation/leaching into groundwater)*.	Implementation: WTW Operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred	NA
Operation of pumping stations	Nuisance to noise-sensitive receptors	Fitting all equipment and pumps with effective exhaust silencers Proper selection of pumps for the specific task considering the lowest sound power level; and, Maintenance of pumping stations as not to create unnecessary noise owing to mechanical problems Insulating generator rooms and engines.	Implementation: WTW Contractor Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred	NA
Maintenance works for potential water leakages	Digging, excavation, road closures, traffic, dust generation and noise generation	Ensure minimal watering activities following best management practices to minimize potential dust generation Conduct works during the daytime and complete daily works as per the MOE Dec. 52/1 noise standards and regulations Ensure proper fencing and speed signs around the perimeter of the work areas Full coordination with all relevant authorities and municipalities to control road traffic and others	Implementation: BMLWE responsibility after completion of Contractors contract		

The ESMP measures (highlighted below) for the original projects will remain applying to original project and to the Additional Finance as applicable

OPERATION ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (OESMP)				
Fuel and Chemicals handling & storage	Contamination of soil quality and groundwater resources	Selecting appropriate locations for septic tanks installation as to avoid leakage and contamination of groundwater. Immediate cleaning of a spill by removing affected top soil layer by trained employees Continuous in-situ sampling of soil in the vicinity and underneath the spill for potential contaminant; and Stopping the source of spill (close valve, seal pipe, seal hole etc…); Refueling in a designated fueling area that includes a temporary berm to limit, if not prevent, the spread of any spill.	Implementation: WTW operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred

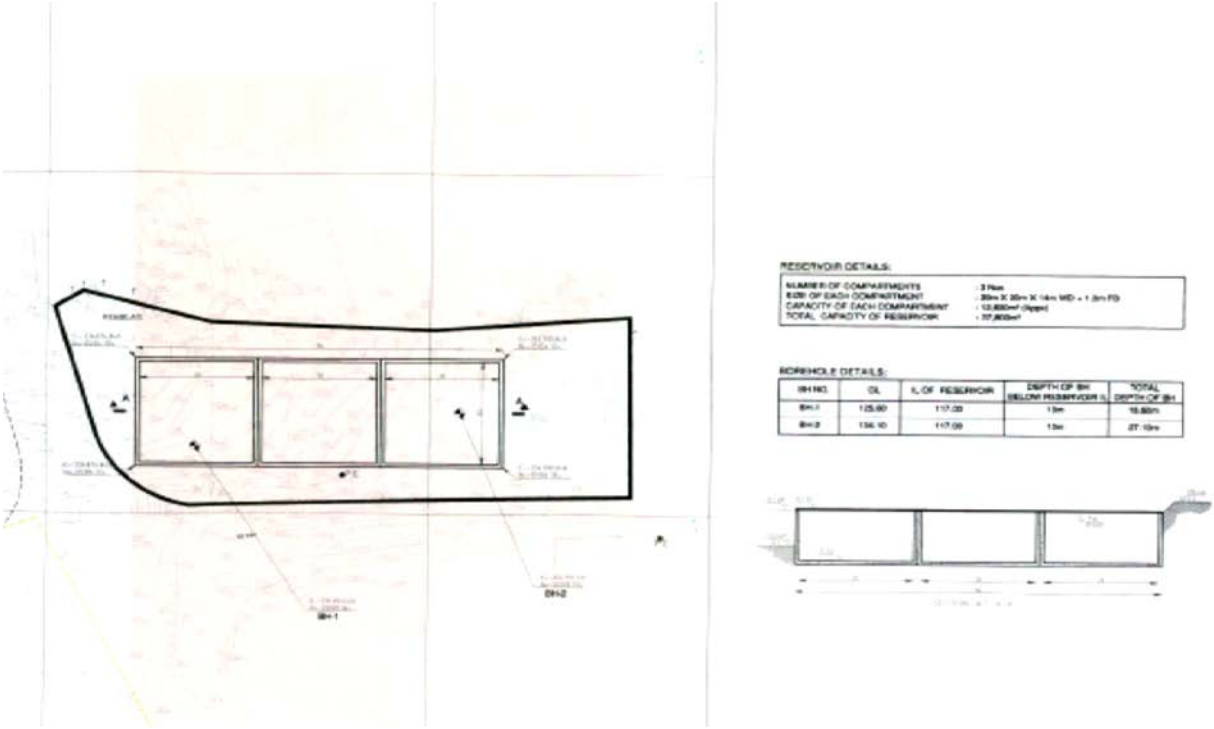
Wastewater generation (sanitary/process)	Contamination of soil quality and groundwater resources	CDR should commission local contractor for the collection of domestic wastewater and disposal to nearest public sewerage network (Frequency will be based on septic tank volume)	Implementation: Local contractor Supervision year of operation: ESM After project handover: Environmental representative from BMLWWA	200 (unit cost)
		Adopting as much as possible dry cleaning techniques to decrease resultant wastewater, and to avoid flushing of spills to deeper soil layers. Develop a stormwater management plan to ensure compliance with regulations and prevent off-site migration of contaminated stormwater.	Implementation: WTW Operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred
Leaching from Naameh landfill	Contamination of groundwater quality	Regular monitoring wells data inspection for the section of the tunnel lying downstream the land fill Giving additional consideration for the subject strip during maintenance of the tunnel Checking for any fissures or fractures in the tunnel wall during maintenance	During the first year of operation: ESM After project handover: Environmental representative from BMLWA	
Sludge handling and disposal	Contamination of groundwater resources	Design considerations for sludge management include dewatering and thickening processes prior to disposal. Re-use of separated water at the inlet of the WTW instead of discharge of liquid effluent to wadis. In the event of effluent discharge into the Wadi (following sludge dewatering), the former should comply with the Lebanese new standards for discharge into receiving water bodies (Decision No. 8/1). Investigate the disposal of sludge cake to the Naameh landfill instead of quarry rehabilitation. *(In the latter case, potential for percolation/leaching into groundwater)*.	Implementation: WTW Operator Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred
Operation of pumping stations	Nuisance to noise-sensitive receptors	Fitting all equipment and pumps with effective exhaust silencers Proper selection of pumps for the specific task considering the lowest sound power level; and, Maintenance of pumping stations as not to create unnecessary noise owing to mechanical problems Insulating generator rooms and engines.	Implementation: WTW Contractor Supervision: During the first year of operation: ESM After project handover: Environmental representative from BMLWWA	No cost incurred

BMLWE : N.B. Regarding contact with asbestos, it is to be noted that it is not expected that there will be any asbestos contact as all old pipes with asbestos were replaced in the 1990s in all of Beirut.

Annex 3

Drawing of Hadath Reservoir for the Parent Project

Volume: 35,000 CUM



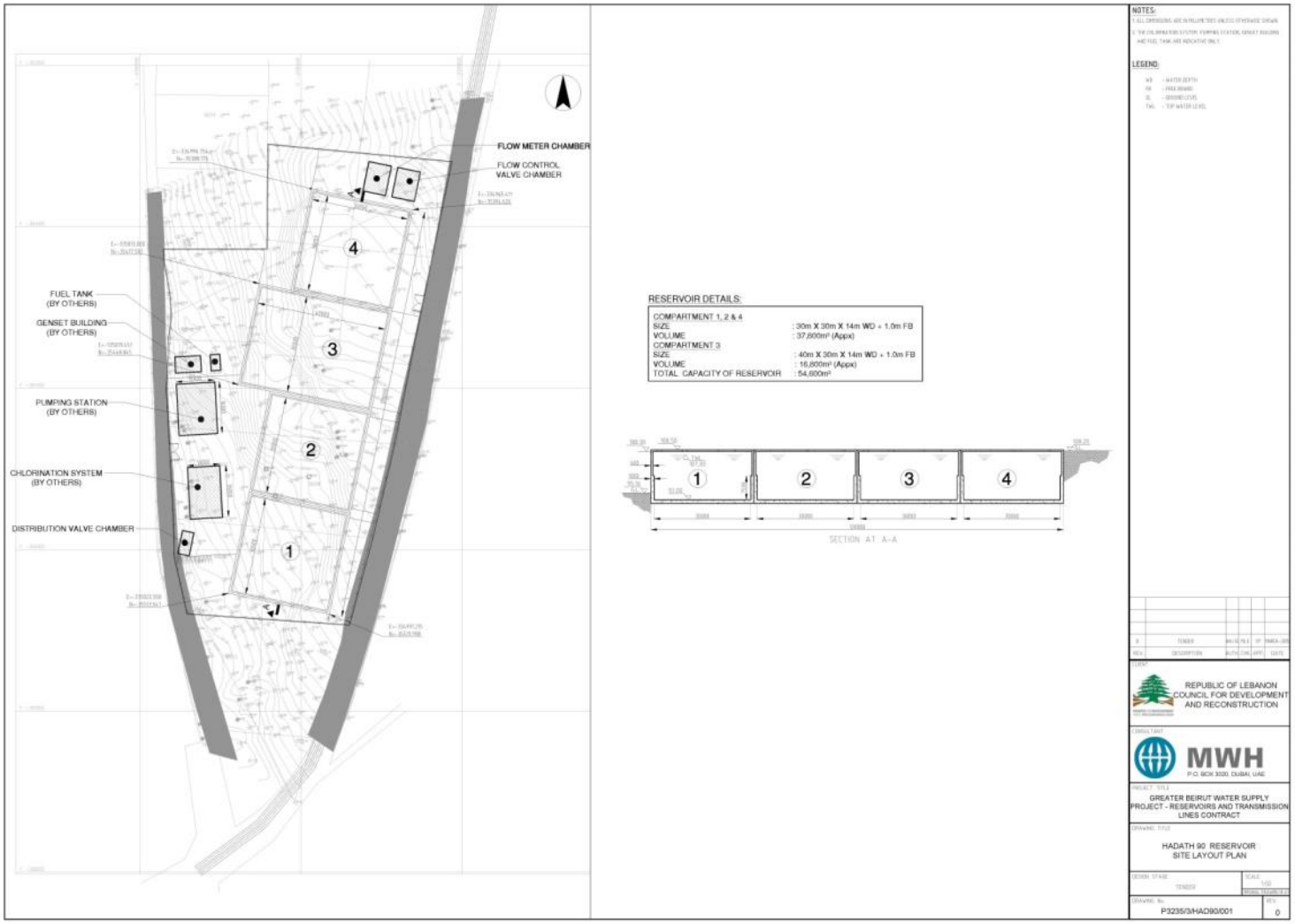
RESERVOIR DETAILS:

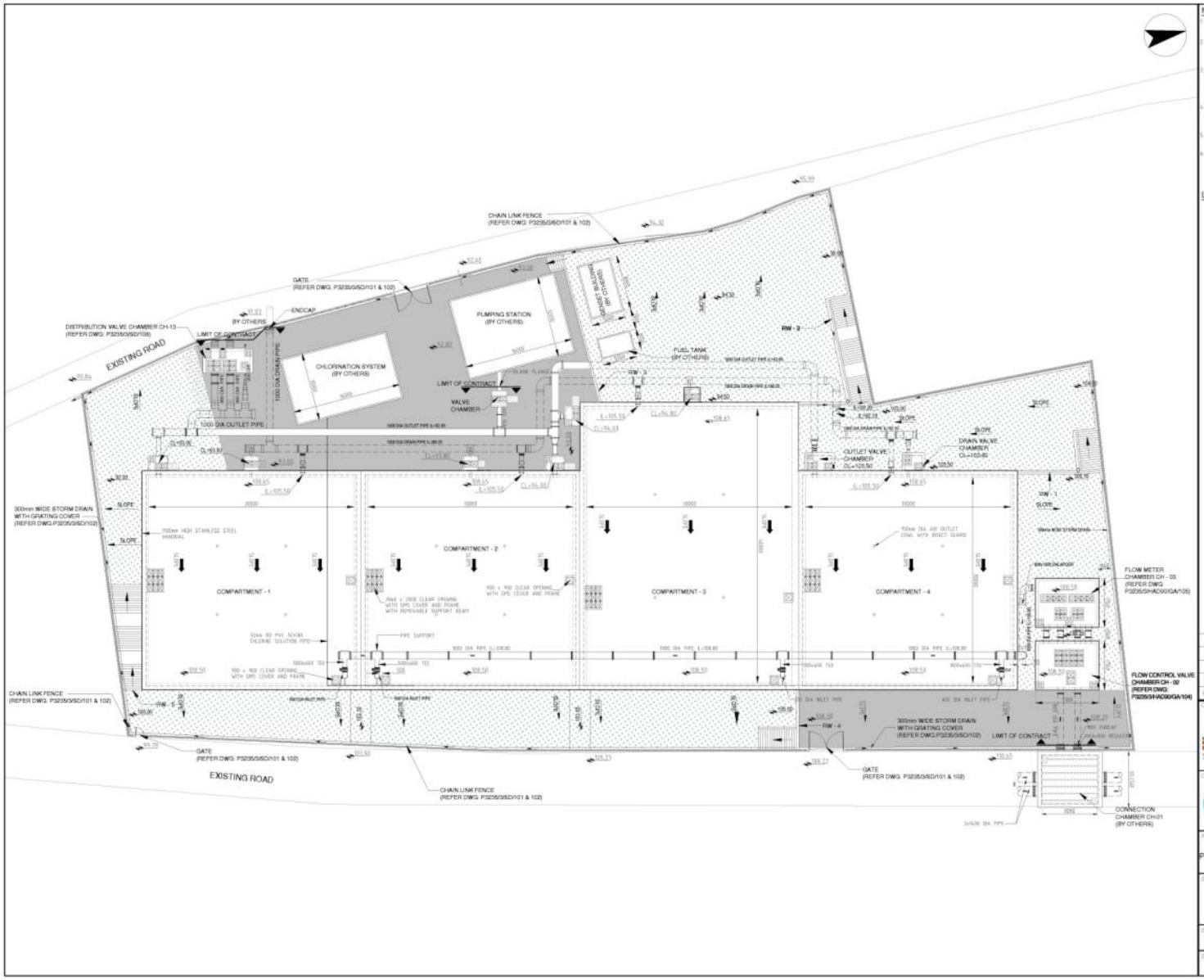
NUMBER OF COMPARTMENTS	: 3 Nos.
SIZE OF EACH COMPARTMENT	: 35m X 35m X 14m WD + 1.0m FB
CAPACITY OF EACH COMPARTMENT	: 13,650m³ (Appx)
TOTAL CAPACITY OF RESERVOIR	: 37,800m³

BOREHOLE DETAILS:

BH NO.	GL	F.L OF RESERVOIR	DEPTH OF BH BELOW RESERVOIR F.L	TOTAL DEPTH OF BH
BH-1	125.00	117.00	15m	16.50m
BH-2	134.10	117.00	15m	27.10m

Drawing of Hadath 90 - Reservoir for the Additional Financing Project
Volume: 54,600 cum





NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. THE CHLORINATION SYSTEM, PUMPING STATION, GENSET BUILDING AND FUEL TANK ARE INDICATIVE ONLY.
3. THE SITE GRADING LEVELS ARE INDICATIVE ONLY. THE CONTRACTOR IS REQUIRED TO PREPARE A SITE GRADING PLAN AFTER CONSTRUCTION OF TANKS AND SUBMIT FOR APPROVAL.
4. THE SITE SHALL BE LANDSCAPED / PAVED WITH MINIMUM GRADIENT OF 1 IN 100.
5. FLANGED JOINTS BELOW GROUND SHALL BE PROTECTED.
6. THE UNDERGROUND DI PIPES AND FITTINGS WITHIN THE RESERVOIR SITE SHALL HAVE RESTRAINED JOINTS IN ACCORDANCE WITH THE SPECIFICATION.

LEGEND:

- ASPHALT PAVED TRAFFICABLE AREA
- LANDSCAPED AREA
- BURIED PIPE
- EXPOSED PIPE
- SLOPE ON GROUND
- SLOPE ON STRUCTURE
- IL — INVERT LEVEL
- CL — COVER LEVEL
- RW — RETAINING WALL
- GMS — GALVANISED MILD STEEL

REV.	DESCRIPTION	AUTH. CHK.	APP.	DATE
0	TENDER	AM/HE	PLX	YF MARCH-2015

CLIENT

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

CONSULTANT

MWH
P.O. BOX 3020, DUBAI, UAE

PROJECT TITLE

GREATER BEIRUT WATER SUPPLY PROJECT - RESERVOIRS AND TRANSMISSION LINES CONTRACT

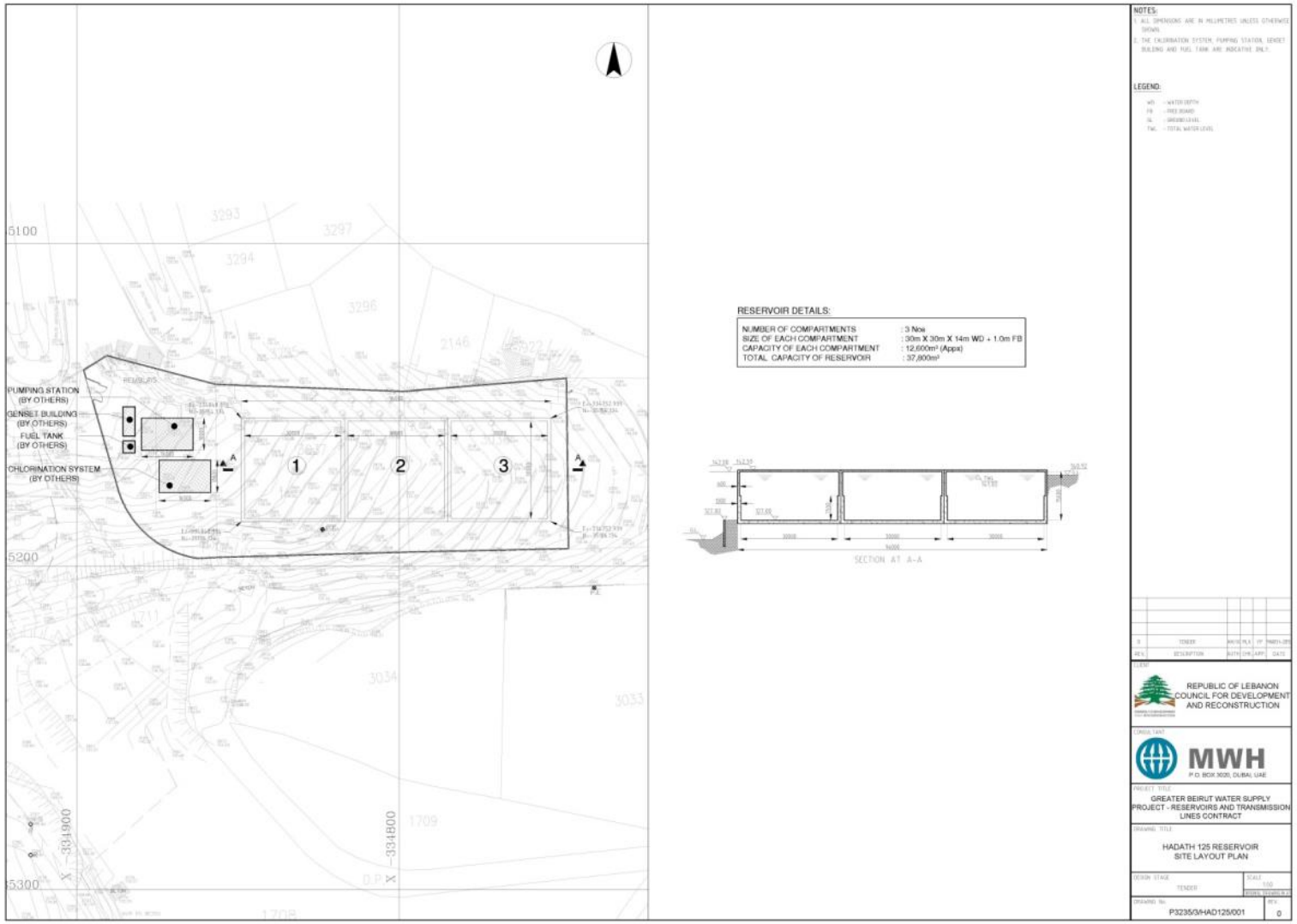
DRAWING TITLE

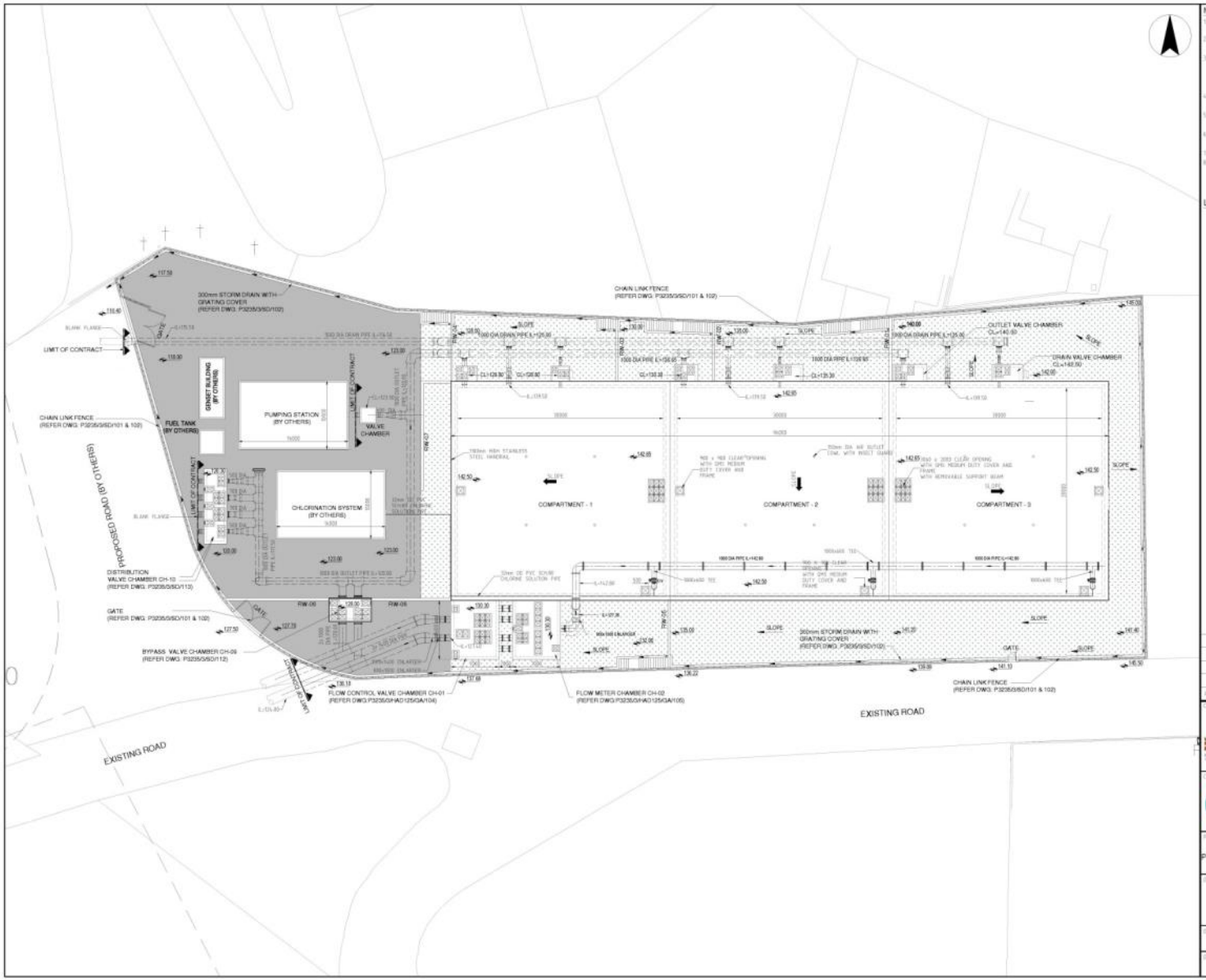
HADATH 90 RESERVOIR
OVERALL LAYOUT AND GRADIENT PLAN

DESIGN STAGE	SCALE
TENDER	1:25
	WORK SIZE: A1

DRAWING No.	REV.
P3235/3/HAD90/002	0

Drawing of Hadath 125 - Reservoir for the Additional Financing Project
Volume: 37,800 cum





NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. THE CHLORINATION SYSTEM, PUMPING STATION, GENSET BUILDING AND FUEL TANK ARE INDICATIVE ONLY.
3. THE SITE GRADING LEVELS ARE INDICATIVE ONLY. THE CONTRACTOR IS REQUIRED TO PREPARE A SITE GRADING PLAN AFTER CONSTRUCTION OF TANKS AND SUBMIT FOR APPROVAL.
4. STORM DRAIN CHANNEL DEPTH SHALL BE DECIDED BY CONTRACTOR DURING EXECUTION.
5. STORM DRAIN CHANNEL SHALL BE CONNECTED TO EXISTING DRAINAGE SYSTEM.
6. THE SITE SHALL BE LANDSCAPED / PAVED WITH MINIMUM GRADIENT OF 1 IN 100.
7. FLANGED JOINTS BELOW GROUND SHALL BE PROTECTED
8. THE UNDERGROUND DI PIPES AND FITTINGS WITHIN THE RESERVOIR SITE SHALL HAVE RESTRAINED JOINTS IN ACCORDANCE WITH THE SPECIFICATION.

LEGEND:

ASPHALT PAVED TRAFFICABLE AREA
LANDSCAPED AREA
BURIED PIPE
EXPOSED PIPE
SLOPE ON GROUND
SLOPE ON STRUCTURE
IL INVERT LEVEL
CL COVER LEVEL
RW RETAINING WALL
GMS GALVANIZED MILD STEEL

REV.	DESCRIPTION	BY/VE	PLN	YP	DATE
0	TENDER	AM/VE	PLN	YP	MARCH-09

CLIENT

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

CONSULTANT

MWH
P.O. BOX 3020, DUBAI, UAE

PROJECT TITLE

GREATER BEIRUT WATER SUPPLY PROJECT - RESERVOIRS AND TRANSMISSION LINES CONTRACT

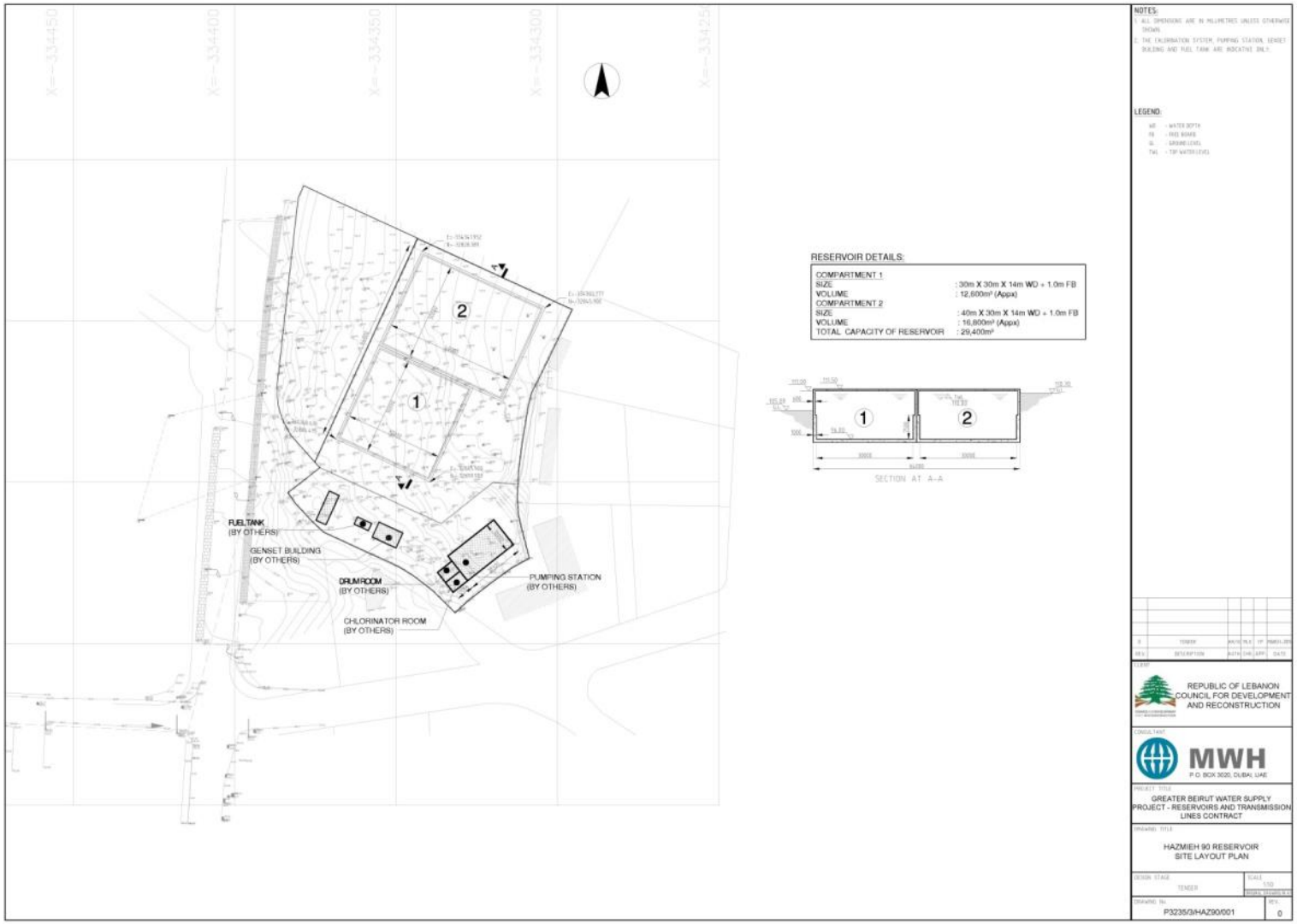
DRAWING TITLE

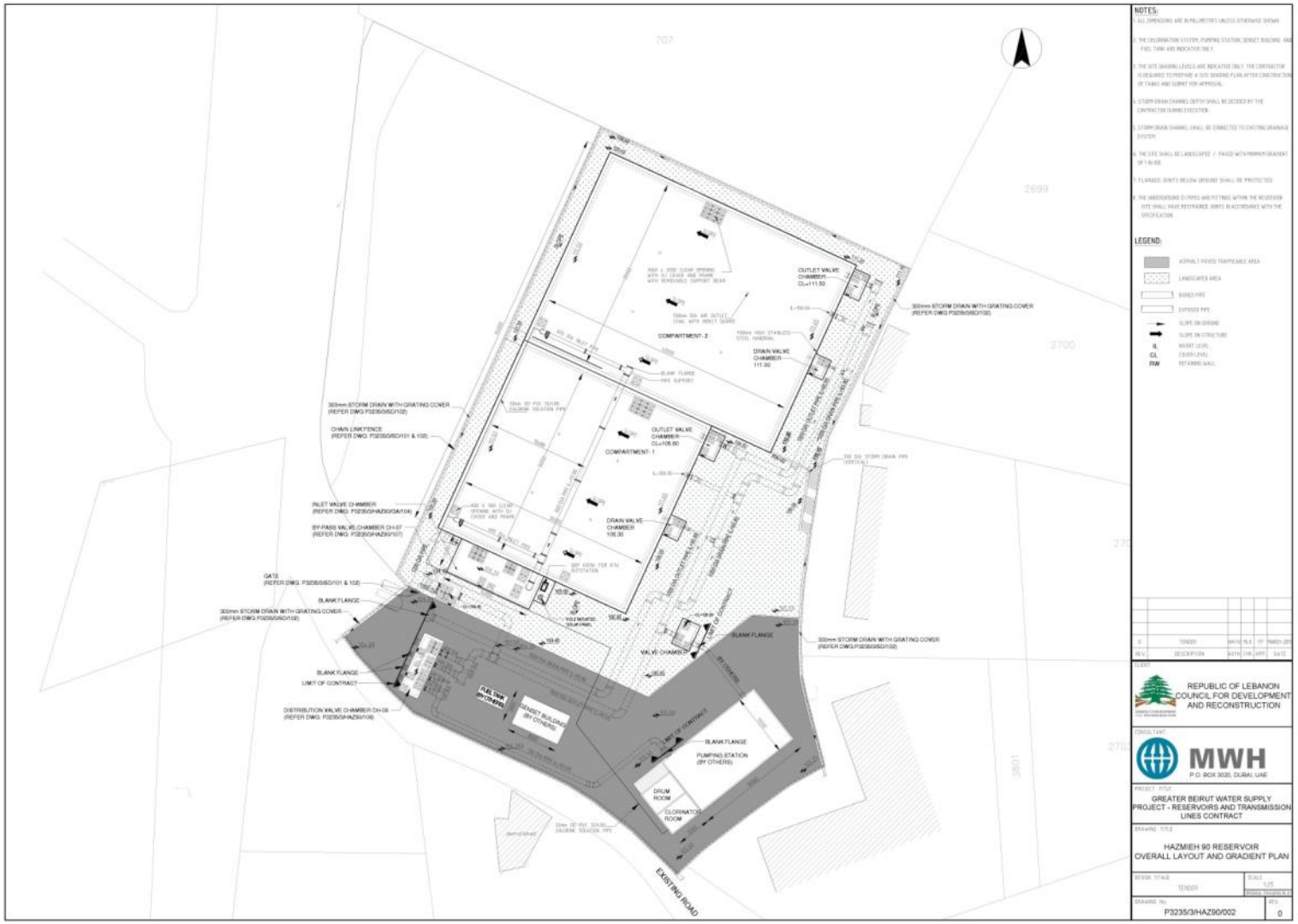
HADATH 125 RESERVOIR
OVERALL LAYOUT AND GRADIENT PLAN

DESIGN STAGE	SCALE
TENDER	1:25
	WORKS TO BE SCALED

Drawing No.	REV.
P3235/3/HAD125/002	0

Drawing of Hazmieh 90 - Reservoir for the Additional Financing Project
Volume: 29,400 cum




NOTES:
LEGEND:
REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION
MWH
P.O. BOX 3020, DUBAI, UAE
GREATER BEIRUT WATER SUPPLY PROJECT - RESERVOIRS AND TRANSMISSION LINES CONTRACT
HAZMIEH 90 RESERVOIR
OVERALL LAYOUT AND GRADIENT PLAN
TENDER
1:25
P3235/3/HAZ90/002
0
COMPARTMENT- 2
COMPARTMENT- 1
OUTLET VALVE CHAMBER
DRAIN VALVE CHAMBER
300mm STORM DRAIN WITH GRATING COVER (REFER DWG.P3235/0/SD/102)
CHAIN LINK FENCE (REFER DWG. P3235/0/SD/101 & 102)
INLET VALVE CHAMBER (REFER DWG. P3235/0/HAZ90/GA/104)
BY-PASS VALVE CHAMBER CH-57 (REFER DWG. P3235/0/HAZ90/107)
GATE (REFER DWG. P3235/0/SD/101 & 102)
BLANK FLANGE
LIMIT OF CONTRACT
DISTRIBUTION VALVE CHAMBER CH-58 (REFER DWG. P3235/0/HAZ90/108)
VALVE CHAMBER
FUEL TANK (BY OTHERS)
GENSET BUILDING (BY OTHERS)
PUMPING STATION (BY OTHERS)
DRUM ROOM
CLORINATOR ROOM
EXISTING ROAD

Annex 4

List of Attendees

- Municipality of Jdeideh – Abdo Chakhtoura
- Municipality of Fanar – Georges Salameh
- Municipality of Ain Saadeh – Antoine Gerges Bou Aoun
- Municipality of Roumieh – Richard Abi Habib
- Municipality of Sin el Fil – Nicolas Azar
- Municipality of Biaqout – Issam Zainoun
- Municipality of Dekwaneh – Myrna Zakhia Sfeir

Annex 5

List of Invitees

- Municipality of Ain Saadeh
- Municipality of Antelias
- Municipality of Beirut
- Municipality of Beit el Chaar – Al Hadira
- Municipality of Biaqout
- Municipality of Borj Hammoud
- Municipality of Bsalim – Mezher – Al Majzoub
- Municipality of Dbayeh – Zouk el Khrab – Haret el Bellaneh - Awkar
- Municipality of Dekwaneh
- Municipality of Dick el Mehdi
- Municipality of Fanar
- Municipality of Jal el Dib
- Municipality of Jdeideh
- Municipality of Mansourieh – Mkalles - Daychounieh
- Municipality of Mtayleb
- Municipality of Roumieh
- Municipality of Sin el Fil
- Municipality of Zalka