

BOSNIA AND HERZEGOVINA
SARAJEVO WATER PROJECT
FEASIBILITY STUDY UPDATE

Environmental and Social Audit and Assessment – Non-Technical Summary

February 2017

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ACRONYMS AND ABBREVIATIONS

BiH	Bosnia and Herzegovina
CEI	Central European Initiative
CESMP	Construction Environmental and Social Management Plan
CSOP	Construction Site Organization Plan
CWMP	Construction Waste Management Plan
E&S	Environmental and Social
ESAP	Environmental and Social Action Plan
EIA	Environmental Impact Assessment (local)
EBRD	European Bank for Reconstruction and Development
ESMS	Environmental and Social Management System
ESP	Environmental and Social Policy
EU	European Union
FBiH	Federation of Bosnia and Herzegovina
FS	Feasibility Study
FMoET	Federal Ministry of Environment and Tourism
HACCP	Hazard Analysis and Critical Control Points
ISO	International Organisation for Standardisation
BAM	Bosnia and Herzegovina Convertible Mark
OESMP	Operation Environmental and Social Management Plan
OHS	Occupational Health and Safety
PIU	Project Implementation Unit
PRs	(EBRD) Performance Requirements

1 INTRODUCTION

The public utility company “Vodovod i Kanalizacija d.o.o. Sarajevo” (the “Company”), established in 1889 and in 100% ownership of Canton Sarajevo, approached the European Bank for Reconstruction and Development (the “EBRD”) with a request to assess the possibility of financing reconstruction of the water supply system in Sarajevo. The water supply system operated by the Company supplies drinking water to a population of around 400,000 in six municipalities in Sarajevo Canton: Stari Grad, Centar, Novi Grad, Novo Sarajevo, Ilidža and Vogošća.

This Project is a revival of the similar project signed in 2010, which was never declared effective and was cancelled in 2014. The EBRD has engaged the Consultant to prepare a comprehensive Feasibility Study update (“FS update”).

The FS update includes, amongst other tasks, an Environmental and Social Assessment of the proposed Project to identify its environmental and social risks, impacts and benefits and to structure the Project to comply with the Bank’s Environmental and Social Policy (“ESP”) and Performance Requirements (“PRs”). This Non-technical Summary (NTS) provides a summary of the expected environmental and social impacts and measures needed to structure the project to meet the PRs of the EBRD ESP¹. The purpose of the NTS is to give information to everyone that may be interested in the Project.

2 PROJECT DESCRIPTION

The Sarajevo Water Project (the “Project”) includes the following Project components:

- Reconstruction of transport and distribution water supply network – separate sections and in the Bjelave area;
- Reconstruction of distribution network in the Skenderija area
- Rehabilitation of pumping stations (pumps, electrical equipment, chlorination and other)
- Metering – control equipment (individual, network, telemetry).

The total expected duration of the Project is approximately 36 months from the date the credit becomes effective, while the duration of individual project components will depend on on-site conditions. Table 2.1 provides a financial overview of the proposed Project components to be financed under Tranche 1, in the amount of Euro 9.5 million. VAT will be covered from funds provided either by the Canton or the Company.

Table 2.1: Project Components Financed under Tranche 1

Description of Component	Cost Estimate (BAM)	Cost Estimate (EUR)
Reconstruction of transport and distribution water supply network – separate sections and Bjelave area	8,459,080	4,325,059
Reconstruction of distribution network in Skenderija area	6,834,050	3,494,194
Rehabilitation of pumping stations (pumps, electrical equipment, chlorination and other)	2,670,000	1,365,149
Metering - control equipment (individual, network, telemetry)	530,000	270,985
TOTAL	18,493,130	9,455,387

¹ <http://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html>

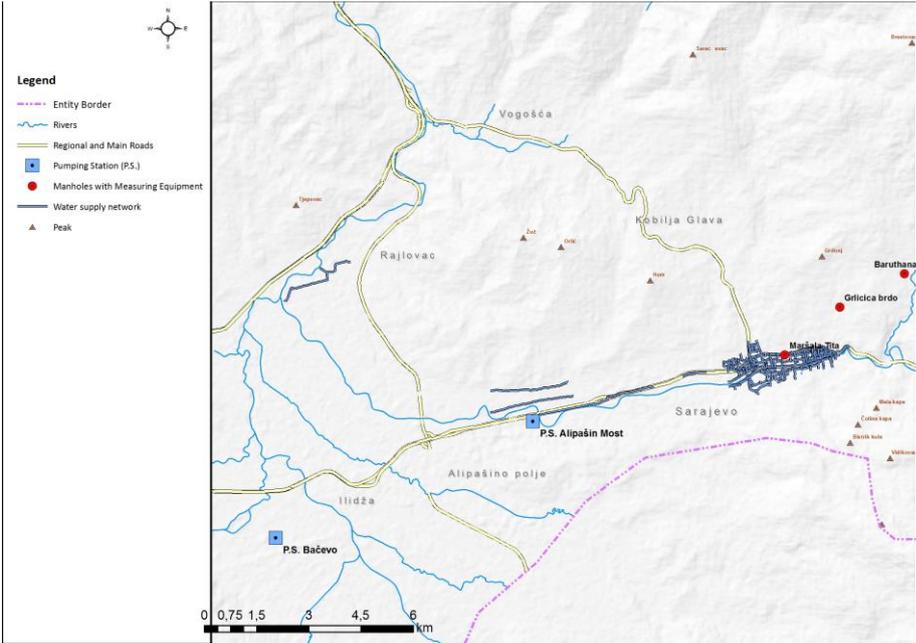


Figure 2.1 Spatial Organization of the Project Components (source: the Consultant)

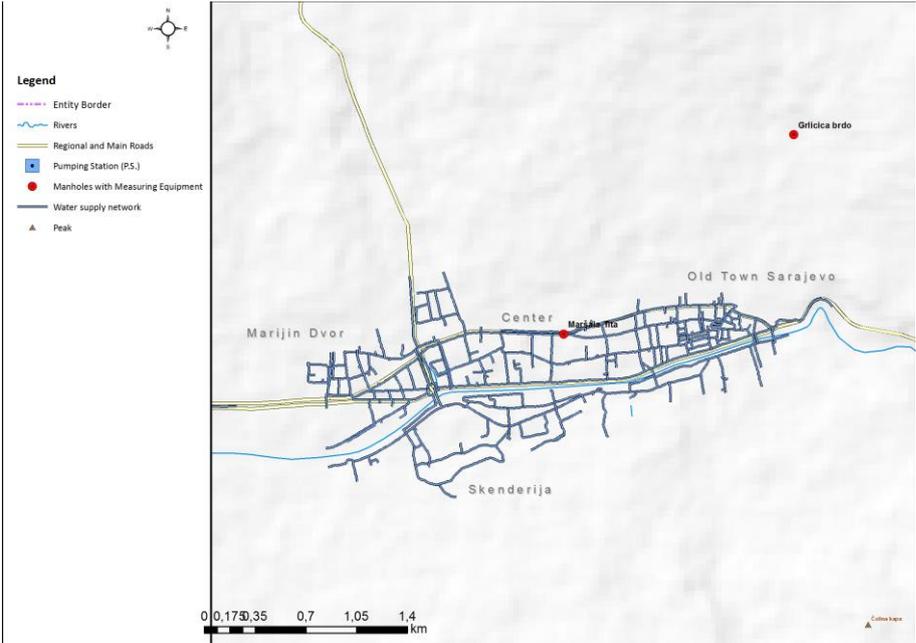


Figure 2.2: Reconstruction of Water Supply Network (in area of Centre of Sarajevo, Skenderija and Marijin Dvor) and Position of Two Manholes (Mršala Tita and Grljića Brdo) (source: the Consultant)

3 BACKGROUND

3.1 Rationale of the Project

The Project is expected to provide environmental and health benefits compared to the existing situation by improving the quality and reliability of the drinking water supply and by reducing water losses. The project rationale is to improve the water supply system by installation of necessary regulation and measurement equipment in the control shafts. The pumping stations “Bačevo” and “Alipašin Most” are to be reconstructed due to their age of over 50 years, and the pipeline sections covered by the proposed Project have been selected due to their age, number of malfunctions and measured water losses. Overall, the proposed Project is expected to reduce annual losses in the system.

3.2 Legal Aspects and Compliance with Relevant Environmental and Social Laws

National, EBRD and EU Requirements

The implementation of this Project requires compliance with a set of local laws and bylaws in the area of environmental protection, water protection, air pollution, nature protection, solid waste management, etc.

Related to Directive 2000/60/EC establishing a Framework for Community Action in the Field of Water Policy, the Company is in line with the provisions on supply of good quality water. The Project will improve the Company performances related to the provision of quality of supplied water. Currently, the quality of water supplied by the Company is in line with the *Regulation on Drinking Water Health Safety* (a regulation adopted at state level). This Regulation is in line with Directive 98/83/EC on the Quality of Water Intended for Human Consumption.

During the implementation of this Project, the Company should meet the requirements set down by relevant national, EBRD and EU environmental, social, health and safety legislation and standards. The most stringent regulations and/or requirements (whether national, EBRD or EU) will be applied, in order to ensure environmental protection and community health and safety. The Company should also require from contractors, through the public procurement procedure, that these requirements and emissions limit values are met during the implementation of the Project.

Local Permitting Requirements

Permits for Company operations

The activities of water abstraction conducted by the Company are subject to environmental permitting procedures in line with local legislation. The Company currently lacks Environmental Permits for abstraction of water from several underground water sources and springs, whereas it has obtained an Environmental Permit for activities of (i) wastewater treatment, (ii) sludge treatment and (iii) energy utilisation on WWTP Butile covering all the necessary processes and facilities on location Butile.

Currently, the Company holds several Water Permits for water abstraction activities and distribution with abstraction volumes of around 3,200 L/s, issued by the competent authorities.

Operation Permits have been issued for all equipment and mechanisation used during daily operations of the Company on the basis of periodical checks safety and correctness of equipment.

Other Relevant Documents and Standards

Under ISO 9001:2008, the Company has developed a structured set of documents, procedures and responsibilities relevant to the protection of the environment, and the health and safety of workers and communities - since 2000, the Company has been certified for quality management in line with ISO standards (BAS EN ISO/ IEC 90001). There are several operational procedures in place addressing environmental, health, safety and labour management within the Quality Management System documentation. In addition, international standards for the operation of testing and calibration laboratories (BAS EN ISO / IEC 17025) and the work of inspection bodies (BAS EN ISO / IEC 17020) have been implemented in the Company's Laboratory for Testing, Calibration and Verification of Water Meters.

The Company plans to introduce the ISO 14001 standard and Hazard Analysis and Critical Control Points (HACCP) standard² in the next 1-2 years. Three employees have already been trained as HACCP managers. Furthermore, the Company's Systematization of Job Positions is currently being reviewed to include 2 new jobs related to integral quality management (14001, HACCP).

The Company is required to introduce HACCP in line with the *Regulation on Health Safety of Drinking Water* and the *Law on Food*.

The Company will develop and implement an Environmental and Social Management System (ESMS), and an appropriate Environmental and Social Policy (ESP) for the ESMS.

The Company will also require from the Contractors to prepare and implement a Construction Site Organization Plan (CSOP) and an Operation Environmental and Social Management Plan (OESMP) for the operational phase.

The Company has already established a Project Implementation Unit (PIU) with the responsibility to manage the Project in accordance with the Financing Agreement with the EBRD. The PIU consists of representatives of the Company, and was appointed on the basis of a formal decision. The PIU will maintain and implement the ESMS and ESP, monitor the environmental and social performance of the Project, and ensure comprehensive and clear reporting procedures between parties involved in this Project.

3.3 Current Environmental and Social Considerations

Ground and Surface Water Quality

The Project area belongs to the Sava River Basin. Monitoring of groundwater quality is still not performed in the country³. The dominant surface watercourse in Canton Sarajevo is River Bosna, where municipality Sarajevo is located in the valley of the Bosna river tributaries (Miljacka, Zujevina, Željeznica and Zujevina in the Canton Sarajevo). Monitoring of surface water quality has been conducted in 2011 for River Bosna and for Miljacka confluence in 2012 and 2013. Chemical and biological status and consequently ecological status were evaluated as poor on both monitoring stations (due to inadequate waste water management and no wastewater treatment for both urban (WWTP Butile was not in operation) and industrial effluents. The worst water quality situation in the River Bosna and its tributaries is usually in the summer, because of the extremely low flow regime specially caused by high anthropogenic consumption of river Bosna and Željeznica sources.

Potable Water Supply and Distribution

The main water resources are underground reservoirs of the Sarajevo Plain (Bačevo, Sokolovići, Stup with 36 wells) that ensure approximately 2,500 l/s, which accounts for over 70% of the total amount of abstracted water. Mountain springs maximum yield is approximately 350 l/s, and a maximum of 500 l/s may be provided via abstraction and filter treatment of water from the Bosna River. In addition to these sources, the Company purchases water from Jahorina and Perački springs⁴. The available quantity of water in the system amounted to an average of 3,031.17 l/s during the period 2013-2015, out of which average of 2,753.8 l/s of water was abstracted from underground water sources and 277.37 l/s was abstracted from springs. The total average annual production of drinking water is around 100 mil m³/year. The water supply system includes 65 reservoirs, 48 pumping stations with more than 80 pumps. Distribution of water to end users is done through primary and secondary water supply network (the pipes are made out of: cast iron, ductile, asbestos cement, plastic and steel). The company possesses its own radio network, telemetry system, which enables remote monitoring and control of almost all water sources and pumping stations. The Company has set up its GIS system in 2006, which contains data on the water

² Official Gazette of FBiH, No. 26/16

³ Ministry of Foreign Trade and Economic Relations, State of the Environment Report Bosnia And Herzegovina, 2012

⁴ Via contracts with the water supply companies "Vodovod - Pale" and "Unis Energetika - Vogošća"

supply network and facilities, failures in the network, quantities of water entering supply zones, etc. Currently this system suffers from water losses of over 70%.

Wastewater Collection, Treatment and Discharge

The total length of the sewerage system operated by the Company is about 1,300 km, out of which 200 km is mixed, 645 km faecal, and 455 km are for the collection and drainage of storm water. The pipes are made of 60% asbestos, 25% centrifugal polyester and 15% concrete. The system includes 15 storm water overflows. Storm water from hilly areas of the city is collected through 40 inlet structures. For the regular maintenance and cleaning of the sewerage network 45,000 revision shafts are in use. The central sewerage system covers the Municipalities of Stari Grad, Centar, Novo Sarajevo, Novi Grad and Ilidža. Approx. 70-80% of the population served by the Company are connected to sewerage system and the rest of the population is connected to septic tanks cleaned by the Company. There are also most likely illegal discharges of sewage to open watercourses and streams. The main problems in the collection of wastewater from central part of Sarajevo are: (i) mixed system that serves old sections of the city is not capable to accept large amounts of rain water. Many streets are flooded during heavy rains and sudden snow melting; and (ii) old sections of the system are exposed to heavy wear-out, slope systems experience clogging and often break, there is a high rated of sediments, sand and soil that accumulate in the system from the surrounding steep slopes. Wastewater treatment is conducted at WWTP Butile (reconstructed and has started regular operation as of 01 November 2016) WWTP Butile is designed for secondary wastewater treatment and sludge treatment (anaerobic digestion of sludge and utilisation of both thermal and electrical energy). The recipient of the effluent from the WWTP Butile is River Bosna.

Air Emissions

The urban area of Sarajevo has poor air quality due to air emissions from the everyday urban road traffic and combustion of fossil fuel (coal, fuel oil and wood) in heating plants and individual residential facilities during the winter season⁵. In addition, geomorphological features of Sarajevo are unfavourable since the city is located in the valley surrounded by the mountains, thus causing difficulties with airflow and regular circulation of the atmosphere. In 2014, increased concentrations of air pollutants were recorded and the most significant aero-pollutants for area of Sarajevo were particulate matter (PM_{2.5}), sulphur dioxide (SO₂), carbon dioxide (CO₂) and nitrogen dioxide (NO₂).

Noise

No data on ambient noise are available in BiH since the monitoring of noise is not carried out on a regular basis. Urban, residential and service areas were identified in the City centre of Sarajevo (relevant for the reconstruction of water supply network) during the site visit (conducted on September 20, 2016). The Company does not perform measurement of ambient noise levels since the activities of the Company have no potential to increase the ambient noise.

Geomorphology and Geology

Geological features of the project area are characterized by (i) alluvial substrate - gravels and sands and (ii) conglomerates, clay, marl and sandstones. The Project area is considered as stable terrain (relevant for lowland area) and conditionally stable terrain (relevant for highly area and steep slopes).

Land Use

The area envisaged by the Project components currently consists of the constructed urban area.

Soil

The Project area is characterized by mainly (i) soils formed with the action of water (along rivers and streams – lowland area of Sarajevo) and (ii) soils formed due to weathering of rocks – hilly area of Sarajevo.

⁵ According to the Annual Report on Air Quality in FBiH for 2014 (Federal Hydrometeorological Institute, 2015)

Biological and Ecological Resources

The project area is largely represented by degraded area of modified/artificial surfaces of the urban area of Sarajevo. All other works will be undertaken in urban zones with no natural environment present.

Protected Areas

No protected areas were identified within the Project area. However, the protected area Vrelo Bosne (Spring of Bosna River) is located in close proximity (approx. 300 m) of the Source Bačevo. This has positive impact on the water source Bacevo as the nature protection zones overlap the water protection zones, therefore forbidding implementation of activities that can endanger both biodiversity and water quality.

Landscape and Visual Values

The landscape of the Project area is represented by (i) mainly lowland area (Source Bačevo, Marijin Dvor, Skenderija and Džemala Bijedića Street) and slightly hilly area (settlements Soukbunar, Grljića Brdo and Baruthana). Visual values of the Project are represented by (i) urban and constructed area of Sarajevo and (ii) suburban area. There is no permanent impact from the Project on the landscape or visual value.

Public and / or Site Specific Transportation System

The transportation in Sarajevo Canton involves (i) individual transport during everyday traffic (personal means of transport) and (ii) public transportation (tramways, trolley buses and buses). During the implementation of the Project, the traffic in streets where the reconstruction works will be done is likely to be temporarily modified or blocked and partly relocated to other adjacent streets/areas.

Material Assets

The urban type of settlements dominates in the Project area, categorized as highly urbanised, moderately urbanised, semi-urbanised and suburban areas. The level of urbanization correlates to the density of material assets– the higher the urbanisation level, the higher density of material assets. The planned reconstruction of the existing water supply system is planned in the Municipality *Centar* and the Municipality *Stari Grad*, which are highly urbanised, with residential structures. In addition, all commercial and social structures are densely placed in these two municipalities. The rehabilitation / reconstruction of pumping stations including equipment for power supply control and chlorination will be carried out in an area categorised as moderately urbanised and semi-urbanised, where material assets are less densely placed. Some of the water supply network planned to be reconstructed is located at a distance of app. 50 m of the following social infrastructure: mosque, first football grounds, an elementary school and a high school. Construction of manholes and installation of measuring equipment includes various urban parts of the city, including: (i) *Marijin Dvor* area neighbourhood in the city centre and (ii) *Grljića Brdo* and *Baruthana* which are in inhabited peripheral parts of Sarajevo.

Cultural Heritage, Including Architectural and Archaeological Heritage

The planned reconstruction of the existing water supply network in the Municipality *Centar* and the Municipality *Stari Grad* are areas with highly densely placed cultural and historical monuments. Along the route is the City Hall and several religious buildings. The area where rehabilitation / reconstruction of pumping stations is planned does not have any identified cultural and archaeological heritage sites in its narrow surroundings.

Socio-economic Status of the Population

The census of 2013 showed that the total population in Sarajevo Canton was 413,593. Sarajevo Canton is divided into 9 municipalities, with the Company providing services to six of them, i.e. the four municipalities in the City of Sarajevo as well as Ilidza and Vogosca. In 2013, these six municipalities had a total of 368,597 inhabitants and 134,308 households. The official population projections until year 2023 estimate that Sarajevo Canton will have an average annual population growth of 0.5 % and the population in the area served by the Company will increase to around 400,000.

In 2011, the average monthly household expenditure (in urban parts of BiH) was BAM 1,738, of which an average urban household spent 9% on electricity, gas, water and other fuel. There are no data on poverty levels specifically for Sarajevo Canton, but around 15,000 socially vulnerable persons receive social aid and special care, i.e. around 3.5% of the total population.

The Company supplies piped water to 147,878 households, 1,009 institutions and 14,173 commercial entities, in total 163,060 customers, i.e. around 405,000 people (average household size of 2.7 persons). This is 31,600 persons more than registered in the six municipalities possibly due to some houses being empty, owners living abroad, or some residents being registered in other municipalities. All customers have meters installed. 70 - 80% of households supplied with piped water are connected to the piped wastewater system, i.e. around 304,000 persons. All customers are charged for both water supply and wastewater discharge services.

It is estimated that households in Sarajevo use up to 1.5% of their expenditures on water and wastewater services, while the absolute poor may have to spend close to 4% of their total expenditure on water and wastewater services and the relative poor and pensioners up to 2.2%. This is below the most widely used affordability threshold of 5% for expenditure on water and wastewater utility services.

3.4 History of Project Development and Planning

As mentioned earlier, this Project is a revival of the similar project signed in 2010, which was never declared effective and was cancelled in 2014. A Feasibility Study was conducted in 2009 for the first project. In 2016, the EBRD engaged the Consultant to prepare a comprehensive Feasibility Study update ("FS update"). This includes, amongst other tasks, an Environmental and Social Assessment of the proposed Project. Available existing technical documentation, provided by the Company for the reconstruction of Sarajevo water supply system did not consider any alternatives. A set of design documentation was prepared for the project in the period 2009 – 2013. This includes main designs for the water supply network including 40 locations, main design for the pumping station "Alipašin most" (including hydro-mechanical and civil design and electrical design) and main designs for three control shafts (control shaft - CS in Titova street, CS in Grljičića Brdo and CS Baruthana).

4 PROCESS

Since the proposed Project envisages the reconstruction / construction activities and removal / replacement of the pumping station and electrical equipment, the following permits will need to be obtained:

- I. **Urban Consent,⁶ Construction Permit⁷** - will need to be obtained prior to reconstruction / construction activities. The Company has already started the process of obtaining Urban Consent / Construction Permits for the Project component 'reconstruction of water supply network in the water supply zone Skenderija and other parts of the network in other water supply zones (divided into two lots)'.

The Company will need to obtain Urban Consent and Construction Permit for implementation of the proposed Project component. The Project component that includes the construction of three control shafts (CS) (Maršala Tita, Baruthana and Grličića Brdo) with supply and installation of measuring control devices will also need to be subjected to the Urban Consent / Construction Permit.

- II. Upon completion of necessary construction activities, all reconstructed facilities will need to obtain **Use Permits** (relevant for Project component 'reconstruction of water supply network and 'construction of three manholes with installation of metering equipment').
- III. **Operation Permits** will need to be obtained for all new electrical equipment upon installation of equipment issued by an authorized institution (e.g. the Institute for Occupational Health and Safety issues the Operation Permit in accordance with the *Law on Safety at Work⁸*)

According to the *Law on Concessions of Canton Sarajevo⁹*, public enterprises in the field of water supply established by the Canton (i.e. the Company) are exempt from the obligation of signing of concession agreements. Reconstruction of existing water supply networks, pump stations and reservoirs, as well as the installation of manholes and measuring equipment are neither subject to an EIA procedure nor to the issuance of an Environmental Permit.

5 SUMMARY OF ENVIRONMENTAL BENEFITS, POTENTIAL ADVERSE IMPACTS, MITIGATION AND MANAGEMENT MEASURES

A summary of the key environmental and social impacts, benefits and mitigation measures related to the project are provided below and based on the Environmental and Social Assessment and on the Environmental and Social Action Plan prepared as part of the FS update.

The following management plans will need to be developed in the pre-construction phase, and implemented by the Contractors during the construction/operation phase:

⁶ The request for obtaining an Urban Consent is submitted to the local Municipality including the Preliminary Design (and the Environmental Permit for construction if the project is subjected to the Environmental Permit). The Urban Consent is valid for one year. The validity of the Urban Consent maybe extended for another year based on reasonable causes. Obtaining an Urban Consent is precondition for the issuance of a Construction Permit

⁷ The validity of the Construction Permit is one year, and construction work must be initiated in this period. The validity of the Construction Permit may be extended for another year based on reasonable causes.

⁸ Official Gazette of BiH, No. 22/99

⁹ Official Gazette of Canton Sarajevo, No. 27/11 and 15/13

<p>1) Construction Site Organization Plan (CSOP)¹⁰ defines:</p> <ul style="list-style-type: none"> - the organization of preliminary works - organization of sites during construction - organization of sites after construction and the project scheme. <p>CSOP should consist of: 1a) Construction Environmental and Social Management Plan (CESMP) 1b) Fire and Explosion Management Plan 1c) Occupational Health and Safety Management Plan</p>	<p>1a) Construction Environmental and Social Management Plan (CESMP)</p>	<p><u>To be developed prior to construction and to include the Company's existing operational procedures within the Quality Management System as appropriate.¹¹</u></p> <p>At a minimum, the CESMP will cover mitigation measures for the following aspects: air emissions, noise and vibration management, soil management, hazardous material management, spill response management, emergency preparedness and response (which includes requirements for chlorine gas incidents), grievance management for external stakeholders, security personnel requirements, information disclosure and stakeholder engagement, community health and safety management and traffic management.</p>
	<p>1b) Fire and Explosion Management Plan</p>	<p>Defines preliminary fire-fighting activities in case of fires, plans for alerting fire-fighting services and contains procedures for identifying and safe handling of unexploded ordnance (UXOs) in case of finding the UXOs</p>
	<p>1c) Occupational Health and Safety Management Plan</p>	<p>Defines mandatory equipment for OHS, preliminary medical assistance and plan for alerting the official medical assistance authorities)</p>
<p>Construction Waste Management Plan (CWMP)</p>	<p>To be developed prior to construction in accordance with the <i>Law on Waste Management</i>¹² with special emphasis on management of hazardous waste.</p>	
<p>Operation Environmental and Social Management Plan (OESMP)</p>	<p><u>To be developed prior to operation and to include the Company's existing operational procedures within the Quality Management System as appropriate¹³.</u></p> <p>At a minimum, the OESMP will cover mitigation measures for the following aspects: waste management, air emissions management, noise management, spill response management, emergency preparedness and response (including requirements for chlorine gas incidents), traffic management and health and safety management.</p>	

In accordance with aforementioned plans and implementation of mitigation measures suggested, the Contractor of the Company will obtain proper organisation of construction site.

5.1 Environmental and Social Opportunities

As this is a cantonal level Project, there are no envisaged national, regional and global impacts.

There are significant positive impacts of the proposed Project. The Company's current customers (households, organisations and commercial entities) will benefit from improved water supply services and the Company will be in a better position to establish water supply connections for new households, businesses and organisations in the six municipalities served by the Company.

The foreseen social and environmental benefits of the Project include:

¹⁰ Required by the *Decree on Construction Site, Mandatory Documentation on the Site and Participants in Construction*- Official Gazette of FBiH, No. 48/09, 75/09, 93/12, 74/13, 89/14, 99/14, 53/15 and 101/15

¹¹ Listed under section "Organisation of Environmental and Social Management System" of this document

¹² Official Gazette of FBiH, No. 33/03, 72/09

¹³ Listed under section "Organisation of Environmental and Social Management System" of this document

- Reduction in water and sanitation related diseases, through reduced risk of contamination of the drinking water (the many current burst of pipes pose a contamination risk). This will result in reduced mortality and morbidity, which will lead to reduced health costs for the individual family and the society as a whole.
- Improved living conditions as less time and efforts are needed to store water and many customers will benefit from a continuous water supply.
- Reduction in water network leakages, water loss/wastage and energy consumption by the Company. This will also reduce the risk of overexploiting the natural water resource.
- Higher productivity is expected as a result of fewer periods with illness due to water and sanitation related diseases, which would be of economic benefit to both individual employees and employers.
- Employment opportunities, and thereby increased incomes, for local residents in connection with the proposed improvements to the water supply infrastructure; increased incomes may in turn lead to increased demand for goods and services and thereby increased economic growth.
- Human resources development, in the form of training mainly by the suppliers of equipment, is part of the project; increased knowledge and skill levels will be of economic benefit to the individual person and to the society as a whole.

5.2 Environmental Benefits, Adverse Impacts and Mitigation Measures

5.2.1 Inadequate Organization of Construction Site

Inadequate organization of construction sites may cause potentially dangerous situations for workers as well as for local communities, and may slow down construction activities. This is mitigated through development of Construction Site Organization Plan (CSOP) in pre-construction phase. **Construction Site Organization Plan (CSOP)**¹⁴ defines:

- the organization of preliminary works
- organization of sites during construction
- organization of sites after construction and the project scheme.

Construction Site Organization Plan (CSOP) includes:

- **Construction Environmental and Social Management Plan (CESMP)** to include the Company's existing operational procedures within the Quality Management System as appropriate and covering at a minimum the adequate mitigation measures for following aspects: air quality management (e.g. machines and vehicles to be used in construction activities must have use/operation permits, machines and vehicles must have installed filters to reduce soot emission, vehicles need to be regularly maintained, the equipment and machinery need to be shut down when not in use, high quality fossil fuels (with low percentage of sulphur and lead) need to be used as motor fuel for machinery and equipment, sand and gravel materials need to be transported in covered trucks), noise and vibration management (e.g. restriction of works to day - time only from 06:00 to 22:00, equipment and machinery need to be shut down when not in use, minimise the duration of clearance works, machinery must have use/operation permits, in case of noise complaints by local residents, simultaneous use of machines that generate noise over 70 db needs to be limited, machines and vehicles to be used in construction activities must have use/operation permits), hazardous material management (e.g. measures for adequate handling of hazardous material), spill response management (e.g. procurement of adsorbent material, use of adsorbent material in case of spills and adequate disposal of used adsorbent material), emergency preparedness and response (which includes requirements for chlorine gas incidents), grievance management for external stakeholders, security personnel requirements, information disclosure and stakeholder engagement, community health and safety management and traffic management (e.g. levelling of ground to reduce the occurrence of trenches and slopes, installation of proper warning signs is required during construction works, in particular in urban areas with dense local traffic, implementation of a stakeholder engagement plan, in particular with provision of timely information to citizens through the media about upcoming construction works, expected duration of the works, alternative routes, etc.)

¹⁴ Required by the *Decree on Construction Site, Mandatory Documentation on the Site and Participants in Construction*- Official Gazette of FBiH, No. 48/09, 75/09, 93/12, 74/13, 89/14, 99/14, 53/15 and 101/15

- **Fire and Explosion Management Plan** – defines preliminary fire-fighting activities in case of fires by using extinguishers, plan for alerting fire-fighting services - fire department and procedures for identifying and safe handling of the unexploded ordnance (UXOs) in case of finding UXOs
- **Occupational Health and Safety Management Plan** - Defines mandatory equipment for OHS, preliminary medical assistance and plan for alerting the official medical assistance authorities).

Mitigation measures covering the impact on Workers' Health and Safety that could be caused by inadequate organisation of construction site are specified in the Fire and Explosion Management Plan and the Occupational Health and Safety (OHS) as part of the CSOP. This Plan to include at least the following mitigation measures to prevent accidents and injuries:

- Implement methods of securing excavations and preventing collapse during any ground disturbance in accordance with EU Directive 92/57/EEC
- Establishment of work zones so as to separate workers from traffic and from equipment as much as possible
- Reduction of allowed vehicle speeds in work zones
- Use of high-visibility safety apparel for workers in the vicinity of traffic
- For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing motorists
- Locate all underground utilities before digging
- Use of proper personnel protective equipment, including use of hearing protection for workers exposed to high noise levels.

Management of environmental and social issues in the operation and maintenance phase is obtained through Development and implementation of an **OESMP** - to be developed prior to operation and to include the Company's existing operational procedures within the Quality Management System as appropriate¹⁵. At a minimum, the OESMP will cover mitigation measures for the following aspects: waste management (emphasis should be given on proper management of hazardous waste, selection of different types of waste, proper temporary storage of waste (adequate storage of different types of both hazardous and non-hazardous waste) and final disposal of waste should be conducted by engagement of authorized third parties.), air emissions management (machines and vehicles to be used in maintenance activities must have use/operation permits, machines and vehicles to be used in maintenance activities must have installed filters to reduce soot emission, high quality fossil fuels (with low percentage of sulphur and lead) need to be used as motor fuel for machinery and equipment), noise management (machines and vehicles to be used in maintenance activities must have use/operation permits), spill response management (procurement of adsorbent material, use of adsorbent material in case of spills and adequate disposal of used adsorbent material), emergency preparedness and response (including requirements for chlorine gas incidents), traffic management (e.g. levelling of ground to reduce the occurrence of trenches and slopes, installation of proper warning signs is required during maintenance works, in particular in urban areas with dense local traffic, implementation of a stakeholder engagement plan, in particular with provision of timely information to citizens through the media about upcoming works, expected duration of the works, alternative routes, etc.), and health and safety management including procedure for identifying and safe handling of unexploded ordnance (UXOs) in case of finding UXOs.

5.2.2 Air Quality

Air emissions are expected during the construction phase, as a result of the combustion of fossil fuels which will lead to **emission of exhaust gases** from mechanization (excavators and trucks). Within the emissions during the construction phase, pollutants such as sulphur dioxide (SO₂), carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxides¹⁶ (NO_x), volatile organic compound (VOC) etc. may be generated. In cases when the motors are not functioning properly (due to poor maintenance or age of machinery and vehicles) potential harmful emissions may be released. Quantities of released pollutants will depend on the length of the work of machinery and combusted fuel. **Dust** will be generated as a result of site preparation activities (excavation of earth material, trenching) and during unloading of construction

¹⁵ Listed under section "Organisation of Environmental and Social Management System" of this document

¹⁶ NO_x is a generic term for the mono-nitrogen oxides (NO) and nitrogen dioxide (NO₂). They are produced from the reaction of nitrogen and oxygen gases in the air during combustion, particularly at high temperatures

materials (i.e. fine granulated construction materials). For managing air quality in construction phase, the implementation of an CESMP is proposed which covers mitigation measures for air quality, and includes at least the following mitigation measures:

- Machines and vehicles to be used in construction activities must have use/operation permits
- Machines and vehicles must have installed filters to reduce soot emission
- Vehicles need to be regularly maintained
- The equipment and machinery need to be shut down when not in use
- High quality fossil fuels (with low percentage of sulphur and lead) need to be used as motor fuel for machinery and equipment
- Sand and gravel materials need to be transported in covered trucks.

Activities during the maintenance phase may include minor repairs or periodical check-ups which may lead to the **emission of exhaust gases** from vehicles due to transport, or **dust emission** (i.e. due to necessary earth works during maintenance phase). Activities related to the operation phase of the Company will not affect the air quality. Implementation of an OESMP is suggested which includes mitigation measures relevant for urgent maintenance of water supply network performed by the Company:

- Machines and vehicles to be used in maintenance activities must have use/operation permits
- Machines and vehicles to be used in maintenance activities must have installed filters to reduce soot emission
- High quality fossil fuels (with low percentage of sulphur and lead) need to be used as motor fuel for machinery and equipment.

5.2.3 Noise and Vibration

Increased levels of noise and vibration will be caused by civil works, machinery and the use of equipment on site and reconstruction of local roads. Urban, residential and service areas were identified in the City centre of Sarajevo (relevant for the reconstruction of water supply network) during the site visit (conducted on September 20, 2016) that may be affected by increased ambient noise during construction phase related to reconstruction activities. Implementation of CESMP is suggested which covers mitigation measures for control of noise and vibration and includes at least the following:

- Restriction of works to day - time only (from 06:00 to 22:00)¹⁷
- Equipment and machinery need to be shut down when not in use
- Minimise the duration of clearance works
- Machinery must have use/operation permits
- In case of noise complaints by local residents, simultaneous use of machines that generate noise over 70 dB needs to be limited
- Machines and vehicles to be used in construction activities must have use/operation permits.

Increased levels of noise are expected during maintenance works (minor repairs or periodical check-ups) on water supply network. The noise related to the operation of pumps in the pumping stations will be generated in enclosed premises of the Company. There are no residential facilities near the Company's pumping stations; the impact is assessed as minor and therefore negligible and therefore, no mitigation measures are necessary.

5.2.4 Surface and Ground Water Quality and Quantity

During the construction activities, accidental leakage of lubricants and fuel may happen as a result of mishandling of machinery and equipment. In case when 'reconstruction of water supply network' is performed in vicinity of River Miljacka the contamination of surface water could be expected. However, the configuration of the terrain and position of the construction work is at a location where the altitude of works, asphalt construction and supporting walls of stone and concrete will act as barriers in case of any

¹⁷ Law on Noise Protection (Official Gazette of FBiH, no. 110/12)

spills and accidental situations. Thus no surface and ground water contamination is expected during the construction activities. Specific mitigation measures are not necessary since the impacts have been assessed as minor and possible only in accidental situations. General mitigation measures are envisaged by the spill response management to prevent or mitigate the water pollution in case of accidental release of contaminants (i.e. in case of accidental spills during traffic, the use of absorbing materials is needed).

During operation, the Project will enable better manipulation of the water supply system and contribute to a more reliable water supply to the City of Sarajevo. The Project will result in benefits through reduction of water losses in water supply network and preservation of water resources.

5.2.5 Geomorphology

During the construction phase, the following impacts on geomorphology may be expected:

- **Possible impact on terrain stability** (relevant for construction of manholes in the area of Grljičića Brdo) - terrain stability may be affected by the creation of earth cuts due to excavation activities (relevant for the OHS aspects at the construction site).
- **Removal of top soil** (relevant only for Baruthana manhole, approx. 2 x 2 m²) is needed in connection with necessary earth works, trenching and excavation activities for construction activities related to installation of manholes with measuring equipment.

There is not expected to be any impact on the geomorphology in other areas. Adequate mitigation measures are envisaged by implementing a CESMP which covers mitigation measures for geomorphology and includes at least the following mitigation measures:

- Control during earthworks to prevent degradation of terrain stability is required
- Good construction practices related to steep slopes are required (relevant for the steep slopes of Grljičića Brdo)
- Securing the open tranches, preventing OHS risk to workers

During the operation and maintenance phase, there are no identified impacts on geomorphology and no applicable mitigation measures.

5.2.6 Soil Quality

During the construction phase, the soil quality might be under impact from spilled hazardous substances such as oils from machinery. This is considered as accidental situations and is unlikely to occur during the regular course of Project implementation. In the area of Baruthana, the soil will be removed, compressed and levelled. It will cause loss of aeration in the soil and loss of subterranean living organisms in the surface level of the soil. However, the surface area under impact is very small (2 x 2 m²) which will leave no permanent impact on the soil quality in the area. The impact is minor and therefore negligible. Implementation of a CESMP which includes proposed measures for hazardous materials management and spill response management (e.g. procurement of absorbent material, use of absorbent material in case of spills and adequate disposal of used absorbent material). Also, vehicles and machines need to be regularly maintained to prevent leakage of oil.

5.2.7 Biological and Ecological Resources

The construction area is mainly represented by urbanized constructed areas. Vegetation cover will be removed only during the preparation for the construction of the manhole Baruthana and surrounding vegetation cover will be covered with dust. Due to the relatively small size of the area impacted by construction activities this impact is considered to be minor. Mitigation measures are not necessary since the impacts are assessed as minor and temporary.

5.2.8 Landscape and Visual Aspects

Partial alternation of landscape and visual aspects may be expected due to temporary presence of machinery at construction site and related equipment and construction fence (relevant for 'reconstruction of the water supply network' and 'construction of manholes with measuring equipment'). Installation of new equipment during the construction phase in the pumping stations Alipašin Most (Alipašin Bridge) and

Mojmilo has no potential to impact the landscape and visual values since the works will be implemented in enclosed facilities. Mitigation measures during the construction phase are not necessary since the impacts are assessed as minor and temporary.

5.2.9 Waste Management

During the construction phase, the Project will include generation of construction waste (inert earth material, soil and asphalt). Most of the excavated material will be used to cover the trenches while the waste asphalt will have to be disposed of. Waste oils and lubricants will also be generated as a consequence of machinery operation. The old asbestos pipes will not be disturbed during reconstruction, as the new ductile pipes will be placed alongside the existing pipeline. Construction and demolition waste will be generated during the rehabilitation / reconstruction of pumping stations. Old pumps and electrical and mechanical equipment will be replaced with new ones. The dismantled old equipment will be stored for spare parts at location of Stup and used for maintenance of other equipment in the water supply system or sold/handed over to an authorized third party. Implementation of a Construction Site Waste Management Plan¹⁸ (CSWMP) to ensure appropriate waste separation, temporary storage of waste and final disposal by engagement of authorized company is necessary, as follows:

- Dismantled water meters should be transported to the Laboratory for Calibration and Verification of Water Meters
- Old dismantled pipes should be sold as metal waste / handed over to authorized third party
- Old dismantled electrical and machine equipment should be transported and saved as spare parts at location “Stup” in Department for Electrical Maintenance and Department for Machine Maintenance or disposed of through authorised operators for this waste stream
- Old asphalt should be handed over to third party authorised to manage construction and demolition waste.

Waste oils and lubricants will be generated during maintenance activities (lubrication of metal parts) as well as spare parts in the pumping stations and worn out pipes that will be replaced in case of need. The OESMP covers mitigation measures for the waste management with emphasis on proper management of hazardous waste, selection of different types of waste, proper temporary storage of waste (adequate storage of different types of both hazardous and non-hazardous waste) and final disposal of waste should be conducted by engagement of authorized third parties.

5.3 Social Benefits, Adverse Impacts and Mitigation Measures

5.3.1 Road Safety, Local Traffic and Access Restrictions

Significant impacts related to access due to construction or maintenance works are not expected, as the works in the city centre are not expected to last longer than two day in fragments, in order to enable continuous access to public facilities in particular. **Trenching and temporary storage of construction material** is likely to be experienced during construction activities, which may impact on pedestrian and road safety (particularly in urban areas of Sarajevo where local transport is more dense compared to other areas, e.g. Baruthana and Grličića Brdo). **Traffic congestion and obstructions of roads** (increased traffic flow, leading to congestion and obstruction) may be experienced during construction of facilities, particularly during the delivery of construction material to sites and collection of waste from construction activities. Applicable mitigation measures during construction phase are:

- Implementation of a CESMP which includes measures for traffic management to enable free flow of vehicles and pedestrians to the extent possible
- Levelling the ground to reduce the occurrence of trenches and slopes
- Installation of proper warning signs is required during construction works, in particular in urban areas with dense local traffic

¹⁸ To be developed prior to construction in accordance with the *Law on Waste Management* (Official Gazette of FBiH, no. 33/03 and 72/09) with special emphasis on management of hazardous waste

- Implementation of a stakeholder engagement plan, in particular with provision of timely information to citizens through the media about upcoming construction works, expected duration of the works, alternative routes, etc.

Certain maintenance activities, e.g. repairs in cases of pipeline ruptures are likely to lead to slowing down of the traffic and may lead to traffic congestions. Occurrences of trenches and slopes as well as open manholes are likely to be experienced during reconstruction and maintenance activities. Applicable mitigation measures regarding the road safety includes installation of proper traffic signs is required during maintenance activities particularly in urban areas with dense local traffic.

5.3.2 Land Acquisition

This Project does not envisage land acquisition, resettlement, physical and economic displacement nor relocation of residence or businesses. Taking into account that construction works imply the replacement of existing pipes, access to a private residence or business during the construction activities will not be entirely restricted. Overall, replacement and reconstruction of the old water supply pipelines can be expected to bring only positive socio-economic benefit to residents in Sarajevo City.

5.3.3 Restrictions on Land Use and Damage to Private Property

This Project is not expected to require any land use restrictions or damage to private property.

5.3.4 Cultural Heritage

No impacts on cultural heritage are expected. Along the route of the planned works under the Project are the City Hall and several religious buildings. However, there will not be any impact on such buildings in terms of demolishing or restricting access. The possibility of chance finds is very small since excavation activities are taking place along the routes of existing pipelines in urbanised areas. The applicable mitigation measure is development of a Chance Find Procedure.

5.3.5 Living Conditions of Local Communities

There will be some temporary inconvenience to local communities during the construction phase. This includes increased noise due to machinery operation, increased dust, waste disposal, potential disruptions to water and electricity supply, etc., as described above in more detail under impacts regarding Air Quality, Noise Levels and Vibration, and Inadequate Organization of Construction Site. Applicable mitigation measures during the construction phase are:

- Implementation of a CESMP covering measures on traffic management, dust/noise management and community health and safety measures
- Providing timely information to citizens on any expected disruptions and inconveniences in accordance with a stakeholder engagement plan.

5.3.6 Workers' Health and Safety

During construction activities, workers may be exposed to higher occupational health and safety risks, due to increased dust, noise and vibration, as well as possible accidents which may occur e.g. during excavation of trenches, pipe laying and filling of trenches and handling hazardous materials (e.g. asbestos pipes). The occurrence of unexploded ordnances (since the Project envisages only reconstruction activities in urbanized and constructed areas. Also, part of the planned activities will be implemented in enclosed facilities) or asbestos risks are unlikely.

Applicable mitigation measures during the construction phase are:

- Implementation of OHS Management Plan and its requirements regarding workers' health and safety (please refer to Section 5.2.1)
- Implementation of Fire and Explosion Management Plan (please refer to Section 5.2.1).

During the operation and maintenance phase, handling chlorine gas and chlorine solutions in the disinfection process might be potentially hazardous to Company workers. Manholes and well pits may

pose an extreme hazard risk as they frequently contain a build-up of toxic gases or simply lack sufficient oxygen. Applicable mitigation measures during the operation and maintenance phase are:

- Provide training program for operators who work with chlorine regarding safe handling practices and emergency response procedures
- Provide appropriate personnel protective equipment and training on its proper use and maintenance
- Prepare escape plans from areas where there might be a chlorine emission
- Install safety showers and eye wash stations near the chlorine equipment and other areas where hazardous chemicals are stored or used
- Ventilate enclosed processing areas and ventilate equipment, such as pump stations, prior to maintenance
- Continuously monitor air quality in work areas for hazardous conditions (e.g. explosive atmosphere, oxygen deficiency)
- Periodically sample air quality in work areas for hazardous chemicals
- Prohibit eating, smoking, and drinking except in designated areas
- Rotate personnel among the various treatment plant operations to reduce inhalation of potentially hazardous materials
- Provide access to safe drinking water and sanitation (including hand washing) facilities
- Provide worker health monitoring, including regular physical examinations.

5.3.7 Community Health and Safety

During construction activities, the water supply pipelines replacement activities will involve open trenches, excavations works, material and equipment staging areas, etc. along the current road corridors, and may thus endanger public safety if not properly fenced and marked with warning signs. Accidental contamination of drinking water may possibly occur during connecting and diverting of water pipes. Applicable mitigation measures during construction phase are:

- Implementation of a CESMP with community health and safety measures, to include at least public announcements on deteriorated water quality in case of any disturbances of such quality.
- In case of any accidental contamination of drinking water, promptly implement the Company's existing Procedure for Managing and Information Disclosure in Case of Accidents (Procedure no. OP-05-05, related to accidental contamination of the water supply system and water protection zones, and occurrence of hazardous toxic and flammable materials in the sewerage system)

Accidental contamination of drinking water may possibly occur during the operation phase. Applicable mitigation measures during operation phase are:

- Implementation of an OESMP which includes community health and safety measure to include at least:
 - exclusion of the sources and springs of the water supply system in case of poor water quality at the source / spring
 - perimeter fencing and video surveillance at all water sources
 - public announcements on deteriorated water quality in case of any disturbances in such quality
- In case of any accidental contamination of drinking water, promptly implement the Company's existing *Procedure for Managing and Information Disclosure in Case of Accidents* (Procedure no. OP-05-05, related to accidental contamination of the water supply system and water protection zones, and occurrence of hazardous toxic and flammable materials in the sewerage system)

6 MONITORING

Environmental and social monitoring will be implemented both during construction and operation of the Project.

The Company will require its construction contractors to monitor relevant environmental issues of their operation (e.g. implementation of suggested mitigation measures required to mitigate dust emission, control noise levels, preservation of terrain stability, prevention of spills and leakages, proper traffic management etc.). During operation, the Company will regularly monitor the implementation of suggested mitigation measures (for example chlorine handling) and during maintenance (measures required to mitigate air emission, control noise levels, preservation of terrain stability, prevention of spills and leakages, proper traffic management etc.)

The Environmental and Social Action Plan prepared for this Project sets out additional monitoring requirements, particularly in relation to the engagement with stakeholders and management of issues raised by local community. Key monitoring results of the project will be made publicly available.

7 COMMUNICATIONS

The Company intends to provide all relevant Project information to the public in Bosnian/Croatian/Serbian language and English (where appropriate).

The following documents will be published on the Vodovod i kanalizacija Sarajevo website (<http://www.viksa.ba>) and the EBRD website (www.ebrd.com):

- Non-Technical Summary,
- Stakeholder Engagement Plan (SEP), including the grievance mechanism.

The Company will make available hard copies of these documents at the location of Company's Headquarters:

- Cantonal Public Utility Company "Vodovod i kanalizacija", Jaroslava Černija Street 8, 71 000 Sarajevo.

8 CONCLUSIONS

There are significant positive impacts of the proposed Project. The Company's current customers (households, organisations and commercial entities) will benefit from improved water supply services and the Company will be in a better position to establish water supply connections for new households, businesses and organisations in the six municipalities served by the Company.

Currently, the quality of water supplied by the Company is in line with the *Regulation on Drinking Water Health Safety*¹⁹. This Regulation is in line with Directive 98/83/EC on the Quality of Water Intended for Human Consumption²⁰.

During the implementation of this Project, the Company should meet the requirements set down by relevant national and EU environmental, social, health and safety legislation and standards. The

¹⁹ Official Gazette of BiH, No. 40/10 and 30/12

²⁰ As amended by Directive (EU) 2015/1787 amending Annexes II and III to Council Directive 98/83/EC on the quality of water intended for human consumption

Company should also require from contractors, through the public procurement procedure, that these requirements and emissions limit values are met during the implementation of the Project.

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