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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT PAPER

ON A

PROPOSED ADDITIONAL LOAN AND RESTRUCTURING

IN THE AMOUNT OF US\$ 233.6 MILLION

TO THE

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE GUAYAQUIL, EMAPAG EP

FOR A

GUAYAQUIL WASTEWATER MANAGEMENT PROJECT

May 21, 2018

WATER GLOBAL PRACTICE
LATIN AMERICA AND THE CARIBBEAN REGION

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CURRENCY EQUIVALENTS

Currency Unit = US Dollar (\$)

FISCAL YEAR

January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
ARAP	Abbreviated Resettlement Action Plan
BEDE	<i>Banco de Desarrollo del Ecuador</i> , Ecuadorian Development Bank
BFO	Best and Final Offer
CAF	<i>Confederación Andina de Fomento</i> , Latin America Development Bank
CEN	Country Engagement Note
CEPT	Chemically Enhanced Primary Treatment
CGE	<i>Contraloría General del Estado</i> , National Comptroller Office
CY	Calendar Year
DAF	Dissolved air flotation
DALY	Disability Adjusted Life Years
DFIL	Disbursement and Financial Information Letter
ECV	<i>Encuesta de Condiciones de Vida</i> , Livelihood Conditions Survey
EIB	European Investment Bank
EMAPAG EP	<i>Empresa Municipal de Agua Potable y Alcantarillado de Guayaquil Empresa Pública</i> , Guayaquil Municipal Drinking Water and Sanitation Company
ENAS	<i>Estrategia Nacional de Agua y Saneamiento</i> , National Water and Sanitation Strategy
ENEMDU	<i>Encuesta Nacional de Empleo, Desempleo y Subempleo</i> , National Employment, Unemployment and Subemployment Survey
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FAD	EMAPAG's Financial and Administrative Management Directorate
FIDIC	<i>Fédération Internationale des Ingénieurs Conseils</i> , International Federation of Consulting Engineers
FM	Financial Management
FMIS	Financial Management Information System
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
IBRD	International Bank of Reconstruction and Development
IFR	Interim Financial Report
INEC	<i>Instituto Nacional de Estadísticas y Censos</i> , National Bureau of Statistics
IP	Implementation Progress
ISR	Implementation Status and Results Report
IUWM	Integrated Urban Water Management
LORHUA	<i>Ley Orgánica de Recursos Hídricos, Usos y Aprovechamientos del Agua</i> , Ecuadorian Water Law
MDP	Municipal Development Plan
MEF	<i>Ministerio de Economía y Finanzas</i> , Ministry of Economy and Finance

MS	Moderately Satisfactory
MTR	Mid Term Review
NDP	National Development Plan
NPV	Net Present Value
O&M	Operation and Maintenance
OP	Operational Policy
PDO	Project Development Objective
PIU	Project Implementation Unit
PPP	Public-Private Partnership
PPSD	Project Procurement Strategy for Development
RFB	Request for Bids
RFP	Request for Proposals
SCD	Systematic Country Diagnostics
SENPLADES	<i>Secretaría Nacional de Planificación del Desarrollo</i> , National Secretary for Planning and Development
SORT	Systematic Operations Risk-rating Tool
UFW	Unaccounted for Water
WB	World Bank
WBG	World Bank Group
WHO	World Health Organization
WSS	Water Supply and Sanitation
WWTP	Wastewater Treatment Plant



BASIC INFORMATION – PARENT (EC Guayaquil Wastewater Management Project - P151439)

Country Ecuador	Product Line IBRD/IDA	Team Leader(s) Zael Sanz Uriarte		
Project ID P151439	Financing Instrument Investment Project Financing	Resp CC GWA04 (9394)	Req CC LCC6C (7052)	Practice Area (Lead) Water

Implementing Agency: EMAPAG-EP

Is this a regionally tagged project?

No

Bank/IFC Collaboration

No

Approval Date 22-Apr-2015	Closing Date 31-Dec-2019	Original Environmental Assessment Category Full Assessment (A)	Current EA Category Full Assessment (A)
<input type="checkbox"/> Situations of Urgent Need or Capacity Constraints		<input type="checkbox"/> Financial Intermediaries (FI)	
<input type="checkbox"/> Series of Projects (SOP)		<input type="checkbox"/> Project-Based Guarantees	

Development Objective(s)

The Project Development Objective (PDO) is to increase access to improved sanitation services and to reduce wastewater pollution in selected areas of the City of Guayaquil.

Ratings (from Parent ISR)

	Implementation	Latest ISR
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	17-Sep-2015	29-Mar-2016	20-Oct-2016	12-May-2017	22-Nov-2017	17-May-2018
Progress towards achievement of PDO	S	S	S	S	S	S
Overall Implementation Progress (IP)	S	S	S	S	S	S
Overall Safeguards Rating	S	S	S	MS	MS	MS
Overall Risk	S	S	S	S	S	S

BASIC INFORMATION – ADDITIONAL FINANCING (Guayaquil Wastewater Management Project AF - P165716)

Project ID P165716	Project Name Guayaquil Wastewater Management Project AF	Additional Financing Type Scale Up	Urgent Need or Capacity Constraints No
Financing instrument Investment Project Financing	Product line IBRD/IDA	Approval Date 20-Jun-2018	
Projected Date of Full Disbursement 31-Mar-2023	Bank/IFC Collaboration No		
Is this a regionally tagged project? No			
<input type="checkbox"/> Situations of Urgent Need or Capacity Constraints		<input type="checkbox"/> Financial Intermediaries (FI)	
<input type="checkbox"/> Series of Projects (SOP)		<input type="checkbox"/> Project-Based Guarantees	
<input type="checkbox"/> Disbursement-linked Indicators (DLIs)		<input type="checkbox"/> Contingent Emergency Response Component (CERC)	
<input type="checkbox"/> Alternative Procurement Arrangements (APA)			



Disbursement Summary (from Parent ISR)

Source of Funds	Net Commitments	Total Disbursed	Remaining Balance	Disbursed	
IBRD	102.50	42.25	60.25		41 %
IDA					%
Grants					%

PROJECT FINANCING DATA – ADDITIONAL FINANCING (Guayaquil Wastewater Management Project AF - P165716)

FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	239.60
Total Financing	239.60
of which IBRD/IDA	233.60
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	233.60
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Non-World Bank Group Financing

Counterpart Funding	6.00
Borrowing Agency	6.00

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?



Yes No

Does the project require any other Policy waiver(s)?

Yes No

INSTITUTIONAL DATA

Practice Area (Lead)

Water

Contributing Practice Areas

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Zael Sanz Uriarte	Team Leader (ADM Responsible)	Water & Sanitation Specialist	GWA04
Iris Marmanillo	Team Leader	Water & Sanitation Specialist	GWA04



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Extended Team			
Name	Title	Organization	Location
Konrad Buchauer	Technical Consultant		
Piero GalluccioChiri	Consultant Social Safegards		



ECUADOR

ADDITIONAL FINANCING FOR THE GUAYAQUIL WASTEWATER MANAGEMENT PROJECT

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I. BACKGROUND AND RATIONALE FOR ADDITIONAL FINANCING

A. Introduction

1. This Project Paper seeks the approval of the Executive Directors to provide an additional loan (IBRD 8888-EC) in the amount of US\$233.6 million to the *Empresa Municipal de Agua Potable y Alcantarillado de Guayaquil, Empresa Pública (EMAPAG EP)* for the **Guayaquil Wastewater Management Project (P151439)**. The proposed Additional Financing (AF) will help finance the costs associated with the scaling up of investments, expected results and impact of the Parent Project. Specifically, the AF will: (i) scale up sewerage household connection activities under Component 1; (ii) scale up wastewater treatment facilities' construction activities under Component 3; and (iii) provide additional financial resources under Component 4 required to fund incremental project management costs associated with the scaling up of Component 1 and 3 activities.

2. Through the proposed AF, the Project would be restructured to (i) adjust the Results Framework and monitoring indicators to reflect increased targets associated with the scaled up investments; (ii) reallocate loan proceeds from Category 2 to Category 1 of the original loan (IBRD-8505-EC) (ii) trigger OP/BP 4.09 Pest Management policy; (iii) change the applicable procurement regulations; (iv) extend the Closing Date of the original loan IBRD-8505-EC by one year; and (vi) extend the overall Project closing date from December 29, 2019 to April 30, 2023 to allow sufficient time for the completion of planned activities under the AF and, ultimately, full achievement of the scaled up Project Development Objective (PDO) and Intermediate results indicators.

B. Project Background and Objectives

3. The Guayaquil Wastewater Management Project was approved on April 22, 2015. The Project is co-financed by an IBRD loan of US\$102.5 million (Loan IBRD-8505-EC), a US\$102.5 million loan provided by the European Investment Bank (EIB), and US\$16.4 million in counterpart funding. The Project Development Objective (PDO) is "to increase access to improved sanitation services¹ and to reduce wastewater pollution in selected areas of the city of Guayaquil." The Project was approved on April 22, 2015, became effective on September 15th of the same year and has a closing date of December 30, 2019.

4. Project investments are currently concentrated in the southern districts of the City of Guayaquil. These investments will serve to achieve universal access to piped sanitation services in the southern wastewater catch basin of the city - where approximately 1.0 million people live - and ensure that 100 percent of the wastewaters generated in this basin are treated to meet applicable environmental standards. This entails: (i) connecting 24,200 households to the sewerage network (Component 1); (ii) rehabilitating roughly 40 km of sewer mains (Component 2); and (iii) construction of the *Las Esclusas* Wastewater Treatment Plant (WWTP) and ancillary facilities to treat an average wastewater flow of 2.7 l/s and 3.5 l/s during the dry and wet seasons, respectively (Component 3).

C. Project Implementation Status

5. The Project is on track towards meeting its development objective. Progress towards achievement of the PDO and Implementation Progress (IP) ratings have been systematically rated

¹ For the purposes of the Project, improved sanitation refers to household connection to the sewerage network whereby wastewater receives proper treatment in compliance with environmental regulation before discharge.



Satisfactory since effectiveness of the original loan. As of April 30, 2018: (i) a total of 4,900 household sewer connections were completed, representing approximately 18.14 percent of the end target; and (ii) 10 km of pipes were rehabilitated, equivalent to 28 percent of the end target. To date, Project disbursements stand at US\$41.9 million, representing 41 percent of the loan, while 84 percent of loan proceeds have already been committed. After overcoming slight delays in the startup of construction of the *Las Esclusas* WWTP, which resulted from difficulties faced by the main contractor in obtaining the required bank guarantees, disbursements are now picking up and are expected to total over 50 percent the original Loan amount by end June 2018. (A detailed discussion of progress by component is included in Annex 2).

6. **IBRD-funded activities are advancing satisfactorily and are expected to be finalized within the current project implementation timeframe.** Minor delays registered to date in the implementation of IBRD-funded contracts have been addressed and works are expected to be completed by the current closing date. However, delays in the contracting of certain EIB financed works could delay the commissioning of *Las Esclusas* WWTP, which construction contract is co-financed by IBRD and EIB. It bears mentioning that this delay will not have a significant impact on IBRD disbursement projections since, as per the agreement reached by EMAPAG EP with these two financial institutions, the first payments to be made to the contractor will be financed by IBRD, until funds allocated under the original loan for this activity are depleted. Nonetheless, a one-year extension of the original Loan Closing Date (from December 30, 2019 to December 30, 2020), is being processed as part of the Restructuring in order to give the Borrower greater flexibility in the financial management of *Las Esclusas* WWTP construction contract. The proposed AF is fully compliant with Operational Policy (OP) 10.00, which requires satisfactory implementation of the Parent Project over the most recent 12 months to move forward with an AF.

7. **The findings of the Mid-Term Review (MTR) that was undertaken in end November 2017 confirmed that there are no outstanding fiduciary nor procurement issues.** Although no environmental, social nor health and safety related issues have arisen, safeguards compliance was rated as Moderately Satisfactory since, per the findings of the MTR, there was room for improvement in the actual application of the preventive measures contemplated in the Environmental and Social Management Plan (ESMP). All corrective measures identified during the MTR, particularly in the field of labor health and safety practices at *Las Esclusas* WWTP construction site (i.e., risk prevention measures for visitors, signaling of danger zones, compliance with the solid waste management program, improvement of sanitary measures, and installation of hydration areas), are being satisfactorily applied by the contractor.

D. Rationale for the Additional Financing

8. **The proposed AF will scale up the scope and expected results of the Project by expanding the area of intervention to the northeastern catch-basin of the City.** The AF will connect 11,206 additional households to the sewer network and ensure adequate treatment of wastewaters generated by 900,000 people living in the northeastern districts of the city, where the four existing treatment facilities are operating above their design capacity and a significant share of discharged effluents do not comply with applicable environmental standards². The AF would thereby: (i) increase the number of direct Project beneficiaries by 90 percent (from 1 to 1.9 million people); (ii) further reduce pollutant discharges (measured in tons of Biological Oxygen Demand – BOD) by 75 percent³; and (iii) increase the number of

² 65 percent as per EMAPAG estimates

³ With the AF, BOD discharges removed per year would increase from the original 8,000 target to 14,000 tons



household sewerage connections by 46 percent, bringing it up to 34,206. It should be noted, that this corresponds to approximately 169,800 people, which represents 5.5 percent of the national urban population that in 2014 was not yet connected to the sewerage system.

9. **The AF will particularly improve livelihood conditions of poor households in the northeastern districts of the City.** Despite recent comparative improvements, Guayaquil continues to post the highest poverty headcount among all municipalities, with roughly 277,000 people living below the poverty line⁴. The AF would expand EMAPAG's sewerage network to reach unserved areas of *Pascuales* - the urban district of Guayaquil with the highest multidimensional poverty incidence rate (28.5 percent)⁵. The AF would also connect households located in some of the poorest areas of the Tarqui district to the sewerage network, i.e., *Juan Pablo II*, *Vergeles*, *Bastion Popular* and *Cooperativas Varias*.

10. **Increasing access to affordable and safely managed sanitation is essential to continue reducing poverty incidence in Guayaquil moving forward.** Per the National Planning Secretariat (*Secretaría Nacional de Planificación del Desarrollo- SENPLADES*), the achievement of access targets set in the *2014-2017 Poverty Eradication Strategy*⁶ for water supply and sanitation (WSS) services alone, would have generated reductions in poverty and extreme poverty of 3.8 and 1.6 percent, respectively. The *2017-2021 National Development Plan (NDP) "Toda Una Vida"*⁷ – also places access to WSS services at the core of the Government's development agenda, while Guayaquil's Municipal Development Plan includes as part of its development objectives: (i) the reduction of inequalities in access to affordable and quality basic services; and (ii) the reduction of contamination and regeneration of degraded environmental assets as a driver of economic growth, social inclusion, and improved competitiveness.

II. DESCRIPTION OF ADDITIONAL FINANCING

11. **Scale up of Component 1: Installation of household connections (Additional US\$19.5 million, of which US\$14.1 million IBRD).** The objective of the scaled-up activities under this component is to carry out sewerage connectivity programs to connect all households located in poor neighborhoods of the northeastern wastewater basin of the city that are not yet connected to the system despite having a sewer main running in front of their houses (4,620 households in total). This component will also finance the extension of the sewerage network and the installation of 6,455 sewer household connections in *Pascuales*, a district also located in the northeastern basin of the city, part of which is currently outside the wastewater collection service area. The 131 households located in *Juan Pablo II* Stage 1 -- an informal settlement neighboring *Los Merinos WWTP* -- will likewise be connected to the sewer system.

12. **Reallocation of proceeds of the original Loan from Component 2 to Component 1.** As part of the

⁴ According to the Poverty and inequality report issued by the National Institute of Statistics (INEC) in 2017, on that year poverty incidence in Guayaquil stood at 10.5 percent, ranking second after Machala (14.4 percent) among the five Ecuadorian cities where poverty incidence is tracked yearly by INEC. In absolute numbers, however, poverty levels in Guayaquil are significantly higher than in any other municipality of the country, since, with a population of 2.64 million inhabitants, Guayaquil is the most populous city of Ecuador.

⁵ *Diagnóstico y proyección de vulnerabilidades frente a la variabilidad y cambio climático en la ciudad de Guayaquil*, CAF, 2017. (www.guayaquil.gob.ec).

⁶ *Estrategia Nacional para la Igualdad y la Erradicación de la Pobreza*, SENPLADES, 2014 (www.planificacion.gob.ec). Targets set by this strategy for the water and sanitation sector called for having 83 percent of the households connected to public water distribution system and 75 percent to a sewer network by 2017.

⁷ *Plan Nacional de Desarrollo 2017-2021. Toda Una Vida*, Quito, SENPLADES 2017 (www.planificacion.gob.ec).



restructuring that is being processed along with the AF, US\$ 3.5 million will be reallocated from Component 2 to Component 1 of the original Loan Agreement to finance the extension of the network and the installation of household connections to get the 1,200 poor households of the *Cisne 2* neighborhood connected to the sewerage system. This neighborhood is located in the southern catch-basin of the city, where all ongoing Project activities are concentrated. This change will not have any impact on the expected results of sewer network rehabilitation activities financed under Component 2.

13. **Scale up of Component 3: Wastewater treatment and disposal facilities (additional US\$217.3, 100 percent IBRD).** Scaled-up activities under this component will provide EMAPAG EP with the infrastructure required to treat 100 percent of domestic wastewaters collected in the northeastern wastewater basin of the city of Guayaquil, as to meet environmental standards for discharges into the *Daule* River. Specific activities to be financed with AF resources under this component will include: (i) the transformation of the *Progreso* preliminary treatment plant into a pumping station collecting all wastewaters generated in northeastern-center districts of the city (1,920 l/s) and pumping them to the new *Los Merinos* WWTP; (ii) the construction, using trenchless technologies, of the *Progreso – Los Merinos* wastewater transmission pipeline (1,100 mm of diameter, 5 Km. long); (iii) the decommissioning of the *Sauces-Alborada* and *Guayacanes-Samanes* stabilization ponds, which are currently overloaded; (iv) the construction of *Los Merinos* WWTP, a chemically enhanced primary treatment (CEPT) facility, which will be designed to manage an average flow in dry and wet seasons of 4.0 m³/s and 4.9 m³/s, respectively; (v) the construction of a sludge digester equipped with a co-generation facility to produce electrical energy; and (vi) the procurement of specialized independent supervision services for the construction works described above.

14. **Activities to be dropped under Component 4.** This component was originally envisaged to finance the development of a master plan for the management of the bio-solids generated in all WWTPs of the city; and of an integrated urban water management (IUWM) study for the planning and development of flood control infrastructure in “*Sistema Tres*”, a growing area of the city of Guayaquil. However, the findings of the MTR mission obviate the need to proceed with these activities since: (i) plans and agreements in place with authorities running the municipal landfill ensure an adequate mechanism for the disposal of treated bio-solids; and (ii) EMAPAG EP managed to liberate funds from their own resources to finance the development of the “*Sistema Tres*” IUWM study, which is already finalized. Consequently, the legal covenant included in the original loan agreement related to the development of the biosolids management plan has been marked for deletion as part of the restructuring.

15. **Activities to be scaled up under Component 4.** This component initially considered the financing of goods and services required to set up a system for the control of the water quality of the Guayas River and the Estero Salado estuary. Per Borrower’s request, this water quality monitoring system, which is already designed, will be extended upstream all along the Daule River, which is the main source of drinking water for the city of Guayaquil. The scale up of this activity, which will have a regional impact and will serve all municipalities and authorities involved in the management of the Daule Basin, will be financed with the funds originally allocated to Component 4 activities that are now being dropped. Part of funds liberated by dropped activities will also be allocated to finance the technical designs and environmental and social management plans required for the construction of infrastructures prioritized by the “*Sistema Tres*” IUWM study.

16. **Resources allocated under the AF to Component 4: Project management and institutional strengthening (additional US\$2.8 million, US\$2.2 million IBRD).** AF resources will serve to finance



incremental project management costs associated with the broader scale of Project activities and extended timeframe allotted for their completion. These include project supervision, M&E, safeguards management, procurement and financial management costs.

17. **Total project costs, including all sources of financing, will reach US\$461.0 million**, including US\$102.5 million of original IBRD financing (IBRD-8505-EC), US\$102.5 million from the EIB and US\$16.4 million of counterpart funding; together with the proposed US\$233.6 million in additional IBRD financing (IBRD 8888-EC) and US\$6.0 million in additional counterpart funding under the AF. The table below summarized sources of financing for each of the project components.

Table 1. Proposed Project funding per Source of Financing and Component (in US\$ million)

Component	Current Project			Additional Financing		Total Project Cost
	EMAPAG	EIB	IBRD	EMAPAG	IBRD	
Component 1: Installation of household connections	15.2		6.3	5.4	14.1	41
Component 2: Rehabilitation of primary sewerage network			33.5			33.5
Component 3: Wastewater treatment and disposal facilities		102.5	58.5		217.3	378.3
Component 4: Project management and institutional strengthening	1.2		4.2	0.6	2.2	8.2
TOTAL	16.4	102.5	102.5	6	233.6	461

18. **While implementation arrangements will remain unchanged, the safeguards management team within the Project Implementation Unit (PIU) will be reinforced to ensure that the required capacity is in place to manage scaled-up investments.** The PIU established under EMAPAG EP's General Manager will remain responsible for day-to-day Project implementation and overall coordination, procurement, financial management, as well as for the management and supervision of the results framework including Project monitoring and evaluation (M&E). The PIU functions with its own general coordinator and is staffed with technical and fiduciary specialists as well as dedicated environmental and social safeguards staff, with support from other units and directorates of EMAPAG EP (particularly from the Finance, Legal, and Social Directorates). On the safeguards management front, the PIU will be strengthened to create a safeguard management structure comprised of (i) a Senior Environmental Specialist with experience managing health and safety issues of major infrastructure construction projects, who will coordinate all aspects related to compliance with safeguards policies; (ii) an Environmental Specialist, who will assist the Safeguards Coordinator in the preparation of performance reports and ensuring compliance with applicable environmental regulations; (iii) a Senior Health and Safety Management Specialist with experience in the supervision of major civil works; and (iv) a Social Management Specialist, who will coordinate compliance with social safeguard regulations.

19. **OP 4.09 on Pest Management will be triggered.** This is due to the presence of vectors (rats), and the need to use pesticides to control them, in the area of the wastewater stabilization ponds that will be decommissioned for the construction of *Los Merinos* WWTP. Following the requirements of OP 4.09, a Pest Management Plan has been developed as part of the ESMP (see section IV.F of the Project Paper for further details).



20. **The results framework for the overall financing will be modified.** The purpose of this revision is to: (i) adjust target values to capture incremental impacts resulting from the scale up of activities under components 1 and 3; (ii) include additional indicators to track progress under new activities financed under components 1 and 3 of the AF; (iii) drop indicators that were duplicated, since despite having different formulations were measuring the same results; and (iv), drop indicators related to activities that either will not be undertaken or cannot be measured accurately. Changes introduced to the results framework and their rationale are explained in detail in Annex 1.

21. **A 3 year and 4 month extension of the Project closing date, from December 29, 2019 to April 30, 2023, is likewise being sought.** Such an extension of the implementation timeframe will allow sufficient time for the completion of activities included under the AF and, ultimately, full achievement of the scaled-up targets set for the PDO and Intermediate results indicators. Likewise, and as explained in paragraph 6 above, as part of the restructuring the Closing Date of the original loan will be extended by one year (from December 30, 2019 to December 30, 2020) to give the Borrower greater flexibility in the financial management of *Las Esclusas* WWTP construction contract.

22. **Two of the original legal covenants will be eliminated as part of the Restructuring, since they are no longer relevant.** These covenants are related to the Borrower's obligation to:

- (i) *Develop a master plan for the management of biosolids generated in all WWTPs of the city (Schedule 2, Section I.C.4).* As explained in paragraph 14 above, plans and agreements in place with authorities running the municipal landfill ensure adequate disposal of treated bio-solids.
- (ii) *Enter into a Transfer Agreement with Interagua (the concessionaire operating the WSS system of Guayaquil), for the operation and maintenance of infrastructure developed under the Project (Schedule 2, Section I.A.4).* Such an agreement is no longer required since the amendment to the Concession Agreement signed between the two parties in July 2016 already establishes the conditions of this transfer.

23. **The AF is fully aligned with the World Bank Group's Twin Goals, the 2016-2017 Country Engagement Note (CEN)⁸.** The 2016-2017 CEN identified maintaining and enhancing access to quality services across regions and population groups as a key instrument to sustain gains in poverty reduction and shared prosperity attained during the early years of the previous administration. The Project is also consistent with the country's NDP, where two out of its twelve key objectives outline access to WSS as key intermediate priorities to ensure quality of life and social cohesion for its citizens.

III. KEY RISKS

24. **The overall risk of the Project is rated Substantial.** This is consistent with the overall Project risk at the time of approval of the original loan. The Systematic Operations Risk-rating Tool (SORT) is presented in section VII of this document, and the main risks based on implementation experience and associated mitigation measures are described below.

25. **Macroeconomic risk remains rated as High.** Representing above 50 percent of their non-financial revenues, Guayaquil municipal finances are highly dependent on central government transfers, which have been negatively affected by the current economic slowdown and worsening fiscal position. Low oil prices, increased debt, and the deteriorating international competitiveness of local producers as a result

⁸ The Ecuador 2016-2017 CEN (report # 100012-EC) was discussed by the Executive Directors on March 15, 2016.



of dollarization have all contributed to a weaker macroeconomic position. In turn, fiscal transfers from the Guayaquil municipal government represent above 77 percent of EMAPAG EP's revenues. The financial analysis performed, included in Annex 6, shows that even under a deteriorating macroeconomic scenario, EMAPAG EP and the Municipality of Guayaquil would be able to face the financial obligations associated with the AF. However, to further mitigate this risk, the covenant included in the Loan Agreement of the original loan (IBRD-8505-EC), establishing limits to EMAPAG EP's debt service coverage ratio, has also been considered for the AF. Likewise, as for the original loan, the Municipality of Guayaquil has issued a document committing itself to ensure the continuity of the fiscal transfers required for EMAPAG EP to be able to honor its financial obligations.

26. **The political and governance risk remains rated as Substantial.** Potential change of administrations after local elections planned for May 2019 may give way to a change in investment priorities, -which may affect the willingness of the municipal government to continue transferring US\$40 million yearly to EMAPAG EP for WSS investments- and a change in the management of the Borrower, EMAPAG EP, which could affect Project performance at a stage that is likely to be still very intense in procurement activities. To mitigate this risk, lines of dialogue will be open with the different candidates early before 2019 elections. The fact that the municipal government has issued a document formally committing itself to ensure the continuity of the fiscal transfers required for EMAPAG EP to be able to honor its financial obligations will also help mitigate this risk.

27. **Sector strategies and policies risk rating has been revised from Substantial to Moderate.** Faced with an adverse fiscal situation, the Government of Ecuador is now showing a greater openness to private sector participation in WSS delivery. The limitations established in the Constitution on the participation of the private sector in WSS service provision have been nuanced by the Government through new laws –particularly the 2014 Water Law (*Ley Orgánica de Recursos Hídricos, Usos y Aprovechamientos del Agua* – LORHUA) and the 2015 PPP Law⁹. This further reduces the uncertainty on the continuity of the concession agreement signed between EMAPAG EP and *Interagua* (per which *Interagua* will be responsible for the operation of the infrastructures developed under the Project), which already passed the audit of the National Comptroller office. To prevent conflicts between Concession contract provisions and tariff regulations to be issued in the future by the recently created Water Regulatory Agency (ARCA), the World Bank will support EMAPAG EP maintaining a fluid policy dialogue on the topic with ARCA and other relevant sector authorities.

28. **Fiduciary risk has been downgraded from High to Moderate.** This is due to the fact that EMAPAG EP is better acquainted with World Bank policies and procedures; the PIU is equipped with qualified and experienced professionals; and Financial management arrangements adopted for the Project are working well. The main Financial Management risk relates to the fact that the PIU will not have financial and administrative autonomy. This may eventually cause delays in the processing and approving of transactions/contractual processes under the Project. To mitigate this risk, clear internal procedures and allocation of responsibilities between the PIU and EMAPAG's Financial and Administration Directorate

⁹ Indeed, building on article 316 of the Constitution, which opens the possibility of delegating the responsibility of providing "strategic public services" to the private sector under exceptional circumstances determined by law, the LORHUA allows for municipalities to delegate sub-processes of the WSS service delivery chain to a private company for a period of up to 10 years, provided that the municipality lacks the financial or technical capacity to deliver the services on its own. The PPP Law further broadens the range of options, by providing not only for the "delegation", but for entry into any kind of partnership.



were defined and are been applied with satisfactory results. On the other hand, the Borrower has demonstrated a satisfactory performance managing all procurement aspects of the Project. The procurement process for all construction and construction supervision contracts to be financed under the original Loan have been satisfactorily finalized. To mitigate the risk associated with the adoption of the new World Bank Procurement Regulations for the procurement of all works and services financed under the AF, the PIU's procurement staff will receive the required training. All the high value and high-risk procurement processes in the AF will be supervised under risk-based approach.

29. **Social and Environmental risk remains rated as Moderate.** Main social and environmental risks relate to potential failure of the WWTP to properly operate (which would result in impacts similar to present conditions), failure to properly dispose of biosolids from the WWTP, and failure to adequately mitigate environmental and social impacts on local population during construction of sewer networks in the *Pascuales* district. These risks are considered moderate since:

- (i) *Interagua's* majority shareholder is Veolia, a French multinational specialized in the provision of environmental services with wide experience managing water supply and wastewater treatment facilities. *Interagua* management system is ISO 14001, ISO 18001, and ISO 9001 certified. *Interagua* has been managing all environmental and social related aspects of water supply and sanitation service provision in a satisfactory manner for the last 17 years.
- (ii) An agreement has already been reached between EMAPAG EP and the consortium running the landfill Las Iguanas, which has all the required environmental permits to receive this type of waste. The landfill has the capacity to receive municipal waste, including the expected volume of sludge during the operation of the WWTPs of the city (*Las Esclusas y Los Merinos*).
- (iii) Appropriate management plans have been developed to handle all environmental and social aspects of construction and operation activities, identifying measures to mitigate potential impacts.

IV. APPRAISAL SUMMARY

A. Economic and Financial Analysis

30. **A cost-efficiency analysis has been conducted as part of the economic analysis of the AF.** There are requirements at municipal level for on-site sewage disposal solutions, as well as for standards at the national level, that the effluents must meet. The environmental and municipal authorities have established that only sewerage connections are allowed in the Project area, as other on-site solutions are increasing pollution due to poor maintenance and high ground water in the area. For the effluent quality, the law¹⁰ has established limits for BOD₅ and TSS concentrations at effluent discharges. The cost-effectiveness analysis took into consideration the regulations and selected among different alternative the most cost-effective. Three alternative treatment technologies complying with the regulation on effluent discharges were studied: (a) Option 1: CEPT followed by aerated stabilization ponds; (b) Option 2: Dissolved Air Flotation (DAF) followed by aerated stabilization ponds; and (c) Option 3: Up Flow Anaerobic Sludge Blanket Digestion (UASB). Associated investment and operating costs were estimated through a life-cycle analysis for the alternatives for a 30-year period. Unsurprisingly, results show that the CEPT solution is also the most cost-effective alternative for *Los Merinos* WWTP, as it was for *Las Esclusas* WWTP financed under the Project (they are both plants of a similar size, working under the same weather

¹⁰ Unified Secondary Environmental Legislation (*Texto Unificado de Legislación Secundaria de Medio Ambiente*), Executive Decree # 3516, modified on Mar 29, 2017.



conditions, receiving raw wastewaters of similar characteristics and located in urban areas, which limit land availability).

31. **A cost benefit analysis was also conducted for the investments financed with the AF, assuming scenarios with and without interventions.** This analysis has been performed as to estimate the positive externalities generated by the Project related to improved environmental conditions and reduced incidence of water-borne diseases in the city of Guayaquil. The Economic Rate of Return (ERR) was estimated with accrual of direct and indirect (shadow prices) costs and benefits that resulted from the intervention, without considering investments in capacity building or project management activities. These “soft” components also lead to intangible benefits that are not estimated through this methodology. The results show that the AF, has an ERR of 17.5 percent, with total costs at net present value (NPV) of US\$440.7 million and total benefits at net present value US\$457.3 million, with a benefit-cost ratio of 1.10 using a discount rate of 10 percent. When indirect benefits are added to the analysis, including net reductions in greenhouse gas emissions, the ERR increases to 23 percent.

32. **The financial evaluation examines whether sufficient funds will be generated for the municipality, EMAPAG EP, and Interagua to meet all their financial obligations.** It also examines, the source of these funds: either coming from user charges or from public budget. Funds and financial obligations were included in the financial analysis of the municipality, EMAPAG EP and *Interagua*, taking into account the institutional arrangements for Project implementation, in which *Interagua* will be in charge of operating the works with its own revenues, and the municipality of Guayaquil, through EMAPAG EP, will execute the investments and pay for them.

33. **The financial analysis of EMAPAG EP and the municipality show strong results.** As per the financial model developed, EMAPAG EP’s projected revenue is above debt service and investment obligations for all years considered. The revenue/debt service ratio is lowest in 2020, when counterpart funding obligations are high and revenues from betterment levies have a temporary decline. Thereafter the ratio improves to a peak of almost 2 but declines temporary in 2031 when full capital payments for the original loan kicks in. As for the municipal government fiscal situation, the analysis also concludes that Guayaquil is able to cover all financial obligations including the ones to be repaid by EMAPAG EP, and in addition to the proposed AF of US\$233.6 million. When consolidating the balance sheets of the Municipal Government and EMAPAG EP, both the debt service and the debt stock indicators are below the official ceilings established under the law: (i) maintaining the debt stock to total non-financial revenue ratio below 200 percent; and (ii) the debt service to total non-financial revenues ratio below 25 percent. The maximum point reached for these indicators in the period shown is obviously when EMAPAG EP is included and reaches 84 percent in 2020 for the Debt Stock ratio and 9 percent expected for this year 2021 for the Debt service indicator.

34. ***Interagua’s* tariff revenues will have to increase 11.2 percent to cover *Las Esclusas* and *Los Merinos* WWTP operating costs and to ensure the financial equilibrium of the concession agreement¹¹.** To allow for this, EMAPAG EP plans to maintain the sewerage tariff at 80 percent of the water tariff and increase the average variable water tariff from US\$0.80 per m³ to US\$0.95 per m³ when both *Las Esclusas* and *Los Merinos* are operating¹². The impact on the bills paid by lowest level consumers will be limited,

¹¹ Capital investments made by EMAPAG EP under the Project constitute a subsidy and will not be recuperated through the WSS tariff.

¹² These average variable water tariff has been calculated by the World Bank as part of the financial analysis of the project dividing the estimated share of *Interagua’s* 2017 annual revenues corresponding to variable water charges



since *Interagua* applies a block tariff structure through which the tariff applied for lower consumption levels is partially cross subsidized by high level consumers. In this sense, the 284,158 users consuming less than 15 m³ per month, which represent 51 percent of *Interagua's* client base, pay US\$0.31 per m³, i.e. 38 percent of the average variable tariff. If the relationship between the tariffs applied for the different consumption levels is maintained, the average monthly bill paid by users within this consumption level receiving both water supply and sewerage services, will only increase from US\$5.27 to US\$5.96 per month. This value represents just 2.6 percent of the average household income of the poorest urban quintile at the national level (US\$223.32)¹³ and 0.6 percent of the average household income in the area of influence of activities considered under the additional financing (US\$956.45¹⁴). The required tariff increase will be implemented in two steps: 9 percent increase when *Las Esclusas* WWTP is commissioned and an additional 9 percent when Los Merinos enters in operation.

35. **The amendment to the concession contract signed in July 2016¹⁵ establishes the formula for the extraordinary tariff revision to be undertaken once *Las Esclusas* and *Los Merinos* WWTP are transferred to the concessionaire for operation.** According to this formula, tariffs should be increased to ensure that incremental annual costs associated to the operation and maintenance of these facilities is compensated by a similar increase of revenue derived from the application of the revised tariff structure. This amendment foresees the obligation of the Concessionaire to hire a consulting firm to define the revised tariff structure required to ensure the financial sustainability of the concessionaire after the transfer of this infrastructure. As part of this exercise, the concessionaire will develop a willingness and ability to pay analysis to ensure the social viability of the proposed tariff structure.

B. Technical

36. **As in the case of *Las Esclusas* WWTP, detailed feasibility studies have been prepared for the *Los Merinos* WWTP and ancillary facilities** by a multidisciplinary team of engineers, wastewater treatment process specialists, and economists within a specialist international firm with quality control from EMAPAG EP and *Interagua*. The feasibility studies were prepared to ensure that the investments are sound from an engineering and design standpoint and that a least cost solution has been adopted among the different alternatives to achieve the Project objectives. During Project preparation, the Bank has reviewed the feasibility studies to confirm the technical viability and appropriateness of the CEPT as the adopted technical option for wastewater treatment (Annex 3 includes further discussion on the selection of technical options). Recommendations were used to refine the overall Project objectives, scope, and approach, as well as specific criteria to be used in the detailed design. The detailed feasibility study reports are available in the Project files. Based on the Bank's global experience in other similar projects in measuring BOD removal and/or reduction of fecal coliform, the proposed Project includes indicators whose monitoring is under the full control of EMAPAG EP (that is, measured at the WWTP outlet and not in estuary) to avoid difficulties in the attribution of benefits to the Project.

by the accumulated volume of water distributed in 2017. Therefore, this average variable water tariff value does not correspond to the contractual reference water tariff, which in 2017 was set at US\$ 0.62.

¹³ 2017 data from the Ecuadorian Central Bank

¹⁴ Data from the socio-economic survey conducted in the area of influence of the AF as part of the Environmental and Social Impact Assessment.

¹⁵ *Convenio Modificatorio al Contrato de Concesión (Revisión Ordinaria de Estructura Tarifaria)*, INTERAGUA-EMAPAG EP (EOM-GG-06953-2016)



C. Financial Management

37. **The AF will adopt the same financial management implementation arrangements used for the original loan.** EMPAG-EP will also be the Borrower under the AF, with a sovereign guarantee from the Government of Ecuador to be granted by the Ministry of Economy. The municipal government of Guayaquil has issued a document committing itself to ensure the continuity of ongoing fiscal transfers that are currently made to EMAPAG EP (US\$40 million per year). The AF will be financed exclusively with funds from the IBRD and local counterpart funding, and there will be no additional financing from the EIB. This will simplify to some extent financial management aspects of the AF. EMAPAG EP will continue as the implementing entity. The AF will maintain the same financial management implementation arrangements used so far under the Project: payments are approved by PIU's director, PIU financial management staff are responsible for budgeting and accounting activities, and EMAPAG's Administrative and Financial Management Directorate is responsible for processing payments. More details on financial management arrangements can be found on Annex 4. Although these arrangements have been working well during the implementation of the Project to date, the PIU should strengthen the coordination between planning and budgeting activities. To address this issue, the Borrower agreed to carry out recurrent monitoring of Project plans against actual and analyze those relevant variances, which may need ongoing adjustments to estimated costs.

D. Procurement

38. **Procurement for the AF will be carried out in accordance with the “World Bank’s Procurement Regulations for IPF Borrowers”, dated July 2016 and revised November 2017** and the provisions stipulated in the Loan Agreement. Works and services to be procured under the original Loan Agreement (IBRD-8505-EC), after the processing of the proposed second order restructuring shall also follow the new regulations. The Borrower has demonstrated satisfactory performance managing all procurement aspects of the Project to date. Moreover, all construction and construction supervision contracts to be financed through the original loan have already been procured. Therefore, in principle the PIU Procurement team will not need to be reinforced with additional staff members to handle the procurement of works, goods and services that will be financed through the AF and that are of a similar size and nature to the ones financed through the original loan. Nonetheless, procurement dedicated staff of the PIU, who have demonstrated the required knowledge and gained specific experience with 2011 World Bank procurement guidelines, will be trained on the application of the “World Bank’s Procurement Regulations for IPF Borrowers”, dated July 2016 and revised November 2017. The procurement specialists and contract administrators of the PIU will also be trained in the management of the standard contracts for construction and consulting services developed by the International Federation of Consulting Engineers (FIDIC in its French Acronym).

39. **The Borrower has developed a full Project Procurement Strategy for Development (PPSD) with World Bank support.** A Procurement Plan for the entire scope of the Project has been defined based on the results of the PSD. An executive summary of the PSD and the procurement plan are included in Annex 4. As per these two documents, the Project is expected to use an open, international, pre-qualification, single stage, single envelope Request for Bids (RFB) process for the procurement of *Los Merinos* WWTP. A similar RFB but with post-qualification in lieu of pre-qualification will be adopted for the procurement of the *Progreso* Pumping Station construction works contract and the *Progreso – Los Merinos* wastewater transmission pipeline detailed design and construction works contract. Household sewer connection contracts works to be procured under component 1 will be procured using an open,



national, post-qualification, single-stage, single envelope RFB, while the *Pascuales* and *Juan Pablo II* sewerage network expansion contract will follow an international post-qualification, single-stage, single envelope RFB procurement process. A contract manager will be hired to manage each of the main construction contracts that will be implemented under the AF. The probity advisor that was hired by the Borrower to oversee and provide advise related to high-risk high-value procurement processes, will continue supporting EMAPAG EP under the AF.

E. Social (including Safeguards)

40. **Grievance Redress Mechanism.** During the MTR mission, the design and use of the tiered grievance redress mechanism (GRM) employed for the Project activities was assessed. This assessment concluded that: (i) the GRM in place should be enhanced as to contemplate contractors' obligation to install citizen attention and information points, at all construction fronts opened in public spaces, ensuring that they are properly identified as such with signals¹⁶; and (ii) that, while complains and requests received seem to be properly registered, actual activities performed to resolve open cases are poorly recorded and documented. To address these issues: (i) the GRM has been modified to incorporate the above-mentioned contractors' obligation; (ii) a standard GRM case registration form has been developed by the Borrower with World Bank assistance; and (iii) the PIU safeguards management team has been reinforced with the hiring of a project-dedicated social management specialist. The revised GRM document has been included in the Environmental and Social Management Plans (ESMPs) and in the Project Operational Manual and is posted in EMAPAG EP's website, alongside with contact information for responsible parties and for addressing concerns.

41. **Citizen engagement.** EMAPAG EP will continue to implement a comprehensive citizen engagement program for Component 1. This will include a series of socialization meetings at the neighborhood level, followed by targeted training and communication campaigns on the benefits of getting connected to the sewer system and on how to properly use the service; and a program of social certification of works completed inside benefiting households.

42. **Gender.** Previous experiences in poor urban settlements of Guayaquil and other Latin American cities, have shown the importance of having women within beneficiary communities leading the intense social management activities required to ensure the success of sewer connectivity programs. Women constitute often the largest share of participants in these citizen engagement activities as mostly they are present at home and/or the neighborhood at the time sewer connectivity works are likely to take place. As such, activities under the AF will actively target the participation of women and account for gender-based priorities with regards to the benefits from the investment as well for communicating about the AF's activities. Moreover, Component 1 social mobilization teams will continue to be mainly comprised of women. Most of the beneficiary households will be located in informal poor urban settlements with high criminality rates. The female majority of the audience targeted by citizen engagement activities is therefore likely to feel more comfortable interacting with the Project if messages are conveyed by other women they know from their own neighborhood. Component 1 results indicators will include one on the

¹⁶ While most of the contractors hired under the Parent Project have installed such information points, this was not formally mandated by the GRM in place.



number of women employed for the social mobilization team and gender disaggregated information on the beneficiaries of Component 1 activities.

43. **Social Safeguards.** The *Los Merinos* WWTP, to be financed under Component 3, will be located on a piece of land owned by a government-owned banking institution over which the Borrower has the right of use under a perpetual commodate agreement¹⁷. However, OP 4.12 on Involuntary Resettlement is triggered because of an affectation of a privately-owned house located within said property where the WWTP access road will have to be constructed. For this reason, an Abbreviated Resettlement Action Plan (ARAP) was developed for the AF.¹⁸ As per the ARAP, the affected household will be compensated at replacement costs. Activities proposed under Component 1 (domestic connections and sewer lines) will not result in any resettlement impacts anticipated under OP 4.12. The extension of the sewer network in the *Pascuales* area has yet to be designed. Its implementation will be guided by an Environmental and Social Management Framework (ESMF)¹⁹. The construction activities include the opening of shallow trenches in sidewalks to install tertiary sewer lines, and deeper trenches in certain main streets. The Project will finance both the designs and construction of these works. To avoid and mitigate limiting access to households and businesses, metal sheets over trenches will be used to ensure full access to business during construction. Furthermore, a *Community Relations Plan for Construction* will be included as a requirement to contractors in the bidding documents. Since there is uncertainty on how the final design could affect this area, the ESMF contemplates possible mitigation measures for potentially affected business, such as: (i) continuous consultation with business; (ii) alternative access roads to the area; (iii) additional signaling like “We are open for business” signs at construction sites; and/or (iv) additional parking areas with security.

F. Environment (including Safeguards)

44. **The Project continues to be classified as Category A per OP 4.01 Environmental Assessment due to the nature and size of the works to be financed under component 3, i.e., the construction of *Los Merinos* WWTP.** AF financed works under component 1, particularly the extension of the sewerage network in the *Pascuales* district, have relatively moderate potential negative environmental impacts and can be readily mitigated with standard measures. The overall Project impact is expected to be positive due to the improved effluent quality that will be discharged into the *Daule* and *Guayas* rivers and the reduction of wastewater that is presently getting infiltrated from poorly constructed septic tanks existing in households of the northeastern wastewater basin of the city that are not yet connected to the sewer network. The effluent quality from the *Los Merinos* WWTP that will be financed under the AF will allow compliance with current environmental regulations in Ecuador. EMAPAG EP has planned for the future expansion of the WWTP if required by Ecuadoran environmental regulations later during the life of the

¹⁷ In civil law a commodate is a gratuitous concession of anything moveable or immovable, for a certain timeframe, on condition of restoring again the same individual after a certain time.

¹⁸ The ARAP was consulted and agreed upon with the affected household and disclosed on Borrower’s and Bank’s websites on April 23, 2018 and April 26, 2018, respectively. The disclosed version of the ARAP can be found in the following webpages: (i) documents.worldbank.org; and (ii) www.emapag-ep.gob.ec.

¹⁹ The first draft *Pascuales* sewer network ESMF was disclosed on February 20, 2018 and consulted with the population of interest on March 9, 2018. The final version of the ESMF was disclosed on Borrower’s and Bank’s websites on April 23, 2018 and April 26, 2018, respectively. The disclosed version of the ESMF can be found in the following webpages: (i) documents.worldbank.org; and (ii) www.emapag-ep.gob.ec



Project. The main environmental risks relate to potential failure of the WWTP to properly operate (which would result in impacts similar to present conditions), failure to properly dispose of biosolids from the WWTP, and failure to adequately mitigate environmental and social impacts on local population during construction of sewer networks in the Pascuales district.

45. **An Environmental and Social Impact Assessment (ESIA) has been developed for *Los Merinos WWTP* and ancillary facilities.** The ESIA includes an assessment of impacts, including mathematical modeling of potential odor and downstream water quality impacts during plant operation, and an ESMP. Alternative analyses in terms of WWTP technological and design options and site locations were conducted as part of the regional water planning work, the WWTP feasibility study and Project design, and the ESIA. The analysis of alternatives and selection of site locations for the treatment plant was conducted in 2004 as part of the Master Plan for Water Supply and Sewerage Services of Guayaquil, which was updated in 2011 (see Annex 3 for more details). The potential risk of flooding at the WWTP has been addressed in the Project design. For works under Components 1 (sewer network extension and household sewerage connection program), as indicated earlier, an ESMP was developed and includes an assessment of potential impacts and proposed mitigation and monitoring measures.

46. **The ESIA foresees the development and implementation of a forest compensation plan.** As per the outline of the plan included in the ESIA: (i) trees that will be affected by the construction of *Los Merinos WWTP* and are mature enough, shall be transplanted to the bank of the Daule river; (ii) a program to rescue, protect and relocate the affected fauna shall be implemented under the supervision of a biologist and a forest engineer; (iv) Compensatory tree planting shall take place to compensate for those trees that cannot be transplanted; and (v) an area of 1.5 ha. contiguous to the WWTP shall be reserved for the construction of a nature interpretation center, which shall be constructed under the Project.

47. **The *Los Merinos WWTP* ESIA was disclosed and consulted locally in February 2018,** and included a formal public audience and informal informative meetings. Comments were addressed in an updated ESIA. The ESMP for Component 1 activities were also consulted in the beneficiary neighborhoods in February 2018, and comments were incorporated in the final versions of the documents. The final version of the ESIA and Component 1 ESMP and ESMF have been published in the Borrower's website and the Bank's external website in April 2018²⁰.

48. **The proposed activities will trigger OP 4.09 on Pest Management.** This is due to the presence of vectors (rats), and the need to use pesticides to control them, in the area of the wastewater stabilization ponds that will be decommissioned for the construction of *Los Merinos WWTP*. Following the requirements of OP 4.09, a Pest Management Plan has been developed as part of the ESMP. It is expected that the presence of rats in the area will decrease once the ponds are decommissioned. For Component 3, while no potential significant impacts on physical cultural resources were identified in the ESIA, OP/BP 4.11 Physical Cultural Resources has been triggered and an archeological monitoring program and chance-find procedure are included in the ESMP as a preventive measure. The ESMP for Component 1 activities includes chance-find procedure.

²⁰ The disclosed version of the ESIA can be found found in the following webpages: (i) documents.worldbank.org; and (ii) www.emapag-ep.gob.ec.



49. **The overall Climate and Disaster Risk to the outcome/service delivery of the Project is deemed moderate for current and future conditions.** The Climate and Disaster Risk Screening identified extreme precipitation and flooding, extreme temperature and sea level rise as the main natural hazards at the intervention area targeted by the Project. The AF is mitigating potential climate related risks and strengthening resilience by supporting: (i) detail designs and the location of the new wastewater treatment infrastructure, based on the occurrence of extreme climate events²¹; and (ii) further enhancing the institutional capacity to operate, maintain, and monitor wastewater systems, so as to support overall sustainability of infrastructure investments and specifically the implementation of emergency response and contingency protocols.

50. **Greenhouse Gas (GHG) emissions reduction benefits are also expected to be generated under the proposed AF.** The AF is expected to bring an overall 53 percent reduction of GHG emissions from wastewater and sludge treatment, i.e., a reduction from about 90,000 to 42,000 tons CO₂e/year. The expected reduction is due to two key changes: (i) the switch from predominantly anaerobic to aerobic wastewater treatment conditions, and (ii) the use of the methane generated as a byproduct of the sludge treatment process to produce renewable electric power. Although the switch from stabilization ponds to CEPT treatment technologies implies a greater use of chemicals and therefore an increase of indirect GHG emissions, caused by electricity requirements, this indirect impact is of lesser relevance than the direct positive impacts mentioned above. Thus, the overall balance shows a substantial reduction of GHG emissions. Climate Change mitigation co-benefits of the proposed AF funded activities amounts to 100 percent of the project costs.

V. WORLD BANK GRIEVANCE REDRESS

51. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

²¹ The final location and design of Los Merinos WWTP was developed taking into account a projected sea-level rise of 0.6 m by 2075, as per the scenario analysis of future climate change impacts in the area conducted by the U.S. Army Corps of Engineers (USACE).



VI. SUMMARY TABLE OF CHANGES

	Changed	Not Changed
Change in Results Framework	✓	
Change in Components and Cost	✓	
Change in Loan Closing Date(s)	✓	
Reallocation between Disbursement Categories	✓	
Change in Safeguard Policies Triggered	✓	
Change in Legal Covenants	✓	
Change in Procurement	✓	
Change in Implementing Agency		✓
Change in Project's Development Objectives		✓
Cancellations Proposed		✓
Change in Disbursements Arrangements		✓
Change of EA category		✓
Change in Institutional Arrangements		✓
Change in Financial Management		✓
Change in APA Reliance		✓
Other Change(s)		✓

VII. DETAILED CHANGE(S)

RESULTS FRAMEWORK

Project Development Objective Indicators

Volume(mass) of BOD pollution load removed by treatment plant under the project
Unit of Measure: Tones/year
Indicator Type: Custom



	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	14,000.00	Revised
Date	15-Sep-2015	15-Sep-2017	28-Apr-2023	
Water & sanitation utility operating ratio Unit of Measure: Percentage Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.90	0.90	0.90	Revised
Date	15-Sep-2015	15-Sep-2017	28-Apr-2023	
Direct project beneficiaries Unit of Measure: Number Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	5,000.00	2,000,000.00	Revised
Date	15-Sep-2015	15-Sep-2017	28-Apr-2023	
Female beneficiaries Unit of Measure: Percentage Indicator Type: Custom Supplement				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	50.00	50.00	Revised
People in urban areas provided with access to improved sanitation services under the project Unit of Measure: Number Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	5,000.00	169,800.00	Revised
Date	15-Sep-2015	15-Sep-2017	28-Apr-2023	
Share of poor people in urban areas provided with access to improved sanitation services under the project Unit of Measure: Percentage Indicator Type: Custom Supplement				



	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	20.00	No Change

Intermediate Indicators

Reduction of the average wastewater flow pumped in the “La Chala” pump station Unit of Measure: Percentage Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	25.00	Marked for Deletion
Date	15-Sep-2015	15-Sep-2017	31-Dec-2019	
New household sewer connections constructed under the project Unit of Measure: Number Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	1,600.00	35,400.00	Revised
Date	15-Sep-2015	15-Sep-2017	28-Apr-2023	
Commissioning of Las Esclusas WWTP Unit of Measure: Yes/No Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No	No	Yes	Revised
Date	15-Sep-2015	15-Sep-2017	31-Mar-2020	
Water quality Monitoring System for the Daule and Guayas River finalized and system operational Unit of Measure: Yes/No Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No	No	Yes	Revised
Date	15-Sep-2015	15-Sep-2017	30-Nov-2021	
Water Quality Monitoring System for the Estero Salado Estuary				



Unit of Measure: Yes/No Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No	No	Yes	Revised
Date	15-Sep-2015	15-Sep-2017	30-Nov-2021	
Master plan for the Management and Final Disposal or Reutilization of Bio-solids from WWTP finalized Unit of Measure: Yes/No Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No	No	Yes	Marked for Deletion
Date	15-Sep-2015	15-Sep-2017	31-Dec-2019	
Citizen Engagement: Number of beneficiary households that sign a certification that they are satisfied with the works conducted in their houses. Unit of Measure: Number Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	4,900.00	34,075.00	Revised
Date	15-Sep-2015	15-Sep-2017	31-Dec-2019	
People trained to improve hygiene behavior/sanitation practices under the proj Unit of Measure: Number Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	22,500.00	Marked for Deletion
Date	15-Sep-2015	15-Sep-2017	31-Dec-2019	
People trained to improve hygiene behavior/sanitation practices - female Unit of Measure: Number Indicator Type: Custom Breakdown				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	18,000.00	Marked for Deletion
Date	15-Sep-2015	15-Sep-2017	28-Apr-2023	



Share of surveyed beneficiaries (gender disaggregated) that feel project investments reflect their needs				
Unit of Measure: Percentage				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	85.00	Revised
Date	15-Sep-2015	15-Sep-2017	03-Apr-2023	
Start of Construction of Los Merinos WWTP				
Unit of Measure: Yes/No				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No	No	Yes	New
Date	14-Feb-2018	14-Feb-2018	07-Jun-2019	
Commissioning of Los Merinos WWTP				
Unit of Measure: Yes/No				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No	No	Yes	New
Date	14-Feb-2018	14-Feb-2018	30-Dec-2022	
Share of the monthly average effluent from Los Merinos WWTP outlet discharged into the Daule River is compliant with regulatory quality standard for BDO, TSS and total coliforms				
Unit of Measure: Percentage				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	100.00	New
Date	14-Feb-2018	14-Feb-2018	28-Apr-2023	
Percentage of Component 1 social mobilization team members that are women				
Unit of Measure: Percentage				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	0.00		80.00	New



Date	21-Feb-2018	31-Mar-2023		
The Los Merinos WWTP Forest Compensation Plan has being developed and approved by National Environmental Authorities				
Unit of Measure: Yes/No				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	No		Yes	New
Date	30-Apr-2018	28-Feb-2019		

COMPONENTS

Current Component Name	Current Cost (US\$, millions)	Action	Proposed Component Name	Proposed Cost (US\$, millions)
Component 1: Installation of Household Connections	18.00	Revised	Component 1: Installation of Household Connections	41.00
Component 2: Rehabilitation of Sewerage Network	37.00	Revised	Component 2: Rehabilitation of Sewerage Network	33.50
Component 3: Wastewater Treatment and Disposal Facilities	161.00	Revised	Component 3: Wastewater Treatment and Disposal Facilities	378.30
Component 4: Project management and Administration, including Communication Plan and Management of Social, Environmental and Safety Issues	5.40	Revised	Component 4: Project management and Administration, including Communication Plan and Management of Social, Environmental and Safety Issues	8.20
TOTAL	221.40			461.00

LOAN CLOSING DATE(S)

Ln/Cr/Tf	Status	Original Closing	Current Closing(s)	Proposed Closing	Proposed Deadline for Withdrawal Applications
IBRD-85050	Effective	31-Dec-2019	31-Dec-2019	31-Dec-2020	30-Apr-2021

REALLOCATION BETWEEN DISBURSEMENT CATEGORIES



Current Allocation	Actuals + Committed		Proposed Allocation	Financing % (Type Total)					
				Current	Proposed				
IBRD-85050-001 Currency: USD									
iLap Category Sequence No: 1		Current Expenditure Category: CW, NCS, CS - Part 1							
2,800,000.00	2,511,594.71	6,300,000.00	100.00	100.00					
iLap Category Sequence No: 2		Current Expenditure Category: CW, NCS, CS - Part 2							
37,000,000.00	10,025,669.28	33,500,000.00	100.00	100.00					
iLap Category Sequence No: 3A		Current Expenditure Category: CW, NCS - Part 3(a)(i)							
50,750,000.00	25,175,478.94	50,750,000.00	52.00	100.00					
iLap Category Sequence No: 3B		Current Expenditure Category: CS - Part 3(b)							
7,750,000.00	2,982,095.76	7,750,000.00	100.00	100.00					
iLap Category Sequence No: 4		Current Expenditure Category: GO, CW, NCS, CS, TR - Part 4							
4,200,000.00	596,969.73	4,200,000.00	100.00	100.00					
iLap Category Sequence No: 5		Current Expenditure Category: PREMIUM FOR CAPS/COLLARS							
0.00	0.00	0.00							
Total	102,500,000.00	41,291,808.42	102,500,000.00						
Expected Disbursements (in US\$, millions)									
Fiscal Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Annual	0.00	1.00	30.40	24.20	36.80	79.95	94.45	62.70	6.60
Cumulative	0.00	1.00	31.40	55.60	92.40	172.35	266.80	329.50	336.10



SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Latest ISR Rating	Current Rating
Political and Governance	● Substantial	● Substantial
Macroeconomic	● High	● High
Sector Strategies and Policies	● Substantial	● Moderate
Technical Design of Project or Program	● Moderate	● Moderate
Institutional Capacity for Implementation and Sustainability	● Moderate	● Low
Fiduciary	● High	● Moderate
Environment and Social	● Moderate	● Moderate
Stakeholders	● Moderate	● Moderate
Other		
Overall	● Substantial	● Substantial

COMPLIANCE

Change in Safeguard Policies Triggered

Yes

Safeguard Policies Triggered	Current	Proposed
Environmental Assessment OP/BP 4.01	Yes	Yes
Performance Standards for Private Sector Activities OP/BP 4.03	No	No
Natural Habitats OP/BP 4.04	Yes	Yes
Forests OP/BP 4.36	No	No
Pest Management OP 4.09	No	Yes
Physical Cultural Resources OP/BP 4.11	Yes	Yes
Indigenous Peoples OP/BP 4.10	No	No



Involuntary Resettlement OP/BP 4.12	Yes	Yes
Safety of Dams OP/BP 4.37	No	No
Projects on International Waterways OP/BP 7.50	No	No
Projects in Disputed Areas OP/BP 7.60	No	No

LEGAL COVENANTS – EC Guayaquil Wastewater Management Project (P151439)

Loan/Credit/TF	Description	Status	Action
IBRD-85050	Finance Agreement :Loan Agreement Schedule 2, Section I.A.4. Description :The Borrower, not later than December 31, 2017, shall enter into an agreement with INTERAGUA (the Transfer Agreement) for the purposes of transferring to INTERAGUA, for its operation and maintenance, the new facilities and sewer mains to be constructed under the Project. Due Date :31-Dec-2017	Not yet due	Marked for Deletion
IBRD-85050	Finance Agreement :Loan Agreement, Schedule 2, Section I. C. 4. Description :The Borrower, not later than December 31, 2017, prepare, in a manner acceptable to the Bank, a master plan for the future management and final disposal/reuse of bio-solids generated by the new wastewater treatment plant “Las Esclusas” to be constructed under Part 3(a)(i) of the Project. Due Date :31-Dec-2017	Not yet due	Marked for Deletion
IBRD-85050	Finance Agreement :Loan Agreement, Schedule 2, Section I. A. 3. Description :The Borrower shall on a date to be agreed with the Bank, but in no case later than twenty-four (24) months after the Effective Date, carry out a review with the Bank on the overall progress and implementation arrangements in the execution of the Project and set out	Expected soon	No Change



the measures and take any remedial action as a result of such review, as agreed with the Bank. | Due Date :30-Sep-2017

LEGAL COVENANTS – Guayaquil Wastewater Management Project AF (P165716)

Sections and Description

Finance Agreement :Loan Agreement, Schedule 2, Section I. A. 3. | Description: The Borrower shall on a date to be agreed with the Bank, but in no case later than twenty-four (24) months after the Effective Date, carry out a review with the Bank on the overall progress and implementation arrangements in the execution of the Project and set out the measures and take any remedial action as a result of such review, as agreed with the Bank.

Finance Agreement :Loan Agreement, Schedule 2, Section I. B. 2. | Description: Prior to the commencement of the civil works under the Project, the Borrower shall ensure that all necessary governmental permits and clearances for such civil works, shall have been obtained from the competent Guarantor’s authority/ies and submitted to the Bank, and that if applicable, that the Safeguard Documents have been revised, updated and disclosed in a manner satisfactory to the Bank.

Finance Agreement: Loan Agreement, Schedule 2, Section I. B. 2. c. | Description: Prior to the commencement of the civil works under the Project, the Borrower shall ensure that all resettlement measures under Part 3(a)(i) and (c) of the Project set forth in the RAPs for such civil works shall have been fully executed.

Finance Agreement: Loan Agreement, Schedule 2, Section I. B. 2. d. | Description: Prior to the commencement of the civil works under the Project, the Borrower shall ensure that all land acquisition required for such civil works under Part 3(a)(i) and (c) of the Project shall have been concluded and such land shall be free of encumbrances and ready to be handed over to the winning bidder, all in a manner acceptable to the Bank.

Finance Agreement: Loan Agreement, Schedule 2, Section I. B. 3. | Description: The Borrower shall ensure, and cause the PIU to ensure, that all bidding documents and contracts for civil works under the Project include the obligation of the relevant contractors and subcontractors to: (i) comply with the obligations under the relevant Safeguard Documents; (ii) adopt and implement measures to assess and manage the risks and impacts of labor influx and workers’ camps; and (iii) adopt and enforce code of conducts that should be provided to and signed by all workers

Finance Agreement: Loan Agreement, Schedule 2, Section I. B. 4. | Description: The Borrower shall, and shall cause the PIU to, maintain, throughout Project implementation, and publicize the availability of a grievance redress mechanism, in form and substance satisfactory to the Bank, to hear and determine fairly and in good faith all complaints raised in relation to the Project, and take all measures necessary to implement the determinations made by such mechanism in a manner satisfactory to the Bank

Finance Agreement: Loan Agreement, Schedule 2, Section I. B. 5. | Description: The Borrower shall provide, and/or cause to be provided, all the funds necessary or appropriate to enable the PIU to perform its obligations under the Project, including, as applicable, all the funds required to implement the pertinent RAPs, in a manner satisfactory to the Bank.

Conditions

Type	Description
	There are no additional conditions





VIII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY : Ecuador

Guayaquil Wastewater Management Project AF

Project Development Objectives

The Project Development Objective (PDO) is to increase access to improved sanitation services and to reduce wastewater pollution in selected areas of the City of Guayaquil.

Project Development Objective Indicators

Action	Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Revised	Name: Volume(mass) of BOD pollution load removed by treatment plant under the project		Tones/year	0.00	14,000.00	This indicator will be measured once for each plant supported under the project, at the end of the corresponding assisted operation	Audited Technical Report of Interagua's operation	EMAPAG EP and Interagua



						phase.		
<p>Description: This indicator measures the cumulative volume (mass) of Biological Oxygen Demand (BOD) pollution loads removed by the treatment plant supported under the project. Project support can include construction, expansion or rehabilitation of the treatment plant.</p> <p>The baseline value will be zero in where wastewater treatment has not yet been available. In the case where wastewater treatment has been available but is to be improved under the project, either with higher levels of treatment or rehabilitation of the existing treatment capacity, the baseline value will not be zero.</p>								
Revised	Name: Water & sanitation utility operating ratio		Percentage	0.90	0.90	Annual	Audited financial statements of Interagua	EMAPAG EP
<p>Description: Operating expenses (including depreciation)/Operating revenues</p>								
Revised	Name: Direct project beneficiaries		Number	0.00	2,000,000.00	Every six months	Certificates of satisfaction signed by households benefiting from Component 1 activities and Interagua's client database	EMAPAG EP
Revised	Female beneficiaries		Percentage	0.00	50.00	Every 6 months	estimated at 50 percent of the total number of beneficiaries	EMAPAG EP
<p>Description: Direct beneficiaries are people or groups who directly derive benefits from an intervention (i.e., children who benefit from an immunization program; families that have a new piped water connection). Please note that this indicator requires supplemental information. Supplemental Value:</p>								



Female beneficiaries (percentage). Based on the assessment and definition of direct project beneficiaries, specify what proportion of the direct project beneficiaries are female. This indicator is calculated as a percentage.

Revised	Name: People in urban areas provided with access to improved sanitation services under the project		Number	0.00	169,800.00	Every six months	This indicator is calculated multiplying number of households benefiting from component 1 activities by the average household size, estimated for Guayaquil in 4.8 members per household. In turn the number of benefiting households is calculated based on the number of households that have signed the certificate of satisfaction with sewer connection works.	EMAPAG EP
No Change	Share of poor people in urban areas provided with access to		Percentage	0.00	20.00	Once at project closure	The indicator will be calculated at the closure of the project through	EMAPAG EP



	improved sanitation services under the project						the conduction of a survey among the beneficiaries of component 1 activities.	
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Description: For the purposes of this Project, sanitation services are considered improved when the concerned household is connected to the sewer network and the septic tank, cesspool or pit is adequately sealed.

Target values and dates for this indicator have been revised to: (i) consider the scale up of component 1 activities financed under the AF; and (ii) to delay the implementation of sewer connectivity contracts under the Parent Project that are to be financed with counterpart funding to improve the cashflow of the Borrower during the overall project implementation timeframe.

This indicator is calculated multiplying number of households benefiting from component 1 activities by the average household size, estimated for Guayaquil in 4.8 members per household. In turn the number of benefiting households is calculated based on the number of households that have signed the certificate of satisfaction with sewer connection works.



Intermediate Results Indicators

Action	Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
No Change	Name: Reduction of the annually reported repair tickets in the La Chala sector sewer main system		Percentage	0.00	50.00	Annual	Audited Technical Report of Interagua's operation	EMAPAG EP
Description: The reported repair tickets at appraisal of the parent project were 10,500 claims/year.								
No Change	Name: Meters of sewers mains rehabilitated under the project		Meter(m)	0.00	40,000.00	Every 6 months	Progress reports issued by the engineering firm hired for the supervision of the works	EMAPAG EP
Description: Interim annual target values for this indicator have been reviewed as per the updated execution plan.								
Revised	Name: New household sewer connections constructed under the project		Number	0.00	35,400.00	Every six months	Certificates of satisfaction with sewer connection works	EMAPAG EP
Description: This indicator is measured as the cumulative number of new sewer connections constructed under the project. The baseline value is expected to be zero.								
No Change	Name: Start of		Yes/No	No	Yes	EMAPAG EP	Progress of work	Once



	Construction of Las Esclusas WWTP						approved by the independent supervisor	
Description:								
Revised	Name: Commissioning of Las Esclusas WWTP		Yes/No	No	Yes	Once, at the commissioning of the treatment facility	Progress of work approved by the independent supervisor	EMAPAG EP
Description: Target date for this indicator has been revised since the commissioning of Las Esclusas WWTP will be delayed as a consequence of the delays in the contracting of the Pradera-Esclusas transmission pipeline construction works.								
No Change	Name: Share of the monthly average effluent from Las Esclusas WWTP outlet discharged into the Guayas River is compliant with regulatory quality standard for BDO, TSS and total coliforms		Percentage	0.00	100.00	Annual	Audited Technical Report of Interagua's operation or Monthly average of daily quality tests	EMAPAG EP
Description: Daily tests will indicate the daily concentration in the effluent at the WWTP's outlet. These values will be averaged by month and the effluent must comply with the indicated standards on a monthly average basis.								
Revised	Name: Water quality Monitoring System for the Daule and Guayas River finalized and		Yes/No	No	Yes	Annual	Progress Reports	EMAPAG EP



	system operational							
Description: The definition of this indicator has been modified to highlight that the water quality monitoring system will cover as well the Daule river. The target date of this indicator has also be postponed.								
Revised	Name: Water Quality Monitoring System for the Estero Salado Estuary		Yes/No	No	Yes	Biannual	Progress Reports	EMAPAG EP
Description:								
Revised	Name: Citizen Engagement: Number of beneficiary households that sign a certification that they are satisfied with the works conducted in their houses.		Number	0.00	34,075.00	Every six months	Progress Reports	EMAPAG EP
Description: Target values for this indicator have been revised to account for: (i) the scale up of component 1 activities financed under the AF; and (ii) the reduction of expected new connections to be installed under the parent project								
Revised	Name: Share of surveyed beneficiaries (gender disaggregated) that feel project investments reflect their needs		Percentage	0.00	85.00	Biannual	Progress Reports	EMAPAG EP
Description:								
New	Name: Start of Construction of Los		Yes/No	No	Yes	Once	Progress Reports	EMAPAG EP



	Merinos WWTP							
Description:								
New	Name: Commissioning of Los Merinos WWTP		Yes/No	No	Yes	Once	Progress report	EMAPAG EP
Description: Commissioning of the treatment facility								
New	Name: Share of the monthly average effluent from Los Merinos WWTP outlet discharged into the Daule River is compliant with regulatory quality standard for BDO, TSS and total coliforms		Percentage	0.00	100.00			
Description: Daily tests will indicate the daily concentration in the effluent at the WWTP’s outlet. These values will be averaged by month and the effluent must comply with the indicated standards on a monthly average basis.								
New	Name: Percentage of Component 1 social mobilization team members that are women		Percentage	0.00	80.00	Annual	Progress Report	EMAPAG EP
Description:								
New	Name: The Los Merinos WWTP Forest Compensation Plan has been developed and		Yes/No	No	Yes	Semiannual	Approval of the proposed Forest compensation plan issued by the Ministry	EMAPAG EP



	approved by National Environmental Authorities						of Environment	
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Description: As per the outline of the plan included in the ESIA: (i) trees that will be affected by the construction of Los Merinos WWTP and are mature enough, shall be transplanted to the bank of the Daule river; (ii) a program to rescue, protect and relocate the affected fauna shall be implemented under the supervision of a biologist and a forest engineer; (iv) Compensatory tree planting shall take place to compensate for those trees that cannot be transplanted; and (v) an area of 1.5 ha. contiguous to the WWTP shall be reserved for the construction of a nature interpretation center, which shall be developed under the Project.



Target Values

Project Development Objective Indicators

Action	Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	End Target
Revised	Volume(mass) of BOD pollution load removed by treatment plant under the project	0.00	0.00	0.00	0.00	0.00	0.00	4,000.00	6,000.00	6,000.00	14,000.00	14,000.00
Revised	Water & sanitation utility operating ratio	0.90	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	0.90
Revised	Direct project beneficiaries	0.00	0.00	0.00	24,000.00	25,025.00	50,025.00	1,100,000.00	1,100,000.00	1,100,000.00	2,000,000.00	2,000,000.00
Revised	Female beneficiaries	0.00	0.00	0.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Revised	People in urban areas provided with access to improved sanitation services under the project	0.00	0.00	0.00	23,520.00	24,000.00	60,000.00	110,000.00	120,000.00	140,000.00	163,560.00	169,800.00
No Change	Share of poor people in urban areas provided with access to improved	0.00			20.00	20.00	20.00					20.00



	sanitation services under the project											
Intermediate Results Indicators												
Action	Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	End Target
No Change	Reduction of the annually reported repair tickets in the La Chala sector sewer main system	0.00	0.00	0.00	10.00	25.00	50.00	50.00	50.00	50.00	50.00	50.00
No Change	Meters of sewers mains rehabilitated under the project	0.00	0.00	0.00	5,000.00	25,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Revised	New household sewer connections constructed under the project	0.00	0.00	0.00	4,900.00	5,000.00	12,500.00	22,916.00	25,000.00	29,167.00	34,075.00	35,400.00
No Change	Start of Construction of Las Esclusas WWTP	No	N	Y	Y	Y	Y					Y
Revised	Commissioning of Las Esclusas WWTP	No	N	N	N	N	N	Y	Y	Y	Y	Y
No Change	Share of the monthly average effluent from Las Esclusas WWTP	0.00	0.00	0.00	0.00	50.00	100.00					100.00



	outlet discharged into the Guayas River is compliant with regulatory quality standard for BDO, TSS and total coliforms												
Revised	Water quality Monitoring System for the Daule and Guayas River finalized and system operational	No	N	N	N	N	N	N	N	Y	Y	Y	Y
Revised	Water Quality Monitoring System for the Estero Salado Estuary	No	N	N	N	Y	Y						Y
Revised	Citizen Engagement: Number of beneficiary households that sign a certification that they are satisfied with the works conducted in their houses.	0.00	0.00	0.00	4,900.00	5,000.00	12,500.00	22,916.00	25,000.00	29,167.00	34,075.00	34,075.00	34,075.00
Revised	Share of surveyed beneficiaries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.00



	(gender disaggregated) that feel project investments reflect their needs												
New	Start of Construction of Los Merinos WWTP	No	N	N	N	N	N	Y	Y	Y	Y	Y	Y
New	Commissioning of Los Merinos WWTP	No	N	N	N	N	N	N	N	N	Y	Y	Y
New	Share of the monthly average effluent from Los Merinos WWTP outlet discharged into the Daule River is compliant with regulatory quality standard for BDO, TSS and total coliforms	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
New	Percentage of Component 1 social mobilization team members that are women	0.00	0.00	0.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00
New	The Los Merinos WWTP Forest Compensation Plan	No											Y



	has being developed and approved by National Environmental Authorities												
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ANNEX 1: PROPOSED RESULTS FRAMEWORK CHANGES

DESCRIPTION AND RATIONALE OF THE MAIN CHANGES INTRODUCED TO THE RESULTS FRAMEWORK OF THE PARENT PROJECT AND CLARIFICATION OF MAIN INDICATORS DEFINITIONS

1. **Volume(mass) of BOD pollution load removed by treatment plant under the project:** This indicator measures the incremental cumulative mass of Biological Oxygen Demand (BOD₅) pollution loads removed per year by the treatment plant which construction, expansion or rehabilitation is supported under the project.
2. Target values and dates for this indicator have been reviewed to take into consideration: (i) the construction of Los Merinos WWTP under the AF; and (ii) the expected delays in the commissioning of Las Esclusas WWTP, which in turn are consequence of the delays in the procurement of the Pradera-Esclusas wastewater transmission pipeline.
3. For the case of Las Esclusas WWTP the baseline value is considered equal to zero, since currently in the Southern wastewater catch basin of the city wastewaters collected are discharged with no treatment. In the case of Los Merinos WWTP, the target value has been determined subtracting annual BOD mass currently removed by the Guayacanes-Samanes and Sauces-Alborada estabilization ponds from the BOD mass removal expected to be achieved with the operation of los Merinos.
4. Annual BOD mass removal will be calculated multiplying the average daily BOD mass removal registered in each of the two WWTPs during the assisted operation phase of the corresponding construction contracts (which has a duration of six months), multiplied by 365.
5. This indicator will be measured once for each plant supported under the project, at the end of the corresponding assisted operation phase. The source of data to calculate this indicator will be Interagua's water quality monitoring system.
6. **Direct project beneficiaries:** The following households are considered direct beneficiaries of the Project: (i) households that are getting connected to the sewerage network thanks to the project (component 1); (ii) households connected to sewer mains that are rehabilitated under the project (component 2); and/or (iii) households which wastewaters are treated in Las Esclusas and Los Merinos WWTP (component 3).
7. The indicator is calculated multiplying number of benefiting households by the average household size, estimated for Guayaquil in 4.8 members per household.
8. In turn the number of benefiting households is calculated: (i) based on the number of households that have signed the certificate of satisfaction with sewer connection works for component 1; and (ii) using Interagua's client data base for components 2 and 3.
9. The final target value has been revised to consider a 100 percent of the households in the Southern and Northeastern wastewater catch basins connected to the sewer network and discharging their wastewaters to the treatment plans constructed under the project.
10. **People in urban areas provided with access to improved sanitation services under the project:** For the purposes of this Project, sanitation services are considered improved when the concerned household is connected to the sewer network and the septic tank, cesspool or pit is adequately sealed.



11. Target values and dates for this indicator have been revised to: (i) consider the scale up of component 1 activities financed under the AF; and (ii) to delay the implementation of sewer connectivity contracts under the Parent Project that are to be financed with counterpart funding, as to improve the cashflow of the Borrower during project implementation.
12. This indicator is calculated multiplying number of households benefiting from component 1 activities by the average household size, estimated for Guayaquil in 4.8 members per household. In turn the number of benefiting households is calculated based on the number of households that have signed the certificate of satisfaction with sewer connection works.
13. **Share of poor people in urban areas provided with access to improved sanitation services:** For the purposes of this indicator, poor people are considered those living in households where the average per capita income is below the income poverty line defined by the National Institute of Statistics. The indicator will be calculated at the closure of the project through the conduction of a survey among the beneficiaries of component 1 activities.
14. **Reduction of the average wastewater flow pumped in the La Chala pumping station:** this indicator is marked for deletion because the concerned pumping station is not equipped with a flow meter and therefore it cannot be accurately assessed.
15. **Meters of sewers mains rehabilitated under the project:** Interim annual target values for this indicator have been reviewed as per the updated execution plan.
16. **New household sewer connections constructed under the project:** Target values and dates for this indicator have been revised to consider: (i) the scale up of component 1 activities financed under the AF; (ii) the reduction of expected new connections to be installed under the Parent Project, since some households located in the southern districts of the city that were not connected to the sewer main at the time of appraisal got connected afterwards by their own means.
17. The number of household connections is determined based on the number of households that have signed the certificate of satisfaction with sewer connection works.
18. **Commissioning of Las Esclusas WWTP:** Target date for this indicator has been revised since the commissioning of Las Esclusas WWTP will be delayed because of the delays in the contracting of the Pradera-Esclusas transmission pipeline construction works.
19. **Water quality Monitoring System for the Daule and Guayas River finalized and system operational:** The definition of this indicator has been modified to highlight that the water quality monitoring system will cover as well the Daule river. The target date of this indicator has also been postponed.
20. **Master plan for the management and final disposal or reuse of biosolids from WWTP finalized:** This indicator has been marked for deletion. the findings of the MTR mission obviate the need to proceed with the development of the mentioned master plan since plans and agreements are already in place with authorities running the municipal landfill to ensure an adequate mechanism for the disposal of treated bio-solids.
21. **Citizen engagement: Number of beneficiary households that sign a certification that they are satisfied with the works carried out in their houses:** Target values for this indicator have been revised to



account for: (i) the scale up of component 1 activities financed under the AF; and (ii) the reduction of expected new connections to be installed under the Parent Project

22. **People trained to improve hygiene behavior or sanitation practices under the Project:** This indicator is marked for deletion because it duplicates the indicator related to the signature of satisfaction, since families are trained to make proper use of the new facilities once they sign said certificate.

23. **Share of surveyed beneficiaries (gender disaggregated) that feel project investments reflect their needs:** The target date of this indicator has been postponed to the project closing date, that is when the satisfaction survey should be conducted.

24. **Percentage of Component 1 social mobilization team members that are women:** New intermediate result indicator

25. **The Los Merinos WWTP Forest Compensation Plan has being developed and approved by National Environmental Authorities:** New intermediate result indicator. As per the outline of the plan included in Los Merinos ESIA: (i) trees that will be affected by the construction of Los Merinos WWTP and are mature enough, shall be transplanted to the bank of the Daule river; (ii) a program to rescue, protect and relocate the affected fauna shall be implemented under the supervision of a biologist and a forest engineer; (iv) Compensatory tree planting shall take place to compensate for those trees that cannot be transplanted; and (v) an area of 1.5 ha. contiguous to the WWTP shall be reserved for the construction of a nature interpretation center, which shall be developed under the Project.



ANNEX 2: DETAILED PROJECT DESCRIPTION

A. Country context

1. **Ecuador's macroeconomic situation has deteriorated since 2014.** Increased public spending during the oil boom fueled growth but increased vulnerabilities, resulting in a recession with the decline in commodity prices in 2014. Since 2014, total poverty incidence and inequality (measured by the Gini coefficient) remained almost constant, at around 20 percent and 0.46, respectively. Moreover, Ecuador has experienced a divergence in poverty and inequality trends within its regions between 2014 and 2017. Coastal regions registered a decline in poverty and sped up the national poverty decline, while the Highlands and the Amazonia witnessed a poverty increase, slowing down the pace of poverty reduction²². In terms of inequality, Coastal regions also reduced their levels of inequality (i.e. from 0.48 to 0.43 between 2014 and 2017) while Highlands remained constant (i.e. around 0.47) and Amazonia increased (i.e. from 0.48 to 0.54 for 2014 and 2017, respectively)²³.

2. **Despite recent comparative improvements, Guayaquil continues to post the highest poverty headcount among all municipalities.** Although it accounts for roughly 18.2 percent of Ecuador's GDP, its poverty levels are high compared to other main Ecuadorean cities. According to National Institute of Statistics (INEC in its Spanish acronym), poverty (measured by income) stood at 10.5 percent in June 2017, ranking second after Machala (14.4 percent)²⁴, among the five Ecuadorian cities where poverty incidence is tracked yearly by INEC. In absolute numbers, however, poverty levels in Guayaquil are significantly higher than in any other municipality of the country, since, with a population of 2.64 million inhabitants, Guayaquil is the most populous city of Ecuador.

3. **In this challenging macroeconomic context, enhancing access to quality basic services is key to retain poverty reduction gains achieved during the 2007-2014 Period.** Significant gaps remain in terms of access to clean water and sanitation, education and health services, which continue to weigh more heavily on the poorest and most vulnerable groups. Per the National Planning Secretariat (*Secretaría Nacional de Planificación del Desarrollo- SENPLADES*), the achievement of access targets set in the *2014-2017 Poverty Eradication Strategy*²⁵ for water supply and sanitation (WSS) services alone, would have generated reductions in poverty and extreme poverty of 3.8 and 1.6 percent, respectively.

4. **The 2017-2021 National Development Plan (NDP) "Toda Una Vida"²⁶ – also places access to WSS services at the core of the government's development agenda to continue reducing poverty incidence**

²² According to World Bank calculations using ENEMDU data, between 2014 and 2017 monetary poverty decreased in the Coastal Region from 24.5 to 20.3 percent. During the same period poverty incidence increased from 39.00 to 42.5 percent and from 18.4 to 20.2 percent in the Amazonian and Highlands regions, respectively.

²³ World Bank Calculations using ECV and ENEMDU data

²⁴ *Reporte de Pobreza y Desigualdad*, Quito, INEC, 2017, p. 5 (www.ecuadorencifras.gob.ec). According this report poverty incidence rates in the other three main Ecuadorian cities, i.e. Quito, Cuenca and Ambato, stood in June 2017 at 7.8, 7.8 and 10.2 percent, respectively

²⁵ *Estrategia Nacional para la Igualdad y la Erradicación de la Pobreza*, Quito, SENPLADES, 2014 (www.planificacion.gob.ec). Targets set by this strategy for the water and sanitation sector called for having 83 percent of the households connected to public water distribution system and 75 percent to a sewer network by 2017.

²⁶ *Plan Nacional de Desarrollo 2017-2021. Toda Una Vida*, Quito, SENPLADES 2017 (www.planificacion.gob.ec).



moving forward. Aligned with national development goals, the 2014-2024 Water Supply and Sanitation Sector Strategy (*Estrategia Nacional de Agua y Saneamiento - ENAS*)²⁷ establishes the ambitious goal of reaching universal access to potable water and sanitation services by 2024 and estimates that US\$7.3 billion in investments would be required to reach the target. In order to operationalize this strategy, the Government of Ecuador has recently launched the “*Agua Segura y Saneamiento para Todos*” Program, through which the central government plans to channel US\$2 billion in grants and concessional loans to sustain municipal governments’ efforts to increase WSS access.

B. Sectorial and Institutional Context

5. **The largest share of the population lacking access to adequate sanitation is concentrated in urban areas of large and medium size municipalities of the coastal region.** Access to adequate WSS services, as per ENAS standards, has seen great progress nationwide from 2010 to 2014, increasing by 6 percent (from 80.4 to 86.4) for water supply and 8.6 percent (from 64.5 to 73.1) for sanitation. Although in percentage terms WSS access rates in rural areas still lag significantly behind those in urban areas, the greatest concentration of households without adequate access to sanitation services, as defined in ENAS²⁸, is found in urban areas (626,000 households in 2014, as compared to 410,000 in rural areas). The greatest concentration of urban households lacking access to sewerage services is found in medium and large cities of the coastal region totaling 464,000 in 2014, out of which 155,000 were in Guayaquil.

6. **The Municipality of Guayaquil remains committed to increase access to affordable and safely managed sanitation services as part of its social inclusion and urban regeneration policies and goals.** Guayaquil’s current Municipal Development Plan (MDP), which was promulgated in January 2012 and updated in February 2015, includes as part of its development objectives: (i) the reduction of inequalities in access to affordable and quality basic services; and (ii) the regeneration of degraded urban areas and environmental assets as a driver of economic growth, social inclusion, and improved competitiveness. In this regard, the MDP establishes the goal of reaching universal access to sewerage wastewater collection and identifies the regeneration of the *Estero Salado* estuary and riparian neighborhoods as a key development objective²⁹.

7. **WSS services In the City of Guayaquil are provided through a public-private partnership (PPP) arrangement with a private operator.** In 2001 a 30-year concession contract for WSS services provision was awarded to a private consortium, *Interagua*. ECAPAG EP, the municipal water company at the time, which was later transformed into a regulatory agency and renamed *Empresa Municipal de Agua Potable y Alcantarillado de Guayaquil* (EMAPAG EP), is responsible for supervising, monitoring and controlling *Interagua*’s performance, among other functions.

8. **Both access to and the quality of WSS services have significantly improved in the City of**

²⁷ Developed in 2016 by the National Water Secretariat (SENAGUA in its Spanish acronym).

²⁸ ENAS defines adequate access to sanitation as piped sanitation for urban areas and piped sanitation or flush toilet connected to a septic tank in rural areas.

²⁹ The Estero Salado Estuary is an important environmental asset that currently establishes the southern and southwestern border of Guayaquil’s urban area. On the East and the North, the growth of the city of Guayaquil is constrained by the Guayas and Daule rivers, respectively. The Estero Salado is heavily polluted, specially by domestic wastewater discharges from riparian households located in southern districts of the city that are not connected to the sewer network. These households are currently being connected to the services through the Parent Project.



Guayaquil since the concession contract was entered into. Between 2006 and 2014 the percentage of Guayaquil's urban households that were connected to Interagua's water and sewerage networks increased from 85.7 to 96.9 and from 53.9 to 77.6 percent, respectively³⁰. The results of more than 99.9 percent of the water quality tests performed in 2015 on the outflow of Guayaquil's drinking water treatment plants were found satisfactory as per applicable health standards. Unaccounted for water (UFW) levels, despite being still high³¹, decreased by 24 percent from 2001 to 2015. Delinquency rates also improved significantly since the signature of the concession agreement, decreasing from 50 percent in 2001 to 10 percent in 2006. This, along with the broadening of the client base and improvements in productivity, contributed to enhancing the financial sustainability of services. Despite these advances, and besides the UFW issue, two important challenges remain on the sanitation services front: (i) only 35 percent of wastewater generated is adequately being treated³²; and (ii) effective access (actual connections to the sewerage network) in Interagua's sewerage service area (i.e. the area covered by the network) stands at roughly 85 percent of the potential access rate.

9. **To meet the ambitious environmental and service access goals set within the framework the MDP and the NDP, EMAPAG EP and Interagua have designed a comprehensive wastewater management investment program.** In 2010, EMAPAG EP commissioned a feasibility study for the treatment of 100 percent of the wastewater of the city of Guayaquil, which concluded with the preparation of a detailed engineering design of the wastewater treatment plants (WWTPs) of *Las Esclusas* (covering the southern districts, which roughly houses 1.0 million inhabitants) and *Los Merinos* (covering the northeastern districts and housing an estimated 0.9 million inhabitants)³³.

10. **Although the City of Guayaquil is allocating substantial resources to the WSS sector, it needs to significantly increase its investment pace to meet the ambitious target of achieving universal access to wastewater collection and treatment services by 2031.** The costs of improving urban sanitation to attain universal sewerage and wastewater treatment coverage were estimated as part of the 2011 WSS Municipal Master Plan at US\$907 million. Interagua's annual average investment commitment amounts US\$21.5 million (both for water and sanitation services), and EMAPAG EP currently complements this investment effort with an annual investment flow of US\$40 million, using municipal fiscal transfers.

³⁰ World Bank Calculations using 2006 and 2014 National Livelihood Conditions Survey data.

³¹ In 2015 UFW rate stood at 56.4 percent. Interagua and EMAPAG EP have developed an UFW reduction plan, which was approved by the National Water Regulatory Agency and sets the target of bringing the UFW rate down to 30 percent by 2031

³² i.e. systematically meeting applicable environmental standards set for contaminants concentrations on wastewater effluent discharges to natural water bodies.

³³ The 2011 Wastewater Management Masterplan contemplates the restructuring of Guayaquil's wastewater collection and treatment system into five macro wastewater catch-basins where wastewaters are collected and conveyed to their respective WWTP, i.e.: (i) Las Esclusas WWTP (1.0 million people; 5,1913 ha), currently under construction under the Parent Project; (ii) Los Merinos WWTP (0.9 million people; 10,997 ha), construction proposed under the scope of the AF; (iii) Mi Lote WWTP, currently being retrofitted to receive and treat all wastewater flows generated in the so call "Sistema 3" catch basin; (iv) Puerto Azul artificial Wetland WWTP, commissioned in 2017; and (v) Via a la Costa WWTP, construction is planned as part of the fifth five-year investment plan of the Concessionaire (2021). Population figures included here correspond to 2017 population estimates. However, Las Esclusas and Los Merinos WWTP have being designed with a design life of 30 years, allowing to serve the projected 2045 population.



11. **In the current macroeconomic context, the ability of EMAPAG EP to mobilize commercial finance beyond what is currently being invested by the concessionaire, is limited.** The country's credit rating³⁴ and macroeconomic perspectives limit the interest of commercial financiers. Thus, the boundary conditions on expected tenor of commercial financing are unaffordable for EMAPAG EP, and financing planned sewerage investments on these terms would require a significant increase of the volume of tariffs been charged by the concessionaire and/or of the fiscal transfers currently received from the municipal government. On the other hand, ongoing large infrastructure programs in other investment grade countries like Colombia and Peru, are competing for limited commercial financing in the region. Finally, the lack of track record of commercial financing at the sub-national level in Ecuador, also affects the ability of EMAPAG EP to attract additional private financial resources.

12. **In this context, EMAPAG EP is using fiscal transfers from the municipal government to leverage concessional financial resources to expedite investments in sanitation.** The Guayaquil Wastewater Management Project (the Project), financed by EMAPAG EP, IBRD (IBRD-8505-EC) and European Investment Bank (EIB), is providing a total of US\$247.8 million to achieve universal access to sustainable sanitation services in the southern wastewater catch basin of the city- where approximately 1.0 million people live- to ensure that 100 percent of the wastewaters generated in this basin are treated to meet applicable environmental standards. This entails: (i) connecting 23,000 households to the water network; (ii) rehabilitate around 40 km of sewer mains; and (iii) construct Las Esclusas WWTP and ancillary facilities to treat an average wastewater flow of 2.7 l/s and 3.5 l/s during the dry and wet seasons, respectively.

13. **The proposed AF will complement investments contemplated under Interagua's fourth 5-year investment plan as to ensure that, by 2023, 100 percent of the wastewaters generated in the northeastern wastewater catch-basin are collected and appropriately treated.** Out of the approximately 188,300 households located in this catch basin, approximately 21,250 (11.3 percent) are not connected to the sewer network, 4,620 of which are within Interagua's sewerage service area. Moreover, although there are four WWTP in this catch basin, existing treatment facilities are working above their design capacity and a significant share of discharged treated effluents do not comply systematically with applicable environmental standards³⁵. The proposed additional IBRD loan (US\$ 233.6 million) will finance: (i) sewer extension and households' connections to get 53,736 additional people connected to the sewerage system; and (ii) the construction of Los Merinos WWTP and ancillary facilities, where 100 percent of the wastewaters generated in this catch basin will be treated. It is worth noting that the Project supported with the proposed AF will help connect 34,206 households to the sewerage network. This value represents 5.5 percent of the national urban population that in 2014 was not yet connected to the sewerage system.

14. **Besides bringing significant environmental and economic benefits to the City as a whole, the proposed AF will particularly improve livelihood conditions of targeted poor households in northeastern districts of Guayaquil.** The sewerage network will be expanded in unserved areas of the Pascuales area, i.e., Guayaquil's urban Parish with the highest multidimensional poverty incidence rate (28.5 percent)³⁶. The AF will also connect households located in some of the poorest areas of the Tarqui

³⁴ B- from S&P (June 29, 2017) and B- from Fitch (August 24, 2017)

³⁵ 65 percent as per EMAPAG estimates.

³⁶ *Diagnóstico y proyección de vulnerabilidades frente a la variabilidad y cambio climático en la ciudad de Guayaquil*, CAF, 2017. http://www.guayaquil.gob.ec/Documents/Vulnerabilidad_Guayaquil_Producto_2_Medidas_VFR.pdf.



Parish, i.e., Juan Pablo II, Vergeles, Bastion Popular and Cooperativas Varias³⁷ to the sewerage network.

C. Detailed Project Implementation Status Review

15. **Development objective and description of the Project.** The Project aims to increase access to improved sanitation services³⁸ and to reduce wastewater pollution in selected areas of the city of Guayaquil. To achieve these objectives, the Project envisages four components: (i) the installation of sewerage connections in households within selected areas; (ii) rehabilitation of the sewerage network in La Chala basin (Suburbio Oeste); (iii) the construction of wastewater treatment and disposal facilities; and (iv) activities associated with overall project management, monitoring and evaluation. Works included originally under the three first components of the Project were geographically concentrated in the southern macro-wastewater basin of the City of Guayaquil³⁹.

16. **The Project is on track towards meeting its development objective.** Progress towards achievement of the PDO and Implementation Progress (IP) ratings have been systematically rated Satisfactory since effectiveness of the original loan. As of April 30, 2018, Project disbursements stood at US\$41.9 million, representing 41 percent of the loan, with 84 percent of the loan proceeds already committed. After overcoming slight delays in the startup of construction of the *Las Esclusas* WWTP, which resulted from difficulties faced by the main contractor in obtaining the required bank guarantees, disbursements are expected to pick up and reach more than 50 percent of the proceeds of the original loan by the end of June 2018.

17. **IBRD-funded activities are advancing satisfactorily and are expected to be finalized within the current project implementation timeframe.** Minor delays registered to date in the implementation of IBRD-funded contracts can be overcome reprogramming construction activities. However, delays in the contracting of certain EIB financed works could delay the commissioning of *Las Esclusas* WWTP, which construction contract is co-financed by IBRD and EIB. This delay will not have a significant impact on IBRD's loan disbursements projections since, as per the agreement reached by EMAPAG EP with these two financial institutions, the first payments to be made to the concerned contractor will be financed by IBRD, until funds allocated under the original loan for this activity are depleted. Nonetheless, a one-year

³⁷ There is no recent socioeconomic statistical data available that is representative for urban areas of Guayaquil at the sub-parish level, since the parish is the lowest administrative division of Ecuador. However, according to a study undertaken by the Municipality of Guayaquil, in 2006 35.81 percent and 24.33 percent of the population of Bastion Popular and Vergeles respectively, were extremely poor, measured using the unsatisfied basic needs index. These values are well above the average extreme poverty rate registered in the city as a whole in the same year, which stood at 19.4 percent.

³⁸ For the purposes of the Project, improved sanitation refers to household connection to the sewerage network whereby wastewater receives proper treatment in compliance with environmental regulation before discharge.

³⁹ The 2011 Wastewater Management Masterplan contemplates the restructuring of Guayaquil's wastewater collection and treatment system into five macro wastewater catch-basins where wastewaters are collected and conveyed to their respective WWTP, i.e.: (i) *Las Esclusas* WWTP (1.2 million people; 5,1913 ha), currently under construction under the Parent Project; (ii) *Los Merinos* WWTP (0.9 million people; 10,997 ha), construction proposed under the scope of the AF; (iii) *Mi Lote* WWTP, currently being retrofitted to receive and treat all wastewater flows generated in the so call "Sistema 3" catch basin; (iv) *Puerto Azul* artificial Wetland WWTP, commissioned in 2017; and (v) *Via a la Costa* WWTP, construction is planned as part of the fifth five-year investment plan of the Concessionaire (2021)



extension is sought for Loan IBRD-8505-EC Closing Date (from December 30, 2019 to December 30, 2020), to give the Borrower greater flexibility in the financial management of Las Esclusas WWTP construction contract. The proposed AF is fully compliant with Operational Policy (OP) 10.00, which requires satisfactory implementation of the Parent Project over the most recent 12 months to move forward with an AF.

18. **The findings of the Mid-Term Review (MTR) undertaken during the last week of November 2017 confirmed that there are no outstanding fiduciary nor procurement issues.** Even though no environmental, social nor health and safety related issues have arisen, safeguards compliance was rated as Moderately Satisfactory since, per the findings of the MTR, there was room for improvement in the actual application of the preventive measures contemplated in the Environmental and Social Management Plan (ESMP). Corrective measures were identified during the MTR, particularly in the field of labor health and safety practices at *Las Esclusas* WWTP construction site (i.e., risk prevention measures for visitors, signaling of danger zones, compliance with the solid waste management program, improvement of sanitary measures, and installation of hydration areas), and have been satisfactorily applied by the contractor. Progress of the Project by component is summarized as follows.

19. **Component 1: Installation of household connections (US\$18.0 million, of which US\$2.8 million IBRD).** Original activities under this component aim to increase effective access to sewerage collection services in the southern districts of Guayaquil to 100 percent through the installation and rehabilitation of household connections. By end December 2017, the construction of 4,900 household sewer connections had been completed, approximately 21.3 percent of the revised end target (24,200 connections). All beneficiary households have signed certifications stating their satisfaction with work performed inside their property (piping to connect existing fixtures and appliances to the sewer network, sealing of existing septic tanks and refinishing of floors) and have received training on the proper use of sewer services. Beneficiary households are mainly located in the districts of *Guasmo Oeste*, *Guasmo Centro-Oeste* and the *Trinitaria* Island areas, which are among the city districts with the highest poverty rates⁴⁰. As part of the restructuring, US\$ 3.5 million will be reallocated from Component 2 to Component 1 of the original Loan Agreement (IBRD-8505-EC) to finance the extension of the network and the installation of household connections to get the 1,200 poor households of the *Cisne 2* neighborhood connected to the sewerage system.

20. **Component 2: Rehabilitation of sewerage network (US\$37.0 million, 100 percent IBRD).** Activities under this component aim at reducing infiltrations in the south sewerage subsystem by rehabilitating the sewerage network (including sections of the primary, secondary and tertiary network) in *La Chala* basin (*Suburbio Oeste*), which is riparian to the *Estero Salado* estuary, an important environmental asset of the city. These sewer network rehabilitation works are being performed using trenchless technologies to minimize negative impacts of construction activities on beneficiary communities. The corresponding construction contract was awarded on August 23, 2016 and, as of April 2018, 10 km of pipes have been rehabilitated, representing 28 percent of the end target. This value is below the interim target set at appraisal for 2017 (15 km), mainly due to higher than expected

⁴⁰ According to the 'Social Information System' of the municipal government of Guayaquil, in 2006, the *Trinitaria* and *Suburbio Oeste* districts were among the 30 districts of the city with the highest percentage of population living in extreme poverty (between 18 and 32 percent of the population) and among the seven districts with the highest percentage of population living below the poverty line (between 55 and 70 percent of the population).



groundwater infiltration levels in to La Chala sewerage network. However, the contractor has open additional construction fronts to make up for this delay, and the end target is still expected to be met by the end of 2019. As mentioned in the previous paragraph US\$ 3.5 million will be reallocated from this Component to scale up Component 1 results. This change will not have any impact on the expected results of Component 2 activities.

21. **Component 3: Wastewater treatment and disposal facilities (US\$161.0 million, of which US\$58.5 million IBRD).** Activities under this component aim to ensure adequate treatment of 100 percent of the domestic wastewater collected in the southern districts of the City of Guayaquil. They entail the construction of (a) *Las Esclusas WWTP*; (b) associated pumping and transmission facilities at *Guasmo-H* pumping station; (c) pumping and transmission facilities at the *La Pradera* pre-treatment station, (d) the construction of a sludge digester, and (e) the independent supervision of the construction of said facilities. The bidding process for the construction and independent supervision contracts of all key IBRD financed works under this component have been finalized, and construction activities are advancing without major deviations from the original schedule. The only major contract yet to be procured is the EIB-financed transmission pipeline that will convey wastewater arriving to the *La Pradera* pumping station to *Las Esclusas WWTP*. This delay is not expected to impact the finalization of *Las Esclusas WWTP* construction works, nor on IBRD disbursements related to this activity. However, it will delay the commissioning of this treatment facility, which, as per current plans, will happen by the end of May 2020. Nonetheless, this impact will be offset by the proposed extension of the project closing date required for the successful completion of AF financed activities.

22. **Component 4: Project management and administration, including communication plan and management of social, environmental, and safety issues (US\$5.4 million, of which US\$4.2 million IBRD).** The component aims at strengthening the Borrower's project management capacity. Specific activities that are being financed under this component include: (i) activities associated with overall project management, including those pertaining to the management of social, environmental and safety matters; (ii) project-related audits; (iii) monitoring and evaluation activities; (iv) office equipment and materials; (v) minor works required for the refurbishment of the PIU's office; (vi) technical assistance; and (vii) staff training.

23. **As part of Component 4, it was originally envisaged to also finance the development of a master plan for the management of the bio-solids generated in all WWTPs of the city;** and of an integrated urban water management (IUWM) study for the planning and development of flood control infrastructure in "*Sistema Tres*", a growing area of the city of Guayaquil. However, the findings of the MTR mission obviate the need to proceed with these activities since: (i) plans and agreements in place with authorities running the municipal landfill ensure an adequate mechanism for the disposal of treated bio-solids; and (ii) EMAPAG EP managed to liberate funds from their own resources to finance the development of the "*Sistema Tres*" IUWM study, which is already finalized. Instead, part of the liberated funds will be allocated to finance the technical designs and environmental and social management plans required for the construction of infrastructures prioritized by the mentioned IUWM study.

24. **Component 4 scaled up activities.** This component also initially considered the financing of the goods and services required to set up a system for the control of the water quality of the Guayas River and the Estero Salado estuary. Per Borrower's request, this water quality monitoring system, which is



already designed⁴¹, will be extended upstream all along the Daule River stream, which is the main source of drinking water for the city of Guayaquil. The scale up of this activity, which will have a regional impact and will serve all municipalities and authorities involved in the management of the Daule Basin, will be financed with the funds originally allocated to Component 4 activities that are now being dropped.

D. Description of the Additional Financing

25. **The proposed AF seeks to scale-up the Project's investments, expected results and impact.** Particularly, proposed AF activities will complement investments contemplated under Interagua's fourth 5-year investment plan as to ensure that, by 2023, 100 percent of the wastewaters generated by all 904.000 households located in the northeastern macro-wastewater basin are collected and appropriately treated. The AF will finance: (i) the costs associated with the extension of the sewer network to reach unserved neighborhoods of the northeastern basin of the City (Pascuales and Juan Pablo II); (ii) the installation of additional sewerage household connections as to reach a 100 percent sewerage service access ratio in areas of the northeastern basin covered by the sewer network⁴²; and (iii) the construction of wastewater collection, conveyance and treatment facilities to treat wastewater of the northeastern districts of the city as to meet applicable standards. The total cost of the additional financing is US\$ 239.6 of which US\$ 233.6 million will be financed by the IBRD and US \$ 6 million by the counterpart EMAPAG EP. Part of the sewer extension and pre-investment costs (including the preparation and development of feasibility studies, Environmental Impact Assessment Plan, final infrastructure designs, and expenses to compensate the owner of the property that will be affected by the construction of the access road to Los Merinos WWTP) is being considered as counterpart financing for the AF.

26. **The AF envisages scaling-up activities specifically in two of the original components.** The proposed AF will specifically finance: (i) the scale-up of household sewerage connections contemplated under Component 1; (ii) the scale-up of wastewater treatment and disposal facilities construction activities under Component 3; and (iii) incremental project management costs under component 4, associated with the scaling up of Component 1 and 3 activities. Changes in activities and budget allocation under Component 2 are not being sought at this point.

E. Scale-up of Component 1: "Installation of household connections" (Additional US\$19.5 million, US\$14.1 million of IBRD loan financing)

27. **The scale-up of activities under this component will increase effective access to sewerage collection services in the city of Guayaquil.** The AF will finance costs associated to the installation of

⁴¹ The designed water quality monitoring system envisions the implementation of 12 remote stations (equipped with sensors to monitor for the physical/chemical parameters of water) and the definition of a central office where transmitted data from all stations will be stored, processed, analyzed and disseminated. The monitoring network has been designed to operate as an automated remote information system in which all parameters will be measured continuously while an alert system that will indicate if measured parameters exceed established thresholds in near-real time. The system will be implemented in four stages with an estimated cost of US \$ 2.5 million (Phase I and II) and an additional US\$1.8 million for Phase III and IV. The Project will finance the rollout of Phases I and II during 2019 and 2020.

⁴² All northeastern neighborhoods except for certain areas of "Inmaconsa" and "Flor de Bastion", where the network will be extended and households connected by Interagua through its fourth 5-year investment plan.



additional household connections and extension of the sewerage network in northeastern districts of the city. In the northeastern wastewater basin of the city, 94 percent of the households are in areas covered by the sewer network but just 91 percent are connected to the service. Most of the 4,620 families that are not connected despite having a sewer main running in front of their houses are poor households located dispersedly across different neighborhoods in this area, Flor de Bastion, Cooperativas Varias, Bastion Popular and Vergeles, and their toilets usually discharge directly to poorly constructed and maintained pits or septic tanks. As per the findings of the social survey conducted neighborhoods benefiting from Component 1 activities of the Project, most of the families that have not been connected despite having the possibility and the legal mandate to do so, is mainly because of financial constraints⁴³, technical issues⁴⁴, or lack of information about their entitlement to enjoy a social tariff and/or about livelihood benefits derived from the enjoyment of an enhanced sanitation solution.

28. **To achieve this objective, household connection costs -including the cost of indoor works like piping, flooring and sealing the septic tank– will be partially subsidized and financed by EMAPAG EP.** Clients will pay to EMAPAG EP the nonsubsidised segment in installments through the water bill (approximately US\$ 0.25 per month for 5 years). In parallel, a communication campaign will be launched to inform the beneficiaries about this initiative and its benefits and to promote improved hygiene and maintenance practices required to ensure the proper use and functioning of the sewer system. The design of this component, was developed based on previous successful experiences with connection campaigns led by EMAPAG EP, which managed to increase effective access to piped sanitation up to 98 percent in other districts of the city with high poverty rates. The design of sewer connectivity activities to be developed under the AF may be subject to some minor adjustments as to take into consideration the lessons learned through the implementation of the Project to date. These lessons are summarized in table A2.1 below.

Table A2.1: Lessons learned from the implementation of sewerage connectivity activities under the Project

Category	Lessons Learned
General	Proposed solutions must respond to client/user demand to assure that their expectations are met.
Technical	Standard solutions should be promoted, while allowing for enough flexibility to accommodate for specific household needs and realities. A budget item should be considered to cover contingency and unforeseen expenditures, such as the potential need for longer pipes, additional accessories and inputs for sealing septic tanks.
Social	To prevent potential lack of coordination between the contractor and the social management team, responsibilities for conducting the technical census and having the agreement of adhesion signed by benefiting households should be transferred to the contractor. The final certificate of satisfaction and supervision activities should remain responsibility of the social consulting firm. Facilitate to the firm responsible for social management activities under the AF the documentation summarizing the outcomes of communication and citizen engagement activities

⁴³ The cost of the connection fee is US\$ 600 and includes the cost of emptying and sealing of the septic tank or other on-site sanitation solution.

⁴⁴ Toilets mostly located at the back of their houses or at a lower level than the condominial sewer branch.



performed under the Parent Project.
Undertake beneficiaries’ satisfaction surveys after completion of the works.

Environmental Incorporate improved measures to control impacts related to dust generation, not only for the works performed in streets, but also inside houses, particularly for cases when thick concrete slabs should be cut to install the piping.

Safety Specific health and safety measures should be incorporated, particularly in homes with the presence of children that require digging deep trenches to install piping or where a septic tank must be sealed.

Safety Safety measures in homes must be reinforced during the initial communication campaigns and at the beginning of IA.

In areas of high crime rates, the contracting of security is recommended, hiring people from the same area to protect workers as well as equipment and materials.

29. **The AF will also finance the extension of the sewer network to serve households of the northeastern wastewater basin located in neighborhoods currently outside the service area.** Component 1 of the AF will finance the extension of the construction of the sewer network in residential areas of the Pascuales district, as well as the installation of the household connections to reach 100 percent household connectivity rate in this district, i.e. 6,455 households.

30. **Households neighboring Los Merinos WWTP will also be connected to the sewer system.** Juan Pablo II is an informal settlement comprising 131 households located between the “*Terminal Terrestre – Pascuales*” highway and the plot where currently the Sauces-Alborada and the Guayacanes-Samanes wastewater stabilization ponds are located, which will be partially decommissioned to build in their place the Los Merinos WWTP (see section B for more details on this). The land where this informal settlement and treatment facilities sit, belongs to the Ecuadorian Housing Bank, a State-owned financial institution which has granted the right of usufruct of land to EMAPAG EP. As per local regulations, no municipal infrastructure investments are made in informal settlements. As such, Juan Pablo II streets are not paved, there is no sewer network and the population gets water at the household level through hoses connected to three public fountains. The municipal government is working on granting to the residents of Juan Pablo II property rights over the land where their houses are located, and Interagua will install the drinking water network in the area once this is done. The AF will finance the expansion of sewer network and household connections to serve these 131 families. Juan Pablo II will also benefit from the construction of Los Merinos WWTP and the decommissioning of the stabilization ponds, as the technology proposed for Los Merinos will significantly reduce odor emission as compared to existing treatment facilities.

31. **Scale-up activities in this component and sewer related investments contemplated under Interagua’s fourth 5-year investment plan will bring up access rates virtually to 100 percent in the northeastern basin of the city.** The table below summarized the expected results of the activities proposed for the scope of Component 1 of the AF.



Table A2.2: expected AF Component 1 outcomes detailed per neighborhood of intervention

Neighborhood	Extreme poverty incidence in 2006 ⁴⁵	Type of intervention	Household connections
Cooperativas Varias	10	Household connections	2,000
Bastion Popular	35.8	Household connections	1,000
Vergeles	24.3	Household connections	1,000
Pascuales	23.4	Sewer expansion + household connections	8,750
Juan Pablo II	Non- available	Sewer expansion + household connections	131
Totals			17,870

F. Scale up of Component 3: “Wastewater treatment and disposal facilities” (Additional US\$ 217.3 million, 100 percent IBRD loan).

32. **Unlike in the Southern wastewater basin where the Project is intervening, a large share of wastewaters currently collected in the northeastern basin is currently receiving some kind of treatment, but effluents discharged to the Daule river and not meeting applicable environmental standards.** The northeastern wastewater macro-basin of the City is integrated by eleven sub-basins. Wastewater collected in each of these sub-basins is conveyed to one of the five wastewater treatment facilities that currently exist in this area:

- (i) The Progreso preliminary treatment plant, serving a total area of 3,205 hectares and receiving between 1,600-1,700 L/s, is equipped with a mechanized pre-treatment and a disinfection system that is presently out service;
- (ii) The Sauces-Alborada stabilization ponds, serving a total area of 996 hectares and receiving 574 L/s, conformed by a set of anaerobic, facultative and maturation ponds;
- (iii) The Guayacanes-Samanes stabilization ponds, serving a total area of (4,896 hectares) and receiving 1,200 L/s, conformed by a pretreatment system, aerated, facultative and maturation ponds;
- (iv) The Orquideas facultative ponds; serving an area of 142 hectares; and
- (v) Mucho Lote facultative and maturation ponds, serving a total of 842 hectares.

33. **All these treatment facilities discharge to the Daule river through their respective subaquatic outfall and are currently working above their design capacity.** Consequently, contaminants concentrations in their treated effluent do not comply systematically with applicable environmental regulations, going often above the authorized 100 mg/l threshold established for Biological Oxygen

⁴⁵ As per calculations of the Social Action and Education Directorate of the Municipality of Guayaquil, using 2006 data and measured using the unsatisfied basic needs index



Demand (BOD) and total suspended solids (TSS). Moreover, the anaerobic conditions under which the Sauces-Alborada and Guayacanes-Samanes stabilization ponds work, generate odor contamination that affect the neighboring community of Juan Pablo II and certain areas of San Borondon, an urban area located at the other shore of the Daule river.

34. **The 2011 Master Plan and the associated feasibility studies developed in 2014, analyzed different alternatives to collect and treat 100 percent of the domestic wastewaters generated in the north subsystem, as to meet applicable environmental standards.** The analysis of alternatives and selection of site locations for the treatment plant was conducted in 2004 as part of the Master Plan for Water Supply and Sewerage Services of Guayaquil, which was updated in 2011. This analysis concluded that the most advantageous solution would imply concentrating and treating all wastewater flows generated in the northeastern subsystem in a new treatment facility to be built in the current location of the Sauces-Alborada and Guayacanes-Samanes stabilization ponds. This would in turn imply: (i) transforming the Progreso preliminary treatment station into a pumping station; (ii) building a transmission pipeline from Progreso to the new treatment facility (Los Merinos WWTP); and (iii) decommissioning the Sauces-Alborada and Guayacanes-Samanes stabilization ponds. This analysis was revisited as part of the feasibility study developed in 2014, reaching the same conclusion.

Table A2.3: Existing wastewater treatment systems in the northeastern basin

Sub-basin name	Sub-basin Area	Sub-basin Population	Sewer coverage	Treatment facility	Number of months in FY16 with average BOD > 100 mg/l	Number of months in FY16 with average TSS > 100 mg/l
Progreso	3,205	191,871	Yes	Progreso	5/11	3/12
Garzota	184	12,325	Yes	Sauces - Alborada	0	3/12
Alborada	811	131,484	Yes			
Guayacanes	324	37,545	Yes	Guayacanes - Samanes	N/A	N/A
Guayacanes-Samanes	2,779	294,783	Yes			
Flor de Bastion	634	69,410	Yes			
Pascuales	317	43,379	Partial			
Mucho lote II	842	8,425	Yes	Mucho Lote	9/12	10/12
Mucho Lote	206	34,314	Yes			
Orquideas	142	18,126	Yes	Orquideas	4/9	1/9
Inmaconsa	1,553	62,875	No	None	N/A	N/A

35. **The feasibility study also analyzed different technological alternatives for the design of Los Merinos WWTP.** The Chemically Enhanced Primary Treatment (CEPT) option⁴⁶ was retained since it

⁴⁶ The technical solution retained for Los Merinos WWTP comprises: (a) *Wastewater Train*: Influent pumping station, coarse screens, fine screens, grit chambers, pre-aeration & flocculation tanks, chemical dosage, primary clarifiers, (only for optional use and for part of the total flow: aerated lagoons with 2 stages in series), chlorine contact tanks,



allows to consistently meet the regulatory authorized limits set for the TSS, BOD and other relevant pollutant concentrations and eases the implementation of effective odor control measures. Moreover, the CEPT technology has extensively and successfully been adopted worldwide in municipal wastewater treatment plants of similar size, which effluent does not require a complex treatment process, considering effluent characteristics, applicable wastewater discharge standards and the dilution capacity of receiving water body. However, Los Merinos treatment facility is being designed to allow for a secondary treatment system to be incorporated into the treatment process in the future, should it be required. The feasibility study included the thorough analysis of secondary treatment process alternatives, including aerobic and anaerobic processes. The retained design also contemplates the construction of a sludge digester with energy co-generation.

36. **In this context, Component 3 activities of the AF will consist on:** (i) the transformation of the Progreso preliminary treatment plant into a pumping station collecting all wastewaters generated in north-center districts of the city (1,920 l/s) and pumping them to the new Los Merinos WWTP; (ii) the construction, using trenchless technologies, of the Progreso – Los Merinos wastewater transmission pipeline (1,100 mm of diameter, 5 Km. long); (iii) the decommissioning of the Sauces-Alborada and Guayacanes-Samanes stabilization ponds, which are currently overloaded; and the construction of the new Los Merinos WWTP, which will be designed to manage an average flow in dry and wet seasons of 4.0 m³/s and 4.9 m³/s, respectively; (iv) the construction of a sludge digester equipped with a co-generation facility to produce electrical energy; and (v) the procurement of specialized independent supervision services for the construction works described above.

37. **Sludge management.** Depending on working conditions and on actual contaminants concentrations of the raw wastewater, the treatment and sludge management process may generate up to 120 tons per day of biosolids that will be disposed in the municipal landfill. The landfill is currently receiving and managing over 4,500 tons of solid waste per day, so the volume arriving from the WWTP represents a minimal addition to the existing capacity. An agreement to dispose of the biosolids is under negotiation between EMAPAG EP and the company running the municipal landfill, which has all required environmental permits to receive this type of waste. The primary sludge generated from the wastewater treatment process will be pressed, dewatered and stabilized before transportation and final disposal at the sanitary landfill.

G. Additional resources under Component 4 to fund incremental project management costs (additional US\$2.8 million, US\$2.2 million IBRD).

38. AF resources will serve to finance incremental project management costs associated with the broader scale of Project activities and extended timeframe allotted for their completion. These include project supervision, M&E, safeguards management, procurement and financial management costs.

H. Social safeguards related aspects of the AF

39. **There are no indigenous people present in the project area that meet the criteria defined by the**

subaquatic outfall to Río Daule. (b) *Sludge Train*: screening, gravity thickeners, anaerobic sludge digesters, sludge buffer tank, sludge dewatering. (c) *Biogas Train*: biogas holder, biogas treatment, combined heat and power (CHP) production.



policy. According to the 2010 census, less than 1.4 percent of the population of Guayaquil identify themselves as indigenous. This population is not concentrated in the project area nor do they have a collective attachment to land which is used for urban residential or industrial purposes. Therefore, the Bank's operational policy on Indigenous Peoples OP 4.10 is not triggered.

40. **The Bank's operational policy on Involuntary Resettlement OP4.12 is triggered as a privately-owned house will be partially affected by the construction of Los Merinos WWTP access road.** Juan Pablo II is an informal settlement comprising 131 households located between the "*Terminal Terrestre – Pascuales*" highway and the plot where currently the Sauces-Alborada and the Guayacanes-Samanes wastewater stabilization ponds are located, which will be partially decommissioned to build in their place the Los Merinos WWTP. The land where this informal settlement and treatment facilities sit belongs to the Ecuadorian Housing Bank, a State-owned financial institution which has granted the right of usufruct of land to EMAPAG EP. The construction of the access road to the treatment facility will require to demolish a one-story structure attached to a three-story house. A new ARAP was developed to capture resettlement impacts of AF activities, and the resettlement compensation and assistance measures and implementation arrangements required as to meet the requirements of OP 4.12. The ARAP describes how the affected property was valued at replacement cost using market comparators.

41. **Activities planned under Component 1 of the AF (domestic connections and sewer lines) will not result in any resettlement impacts anticipated under OP 4.12.** The extension of the sewer network in the Pascuales area is not designed yet. Construction activities include the opening of shallow trenches in sidewalks to install condominial sewer lines, and deeper trenches in certain main streets to install sewer mains. The Project will finance both the designs and the construction of these works. To avoid and mitigate limiting access to businesses, metal sheets over the trenches will be used to ensure full access to business during construction. In addition, a Community Relations Plans for Construction will be included as a requirement to contractors in the bidding documents. Since there is uncertainty on how the final design could affect this area and timing, the corresponding ESMF will consider measures to mitigate potential impacts on local business, such as: (i) on going consultation and information with business; (ii) alternative access roads to the area; (iii) additional signaling like "We are open for business" signs; and/or (iv) additional parking areas with security.

42. **Grievance Redress Mechanism.** During the midterm review of the Project, the design and use of the tiered grievance redress mechanism (GRM) employed for the Project activities was assessed. This assessment concluded that: (i) the GRM in place should be enhanced as to contemplate contractors' obligation to install citizen attention and information points, at all construction fronts opened in public spaces, ensuring that they are properly identified as such with signals; and (ii) that, while complains and requests received seem to be properly registered, actual activities performed to resolve open cases are poorly recorded and documented. To address these issues: (i) the GRM has been modified to incorporate the above-mentioned contractors' obligation; (ii) a standard GRM case registration form has been developed by the Borrower with World Bank assistance; and (iii) the PIU safeguards management team has been reinforced with the hiring of a project-dedicated social management specialist. The revised GRM document has been included in the Environmental and Social Management Plans (ESMPs) and in the Project OM and is posted in EMAPAG EP's website, alongside with contact information for responsible parties and for addressing concerns.

43. **Citizen engagement.** EMAPAG EP will continue to implement a comprehensive citizen



engagement program for Component 1. This will include a series of socialization meetings at the neighborhood level, followed by targeted training and communication campaigns on the benefits of getting connected to the sewer system and on how to properly use the service; and a program of social certification of the works completed inside benefiting households.

44. **Gender.** Previous experiences in poor urban settlements of Guayaquil and other Latin American cities, have shown the importance of having women within beneficiary communities leading the intense social management activities required to ensure the success of sewer connectivity programs. Women constitute often the largest share of participants in these citizen engagement activities as mostly they are present at home and/or the neighborhood at the time sewer connectivity works are likely to take place. As such, activities under the AF will actively target the participation of women and account for gender-based priorities with regards to the benefits from the investment as well for communicating about the AF's activities. Moreover, Component 1 social mobilization teams will be mainly comprised of women. Most of the beneficiary households are located in informal poor urban settlements with high criminality rates. The female majority of the audience targeted by citizen engagement activities is therefore likely to feel more comfortable interacting with the Project if messages are conveyed by other women they know from their own neighborhood. Component 1 results indicators will include one on the number of women employed for the social mobilization team and gender disaggregated information on the beneficiaries of Component 1 activities.

I. Environmental safeguards related aspects of the AF

45. **The City of Guayaquil is surrounded by the Daule and Guayas Rivers on the East and by the Estero Salado Estuary on the West.** The Guayas River and its tributaries form the largest watershed in South America draining into the Pacific Ocean, with an extension of 32,130 km² partially covering eight provinces of the country. The Guayas River rises at the intersection of the Daule and the Babahoyo, located 5km north of the city, and has a flow that varies from 230 m³/s in the dry season (60 percent coming from Babahoyo) to 1500 m³/s during the rainy season (66 percent from Babahoyo). Due to its proximity to the ocean, at the vicinity of Guayaquil, the Guayas presents the characteristics of an estuary: its water is saline (with a salinity range of 5,000 -10,000 mg/l) and its actual flow, influenced by the tides ebb and flow patterns, varies from -15,000 to +15,000 m³/s during the cycle. The Guayas River is affected by several wastewater discharges and other pollution sources (e.g., storm water runoff) upstream of the Project location with none or very limited treatment.

46. **The wastewater collection and transportation network of Guayaquil serves approximately 2,005,000 people** through a sewer network composed of 4505 km of sewer mains and 70 pump stations that drains primarily into the Daule and Guayas Rivers. The sewer network of the city comprises four urban wastewater macro-basins, being the main ones in terms of population size (i) the southern-center basin, with approximately 1.2 million inhabitants, and where 100 percent of the wastewater generated will be achieved by 2020 thanks to the parent project, along with universal access to wastewater collection services (discharging to the Guayas river); (ii) the northeastern basin, with around 0.9 million inhabitants, and where AF financed activities will be concentrated (discharging to the Daule River). AF Component 1 activities (sewer expansion and household connections installation) will benefit poor households of Cooperativas Varias, Bastion Popular, Vergeles, Pascuales and Juan Pablo II districts. All of these districts are at the interior of the city with the exception of Pascuales and Juan Pablo II, which are riparian to the Daule River. AF Component 3 will finance the decommissioning of the Sauces-Alborada and Guayacanes-



Samanes stabilization ponds, and the construction in the same plot, riparian to the Daule River, of Los Merinos WWTP.

47. **The Project continues to be classified as Category A per OP 4.01 Environmental Assessment due to the nature and size of the works to be financed under component 3, i.e. the construction of Los Merinos WWTP.** AF financed works under Component 1, particularly the extension of the sewerage network in the Pascuales district, have relatively moderate potential negative environmental impacts and can be readily mitigated with standard measures. The overall Project impact is expected to be positive due to the improved effluent quality that will be discharged into the Daule and Guayas Rivers and the reduction of wastewater that is presently getting infiltrated from poorly constructed septic tanks existing in households of the northeastern wastewater basin of the city that are not yet connected to the sewer network. The effluent quality from the Los Merinos WWTP to be financed under the AF will allow compliance with current environmental regulations in Ecuador. EMAPAG EP has planned for the future expansion of the WWTP if it is required by the Ecuadoran environmental regulations later during the life of the Project.

48. **The main expected positive impacts of the activities to be financed under the AF are:** (i) improvement in the public health conditions in the city of Guayaquil thanks to the expected reduction of the contamination of the Daule river; (ii) recovery of the ecosystems of the Daule and Guayas River through the improvement of the landscape and the preservation of its flora and fauna; (iii) Improvement in the quality of life of the communities neighboring the current treatment system (Sauces-Alborada and Guayacanes-Samanes stabilization ponds), due to the elimination of offensive odors that have been present for several years; and (iv) reduction of ground water contamination.

49. **There is no anticipated negative large scale, significant or irreversible environmental impacts.** Main environmental risks relate to potential failure of the WWTP to properly operate (which would result in impacts similar to the present conditions), failure to properly dispose of biosolids from the WWTP, and failure to adequately mitigate environmental and social impacts on local population during construction of sewer networks in the Pascuales district.

50. **Depending on working conditions and on actual contaminants concentrations of the raw wastewater, Los Merinos WWTP may generate up to 120 tons per day of primary sludge,** which will be digested and disposed in the existing municipal landfill, which is currently handling 4,500 tons of waste per day. An agreement has already been reached between EMAPAG EP and the consortium running the landfill Las Iguanas, which has all the required environmental permits to receive this type of waste. The landfill has the capacity to receive municipal waste, including the expected volume of sludge during the operation of the WWTPs of the city (Las Esclusas y Los Merinos).

51. **The main significant impacts in the construction phase are:** urban congestion and traffic, temporary changes in the fluvial dynamics of the Daule river, noise during foundations and piloting, the excavation of wells for the construction of the line of impulsion and increase of vehicular traffic. The required environmental and social management plans have been developed, identifying measures to mitigate these potential impacts.

52. **In the area of the project there are strong precipitations during the winter, which added to the increase of the tide of the Daule River, bordering the place; could cause flash floods inside the facilities.** The tidal conditions in Guayaquil change every 12 hours, with differences of approximately 3 m between



the high and low levels. In the designs, the necessary works have been planned to protect the installations from the risk of flooding.

53. **An Environmental and Social Impact Assessment (ESIA) has been developed for Los Merinos WWTP and ancillary facilities.** The ESIA includes an assessment of impacts, including mathematical modeling of potential odor and downstream water quality impacts during plant operation, and an ESMP. Alternative analyses in terms of WWTP technological and design options and site locations were conducted as part of the regional water planning work, the WWTP feasibility study and Project design, and the ESIA. The analysis of alternatives and selection of site locations for the treatment plant was conducted in 2004 as part of the Master Plan for Water Supply and Sewerage Services of Guayaquil, which was updated in 2011 (see appendix 1 for more details).

54. **The ESIA include an ESMP comprising 18 programs,** namely: plan for prevention and mitigation of environmental impacts; waste management plan; plan for the restoration of degraded areas; plan for the decommissioning of Sauces-Alborada and Guayacanes-Samanes wastewater treatment facilities; occupational health and safety plan; community engagement and communication plan; training and environmental education plan; ecological management plan for Canal 16; construction camp management plan; traffic management plan; involuntary resettlement plan; management plan for environmental liabilities; contingency management plan; abandonment plan; and environmental monitoring plan. Other ESMPs that have been elaborated are: social & environmental management plan for the sewer connectivity program activities; and social & environmental management framework for Los Pascuales sewer extension activities.

55. **Los Merinos WWTP ESIA was disclosed and consulted locally in February 2018, and included a formal public audience and informal informative meetings.** Comments received were addressed in an updated ESIA. The ESMP for Component 1 activities were also consulted in the beneficiary neighborhoods in February 2018, and comments were incorporated in the final versions of the documents. The final version of the ESIA and Component 1 ESMP and ESMF will be disclosed in the Bank's external website on April 2018, before the appraisal mission.

56. **Implementation arrangements will remain unchanged, but the safeguards management team within the PIU will be reinforced as to ensure the required capacity to manage scaled-up investments.** The PIU established under EMAPAG EP's General Manager will continue being responsible for day-to-day Project implementation and overall coordination, procurement, financial management, as well as for management and supervision of the results framework, monitoring, and Project M&E. The PIU functions with its own general coordinator and is staffed with technical and fiduciary specialists as well as dedicated environmental and social safeguards staff, with support from EMAPAG EP (particularly from the Finance, Legal, and Social Directorates). Nevertheless, on the safeguards management front, the PIU will be strengthened as to create a safeguard management structure integrated by (i) a Senior Environmental Specialist with experience managing health and safety issues of major infrastructure construction projects, who will coordinate all the aspects related to compliance with Safeguards Policies; (ii) an environmental specialist that will assist the safeguards coordinator in the preparation of performance reports and ensuring compliance with applicable environmental regulations; (iii) a senior health and safety management specialist with experience in the supervision of major civil works; and (iv) a social management specialist who will coordinate compliance with Social Safeguard regulations.

57. **The operation and maintenance of the Project, once constructed, will be the responsibility of**



Interagua, which is the private consortium to which EMAPAG EP has delegated the management of Guayaquil's drinking water, wastewater and drainage systems. Interagua has environmental staff, experience managing wastewater treatment facilities and its management system is ISO 14001, ISO 18001 and ISO 9001 certified. Specific details on environmental and social safeguards responsibilities and supervision has been established in the Project's Operational Manual.

58. **All bidding documents for civil works will have embedded environmental and social clauses**, in order to enable contractors to follow up on environmental and social due diligence and to mitigate the anticipated negative risks and impacts. A Supervising Consultant Firm will be hired by the project to oversee the construction works (including implementation of environmental and social measures by the constructor) on behalf of the PIU.



ANNEX 3: STUDY OF ALTERNATIVES AND CHOICE OF TECHNOLOGY FOR THE LOS MERINOS WWTP

1. As part of the Feasibility Study developed in 2014 for the treatment of the wastewater generated in the city of Guayaquil, an analysis of both the optimum number of WWTPs and of alternative technologies was undertaken for the treatment of the wastewater flows collected in its largest sub-catchment, called Los Merinos or Northeastern sub-system.
2. For the analysis of **optimum number of WWTPs** in the Northeastern sub-system two options were taken into consideration in the Feasibility Study: (a) Two WWTPs, with one at Progreso (1.1 m³/s) and another one at Merinos (2.3 m³/s); (b) A single WWTP at Merinos (3.4 m³/s), which also implicated a 5 km pressure line, diameter 48", and Wastewater Pumping Station with 1.1 m³/s capacity. For the comparison of those options a multi-criteria assessment was applied that considered 9 factors: Capex, Opex, land availability, urban impacts of sludge management, impact of treated discharges on receiving water bodies (Rivers Daule and Guayas), impact of construction of necessary pressure lines and pumping stations, urban impact of sludge transport, use of existing installations and works, vulnerability. For the weighting, Capex and Opex received 25 percent of total weight each, while the 7 other factors received a total weight of 50 percent. The outcome favored quite clearly option (b); hence a single WWTP at Merinos was recommended.
3. For the selection of the **optimum treatment technology** it was distinguished between 'primary treatment' and 'secondary treatment'. This facilitates a stage-wise implementation of the WWTP, based on the strategy that the employed 'primary treatment' should be able to match the actually prevailing discharge standards, which are relatively relaxed⁴⁷. Whereas the 'secondary treatment' should then be able to match stricter (hypothetical) future requirements. This 'secondary treatment' will not be constructed at the present first stage of implementation, but its feasibility will be granted.
4. For the evaluation of '**primary treatment**' two possible technologies were defined and analyzed: Chemically Enhanced Primary Treatment (CEPT), and Rotary Fine Sieves (RFS). The former technology employs the dosage of chemicals (FeCl₃ and polymers) to enhance primary sedimentation efficiencies. Such an approach not only eliminates the conventionally settleable primary sludge, but it also removes a considerable part of colloidal matter present in the raw wastewater. The latter RFS technology employs 2-stage screening and sieving, with the second sieve stage having circular openings of just about 1 mm. Both technologies have already been implemented at large municipal WWTPs in Latin America. The detailed analysis concluded that RFS would not be able to safely meet the BOD₅ limit of 100 mg/L. Even additional dosage of chemicals to the RFS stage was considered uncertain in delivering the expected effluent quality. On the other hand, it turned out that CEPT will not require permanent dosage of chemicals. Particularly in the initial years of operation, roughly up to the year 2025, it is expected that no or just low quantities of chemicals shall be needed to meet the expected effluent quality. This enables ample room for operational optimization and substantial Opex reduction. – In conclusion, CEPT was

⁴⁷ The 'Norma de Calidad Ambiental y de Descarga de Efluentes: Recurso Agua' (NCADE) sets the maximum limits for effluent quality at: BOD₅ = 100 mg/L; COD = 200 mg/L; SST = 130 mg/L; Fat & Grease = 30 mg/L; NH₄-N = 30 mg/L; P = 10 mg/L; detergents (SAAM) = 0.5 mg/L; Total Coliforms = 2000 MPN/100 mL.



evaluated more efficient and financially advantageous, as compared to RFS technology. Hence CEPT was recommended for implementation.

5. For the evaluation of '**secondary treatment**' a multi-criteria analysis was applied, based on the recommendations of the 'Water Environment Federation' (WEF) in its guidelines for the 'Design of Municipal Wastewater Treatment Plants'⁴⁸. The selected approach comprises the following three steps:

- (a) *Identification of alternative technologies*: For this step a total of 19 technology options for secondary treatment were defined. These options ranged from various types of Activated Sludge technologies (both of flow-through and SBR type), to Trickling Filters, Rotating Biological Contactors (RBCs), Membrane Bioreactors, different types of Biofilters, various combinations of Activated Sludge with Trickling Filters, Facultative Lagoons, and Aerated Lagoons.
- (b) *Qualitative screening* of alternative technologies according to six criteria: competitiveness of Capex and Opex, probability of successful operation under the conditions prevailing in Guayaquil, demonstrated international references in facilities of similar scale, availability of the necessary land, and adaptability to the local context. The following three technologies were rated best in this screening: Conventional Activated Sludge (CAS), Trickling Filters (TF) with plastic media, and the Trickling Filter / Solids Contact (TF/SC) process.
- (c) *Quantitative comparative analysis* and selection of the preferred technology: The three pre-selected alternatives were first pre-dimensioned, applying the BioWin™ software. This permitted to define necessary reactor volumes, expected effluent quality, minimum land footprint, and a quantification of sludge production. Subsequently the alternatives were subjected to 8 criteria that had been agreed and weighted mutually by INTERAGUA, ECAPAG and the Consultant. Those criteria and their weighting were: Capex (20%), Opex (20%), ease of operation (7.5%), operational reliability (10%), flexibility to adjust to future discharge standards (12.5%), land requirements (7.5%), risk of bad odor emissions (12.5%), and quantity of biosolids (10%). The sensibility of those criteria was also analyzed. Based on the outcome of that analysis the Trickling Filter technology was recommended as optimum 'secondary treatment' technology.

6. As explained, the original Feasibility Study had been done in 2014. Since then two key issues had changed and were agreed: final adjustments of Los Merinos WWTP's catchment, and an extension of the design horizon from 2030 to 2045. Hence an **update of the Feasibility Study** was prepared recently in March 2017. The outcome showed that the relevant design input values for Los Merinos WWTP were subject to only marginal changes. This is due to two opposing trends of similar order of impact on flow rates and pollution loads: on one side the catchment area was reduced by about 1664 hectares, and on the other side the wastewater production rates and population numbers increase during the additional

⁴⁸ Design of Municipal Wastewater Treatment Plants (2010), WEF Manual of Practice No. 8, ASCE Manuals and Reports on Engineering Practice No. 76, Fifth Edition. Prepared by the Design of Municipal Wastewater Treatment Plants Task Force of the Water Environment Federation and the American Society of Civil Engineers/Environmental and Water Resources Institute.



15 years. Further, the update also permitted to consider the wastewater quality data collected in the period 2015-2016.

7. The **revised / updated key design parameters** for Los Merinos WWTP in the year 2045 are: average dry weather flow rate = 4.0 m³/s; average stormwater weather flow rate = 4.9 m³/s; peak flow = 9.0 m³/s; influent BOD₅ concentration = 210 mg/L, influent BOD₅ load = 72.6 tons/d; influent TSS concentration = 165 mg/L, influent TSS load = 57.0 tons/d. The quoted pollution concentrations and loads prevail for dry weather conditions; during wet weather conditions they increase by about 9-10 percent due to additional infiltration effects.

8. The **key technology components** of the finally suggested treatment trains of Los Merinos WWTP are: (a) *Wastewater Train*: Influent pumping station, coarse screens, fine screens, grit chambers, pre-aeration & flocculation tanks, chemical dosage, primary clarifiers, (only for optional use and for part of the total flow: aerated lagoons with 2 stages in series), chlorine contact tanks, subaquatic outfall to Río Daule. (b) *Sludge Train*: screening, gravity thickeners, anaerobic sludge digesters, sludge buffer tank, sludge dewatering. (c) *Biogas Train*: biogas holder, biogas treatment, combined heat and power (CHP) production.

9. **Disposal of biosolids.** The sludge management process described above generates an average of about 125 tons biosolids per day that will be transported and disposed at the municipal landfill. The standard that must be met by the sludge to be received at the landfill is a maximum humidity of 75 percent; that is the sludge needs to be dewatered to at least 25 percent DS (dry solids). To be on the safe side, the design of the sludge installations is hence for dewatering to 27 percent DS. The landfill is currently receiving and managing over 4,500 tons of biosolids per day, so the volume arriving from the Los Merinos WWTP represents a minimal addition to the existing capacity. The municipal landfill has all the required environmental permits to receive this type of waste.

10. **Some aspects of the project were further detailed** and optimized in the Feasibility Study update in 2017, such as: (a) Control and treatment of odor emissions, including a dispersion model development; (b) Geotechnical aspects, particularly related to the foundation of works; (c) Layout of aerated lagoons for optional post-treatment of CEPT effluents; (d) architectural aspects.

11. The Feasibility Study update in 2017 also permitted to revise some **coordination activities with other projects**, which are particularly important for the construction works: (a) The project for the new bridge Guayaquil – Samborondón – Daule (GUSAMDA) had meanwhile been further developed, and could thus be incorporated in more detail into the layout of Los Merinos WWTP. (b) Alignment, cross section, and specific structures (inlet, flow metering, access, outlet) of the 'Canal 16', which crosses about 480 m through the WWTP premises, conducting stormwater to the Río Daule.



ANNEX 4: PPSD – EXECUTIVE SUMMARY OF PROCUREMENT STRATEGY

1. **General.** Procurement for the proposed Project will be carried out in accordance with the “World Bank Procurement Regulations for Borrowers under Investment Policy Financing” dated July 1, 2016 and revised November 2017. As per the requirements of the World Bank Procurement Regulations, the first draft of a comprehensive Project Procurement Strategy for Development (PPSD) was carried out and identified the appropriate selection methods, market approach and type of review by the World Bank. The objective was to improve procurement efficiency. An acceptable Procurement Plan was also prepared and is included here below.
2. **Relevant legal and regulatory framework.** Article 3 of the Organic Law on the National System for Public Procurement states that all contracts financed through loans and international cooperation grants will be ruled by the condition established in the corresponding loan and grant agreements. Aspects not regulated by World Bank Procurement Regulations framework could be complemented with provisions included in the Public Procurement Local Law. This will be agreed in the Project's operational manual.
3. **The influence of the economic context.** In the current context of economic crisis and ongoing fiscal consolidation under which national public infrastructure investments opportunities are scarce, AF procurement processes are likely to generate significant interest in the construction and the engineering consulting services' industries, particularly taking into consideration the solid fiscal situation enjoyed by the municipality of Guayaquil as compared to other public authorities in the country. On the other hand, the fact that Ecuador is a dollarized economy; that IBRD is financing and supervising procurement aspects of the project, and the complexity and size of some of the works to be contracted are likely to attract sophisticated international construction and engineering firms. Taking into consideration the relatively high inflation rates registered during the last years -ranging from 2 to 5 percent, price revision formulas may have to be considered for certain construction contracts to be financed through the AF, depending on the nature of the works, the size of the contract and their duration.
4. **Procurement institutional Arrangements.** Implementation arrangements will remain unchanged, but the PIU team will be reinforced as to ensure the required capacity to manage scaled-up investments. The PIU established under EMAPAG EP's General Manager will continue being responsible for day-to-day Project implementation and overall coordination, procurement, financial management, as well as for management and supervision of the results framework, monitoring, and Project evaluation. The PIU functions with its own general coordinator and is staffed with technical and fiduciary specialists as well as dedicated environmental and social safeguards staff, with support from other units and directorates of EMAPAG EP (particularly from the Finance, Legal, and Social Directorates). As for the Parent Project, a contract manager will be hired to manage each of the main construction contracts that will be implemented under the AF. The probity advisor that was hired by the Borrower to oversee and provide advise related to certain sensitive procurement process, will continue supporting EMAPAG EP under the AF.
5. **Client Capability and PMU Assessment.** The Borrower has demonstrated a satisfactory performance managing all procurement aspects of the Project to date, which is mirrored by the proposed



AF in northeastern districts of the city. Moreover, all construction and construction supervision contracts to be financed through the Original loan have already been procured. Therefore, in principle the PIU Procurement team will not need to be reinforced with additional staff members to handle the procurement of works, goods and services that will be financed through the AF and that are of a similar size and nature to the ones financed through the Parent Project. Nonetheless, procurement dedicated staff of the PIU, who have shown having the required knowledge and gained specific experience with 2011 World Bank procurement guidelines, will be trained on the application of the New 2016 World Bank Procurement framework that will be applicable to all contracts financed through the AF. The procurement specialists and contract administrators of the PIU will also be trained in the management of FIDIC contracts.

6. **Key procurement processes under the proposed AF.** The main works and services to be procured under the AF are: (i) the construction of Progreso pumping station; (ii) the design and the construction of the Progreso-Los Merinos wastewater transmission pipeline; (iii) the decommissioning of the Guayacanes-Samanes and Sauces-Alborada stabilization pond systems and the construction of Los Merinos WWTP; (iv) the sewerage extension to the Pascuales district; (v) the sewerage expansion to the Juan Pablo II district; (vi) the installation of household water connections; and (vii) the supervision of all construction activities listed above.

7. **Market analysis.** Works and services to be procured under the AF are of the same nature, size and complexity as those procured under the Parent Project, which also included the construction of a CEPT treatment facility; a wastewater pumping station and the associated transmission pipeline (to be constructed also employing trenchless technologies); and the installation of around 11,500 household connections. Therefore, the Borrower has gained a good understanding of the relevant construction market segments and clear idea of the type, number and characteristics of the expected bidders. The table below summarizes the response of the market to the bidding processes launched under the Project.

Table A.4.1: response of the market to procurement processes launched under the Project

Procurement Process	Number of bidders	Of which national (or with a national joint venture partner)	Number of receivable bids/qualified firms
WWTP	17	2	6
Pumping Stations	4	1	4
Transmission Pipeline	8	0	3
Household connections	12	12	2

8. **Procurement risk analysis.** As part of the PPSD, the following risks potentially affecting the procurement of the above described works and services were identified and assessed: (i) experience and capacity of the executing agency; (ii) weaknesses of the technical specifications; (iii) market competition and number of interested firms; (iv) Poor performance of contractors; and (v) political risk related to upcoming municipal elections. Mitigation measures for each of these risks were identified. The likeliness and potential impact of each of these risks on each of the key works and services was evaluated from 1 to 5, and weighted as per their estimated value. As per this analysis, works with the highest procurement



risk rating were those related to the design and construction of Progreso-Los Merinos wastewater transmission pipeline, followed by the ones related to the construction of Los Merinos WWTP.

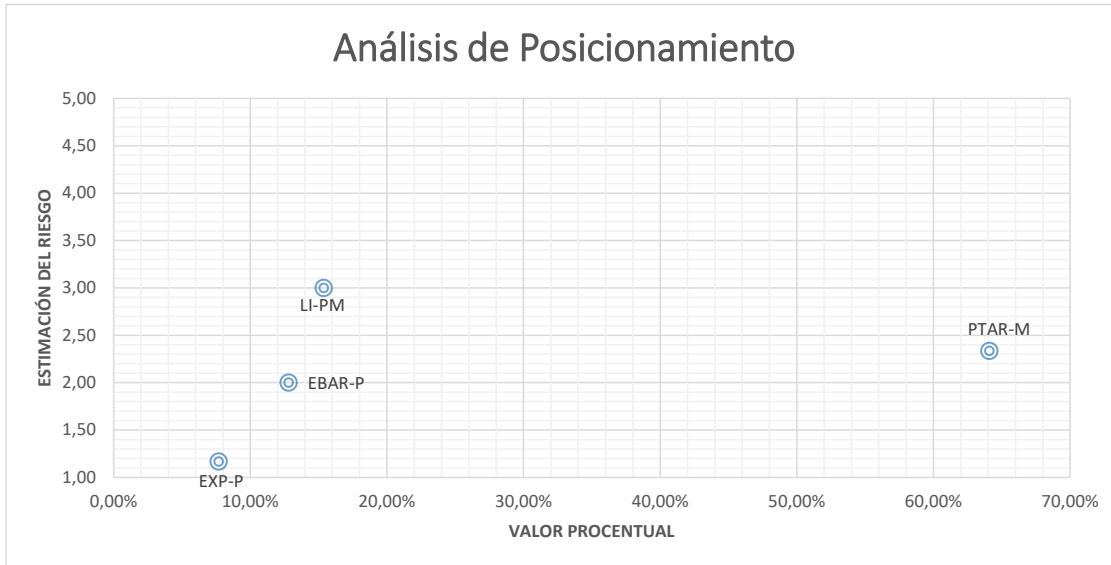


Figure A4.1: procurement risk analysis

9. **Procurement approach retained for main construction works.** Based on the analysis described above, the PPSD lands into a detailed description of the procurement approach retained for each of the main construction and consulting contracts to be financed under the AF. These are summarized in table A3.2.

Table A4.2: Procurement approach retained for main construction works

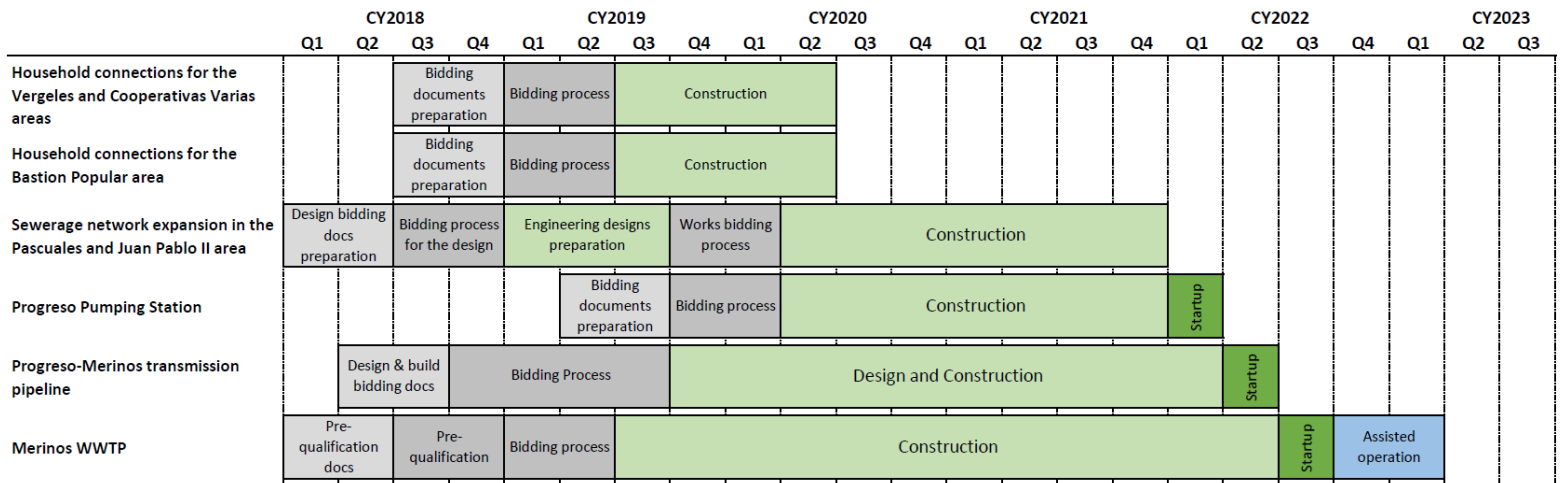
Works and services to be procured	Estimated Budget (US\$ million)	Contractual implementation timeframe	Proposed procurement method	Rationale and comments
Los Merinos WWTP	137	36 months for construction; 3 months for startup and 6 months of assisted operation	Plant supply and installation contract. It will also include 6-month period of assisted operation and maintenance. Open, international, pre-qualification, single stage, single envelope RFB.	A prequalification is not considered necessary for the Progreso Pumping Station because: (i) the risk of not receiving the required interest from the industry on the procurement process is considered negligible, based on the experience gained with the procurement of the contract for the construction of Las Esclusas WWTP; and (ii) the preparation of the
Progreso pumping station	20	21 months for construction and 3 months for startup	Plant supply and installation contract. Open, international, post-qualification,	



Progreso-Merinos transmission pipeline	30	30 months for construction and 3 months for startup	single stage, single envelope RFB. Design and build international, post-qualification, single stage, single envelope RFB.	offers will not entail a significant cost to bidders. A design and build contractual approach was selected because pipe-jacking equipment proposed by the different bidders will condition the detailed design of the transmission pipeline.
Pascuales sewerage expansion	14	21 months	Construction. Open, international, post-qualification, single-stage, single envelope RFB.	Under a single contract.
Sewer household connections	2.3	12 months	Construction. Open, national, post-qualification, single-stage, single envelope RFB.	To be bided under 2 different lots, one per area of intervention.

10. Envisaged chronogram for the procurement and implementation of key construction contracts. Figure A.3.2 below captures the envisaged chronogram for the procurement and implementation of these key construction contracts. It should be noted that ideally, the Progreso pumping station and the associated wastewater transmission pipeline should be operational for the commissioning of Los Merinos WWTP.

Figure A4.2: envisaged chronogram for the procurement and implementation of key construction contracts





ANNEX 5: FINANCIAL MANAGEMENT ARRANGEMENTS

11. **Background.** The Project, co-financed by IBRD (IBRD-8505-EC) and the EIB (US\$ 102.5 million each institution) became effective on September 15, 2015, and has a closing date of December 31, 2019. As of April 30, 2018, the Project has disbursed US\$41.9 million, representing 41 percent of the loan, with 84 percent of the loan proceeds already committed. It is expected all IBRD funded activities can be completed by the original closing date. However, the withdrawal period will be extended by one year to provide EMAPAG EP with greater flexibility in the financial management of certain contracts which payments are to be co-financed with the EIB.

12. EMPAG-EP will also be the Borrower under the AF, with a sovereign guarantee from the Government of Ecuador to be granted by the Ministry of Economy. As for the original loan, the municipal government of Guayaquil will issue a legally binding document to ensure the continuity of ongoing fiscal transfers that are currently made to EMAPAG EP (US\$ 40 million per year). EMAPAG EP will continue as the implementing entity and will maintain the same financial management implementation arrangements used so far for the Project. The AF will be financed with funds from the WB and local counterpart funding, and will not have financing from the EIB. The main objective of the proposed AF is to scale up Project's expected results.

13. **Financial Management risk.** From the FM standpoint, the project FM risk is moderate and the combined fiduciary risk is also moderate. This risk takes into account EMAPAG EP is better acquainted with the Bank policies and procedures; the PIU's is staffed by qualified and experienced professionals; and FM aspects related to internal controls, financial reporting and auditing are working well. However, the PIU will not have financial and administrative autonomy which may cause delays in processing/approving of transactions/contractual processes under the Project.

14. **Financial Management performance.** FM performance was upgraded in December 2017 from Moderately Unsatisfactory (MU) to Moderately Satisfactory (MS) since the overdue CY2016 audit report was finally submitted on October 30, 2017 and found acceptable per Bank's review. Although financial management arrangements are working well, the PIU should strengthen the planning of project activities as it has a direct impact on budget allocation and execution. It has been preliminary agreed with project staff to carry out recurrent monitoring of project plans against actual and analyze those relevant variances which may need ongoing adjustments to estimated costs.

15. **Organization and staffing.** The PIU established under EMAPAG EP's General Manager will continue to be responsible for day-to-day Project implementation including FM tasks. Project FM staff (Financial Management Specialist and Assistant) are qualified and experienced. There is an adequate segregation of duties and responsibilities⁴⁹. Considering the experienced gained under the Project so far, they are better acquainted with Bank policies and procedures. Thus, continuity of PIU's staff is a key factor to effectively support the implementation of the AF as well as continuance of ongoing coordination with EMAPAG EP's Financial and Administrative Management Directorate (FAD).

16. **Budgeting, accounting and internal controls.** All budgeting, accounting policies and procedures are acceptable and will be applied to the AF. The project is committed to maintaining enhanced

⁴⁹ PIU's Coordinator authorize payments, EMAPAG EP's Financial and Administrative Management Directorate processes the payments and PIU's FM staff is responsible for accounting activities.



coordination with EMAPAG EP and adjust chart of accounts in order to ensure that budget and accounting classification is ready to record additional financing transactions.

17. **Financial reporting.** The Project will continue to use the financial management information system (FMIS) ERCO, which is an automate software that fulfill regulatory requirements of the country and has been customized to EMAPAG EP's information needs since 2004. This FMIS has good internal controls and is user friendly. The chart of accounts has enough fields which allow to record and control project specific activities by financing source and provides reliable and timely information on the project through the following modules: Budget; Accounting; Treasury; Fixed assets; and Inventories.

18. Project financial statements (Statement of Sources and Uses of Funds and the Statement of Accumulated Investments and explanatory notes) are prepared on Excel spreadsheets based on the information provided by FMIS ERCO. Semiannual Interim Financial Reports (IFR) will continue to be prepared and submitted to the Bank within 45 days following the end of each semester. The main content and scope of IFRs (including the AF) have been reviewed and agreed. The revised forms are reflected in the Operational Manual.

19. **Internal control and internal audit.** EMAGPAG must comply with the internal control standards issued by the National Comptroller Office (Contraloria General del Estado - CGE, by its name in Spanish). Moreover, the internal audit unit of EMAPAG EP reports to the CGE. Under the Project, it was agreed that project's transactions will be subject to internal reviews as required by the CGE, and the reports resulting from those reviews should be made available to the Bank and external auditors as appropriate. This arrangement will be continued during the AF.

20. For project purposes, there will be specific and dedicated technical and administrative team, including contract administrators. This is due to technical complexity, and high level of expertise required. Specific processes agreed for project implementation include (a) PIU's technical team will receive and review progress reports and external supervisor reports (of civil works) and upon approval will send them for approval of the corresponding contract administrator; (b) Project FM specialist will (i) ensure the payment is adequately recorded and supported; (ii) set out budgeting account/s to be utilized under such payment; and (iii) specify the percentage to be paid by financing source; (c) EMAPAG EP's FAD will review adequateness of information and carry out the commitment process into the FMIS ERCO; (d) the FM specialist will record project's transactions in the FMIS ERCO, using the accrual accounting basis; and (e) FAD will process payments. EMAPAG EP will use the scanning documentation system called "Onbase" for all project documentation.

21. **External Audit.** Audit of annual financial statements of the project will continue to be conducted by an external audit firm in accordance with International Standards on Auditing issued by the International Federation of Accountants. Each audit of the project financial statements (containing the additional financing) will cover the fiscal year of the Borrower or any other period agreed with the Bank. Auditors should submit: (i) an opinion on the project financial statements; and (ii) management letter. Audit costs will be financed out of the loan proceeds. In accordance with the World Bank's Access to Information Policy, the annual audited financial statements of the project will be made publicly available by the Bank upon receipt. The audit report shall be submitted to the Bank within six months of the end of the Borrower's fiscal year. EMAPAG EP will directly carry out selection and appointment of acceptable audit firm, based on the list of eligible audit firms acceptable to the Bank; based on the set of audit terms of reference no objection.



22. **Flow of funds and disbursement arrangements.** The same disbursement methods established under the original loan will be applied, namely advances, reimbursements and direct payments. Under the advance method, EMAPAG EP will open in the Central Bank a new Segregated Designated Account (DA) in US dollars to manage AF loan proceeds. According to funds flow arrangements for subnational governments, the DA is not part of the Single Treasury Account. For payment processing, EMAPAG EP will withdraw the DA to carry out payments to consultants, contractors and suppliers, based on a financial programming and considering Bank disbursement percentages. Payments of taxes will be carried out from EMAPAG EP general account. All payments will be processed through the Interbank Payment System (SPI) of the Banco Central del Ecuador (Ecuador’s Central Bank), which allows cash transfers to beneficiaries’ bank accounts.

23. These procedures will be reflected as appropriate in the Disbursement and Financial Information Letter (DFIL). Local counterpart contributions under the proposed AF will mainly cover taxes (IVA). The project has confirmed no need for retroactive financing under the additional financing.

24. The ceiling for advances to be made into the DA will continue to be based on a three-months forecast which will need to be approved by TTL. The minimum value of applications for direct payment and reimbursement, will be established in the DFIL. Similarly, supporting documentation to document project expenditures under advances, reimbursement and direct payments will also remain the same. The frequency for reporting eligible expenditures will be on a quarterly basis or more often as required. Current disbursement reports will include the Additional Financing.

25. EMAPAG EP remains as main responsible for payment processing of project expenditures and ensure supporting documentation is adequately maintained.

Table A5.1: Withdrawal categories for the loan proceeds

Category	Amount of the Loan Allocated (USD)	Percentage of expenditures to be financed (excluding VAT)
(1) Works, non-consulting services and consulting services under Part 1 of the Project	14,100,000	100%
(2) Works, consulting services and non-consulting services under Part 3 of the Project	217,300,000	100%
(3) Goods, small works, non-consulting services and training under Part 4 of the Project	2,200,000	100%
TOTAL AMOUNT	233,600,000	



ANNEX 6: FINANCIAL ANALYSIS OF THE BORROWER

1. This evaluation consists of two analyses: (i) financial analysis of EMAPAG EP, regulatory agency, as the Borrower and entity in charge of repaying the loan; and (ii) the fiscal analysis of the Municipality of Guayaquil, as the entity owning 100 percent of EMAPAG EP.

A. Financial Analysis of EMAPAG EP

2. **EMAPAG EP's financial analysis is geared at evaluating the institution's current financial situation and ascertaining its capacity to serve its current and projected obligations**, including the original IBRD (IBRD-8505-EC) and EIB Loans and the proposed AF (IBRD-8888-EC). The analysis is an update of the one undertaken initially for the Project: 2014-2017 financial projections were updated with actual results, while the current budget statement was used for 2018. Projections for 2019-2026 were then updated based on the more recent historic data. Overall results of the analysis indicate a healthy financial situation for EMAPAG EP, that will be able to cover all its obligations both in terms of debt service and investment, including the proposed AF.

3. **EMAPAG EP serves its financial obligations with fiscal transfers received from Guayaquil municipal government and the recuperation of investments through betterment levies.** In addition, EMAPAG EP receives charges a regulatory fee to the concessionaire which pays for EMAPAG EP's personnel and operations costs. Annual fiscal transfers received by EMAPAG EP to complement Interagua's capital investments increased from US\$ 35 million in 2017 to US\$ 40 million in the 2018 budget. This annual transfer amount, secured under institutional agreements in place, are expected to represent more than 85 percent of EMAPAG EP's revenues in the coming 10 years. It also continues to represent a small fraction of the municipalities total revenues (less than 5 percent) and of the amount to be fiscal transfers received by the municipality from the National treasury (15 percent in 2018). The analysis of Guayaquil's capacity to provide the above-mentioned transfer (shown separately), indicates that it poses no financial risk for the municipality.

4. **Betterment levies are expected to represent about 15 percent of EMAPAG EP's revenues by 2020.** These relate to infrastructure financed with municipal fiscal resources and concessional loans, and relate mostly to the current Las Esclusas and the proposed Los Merinos WWTP. These are backed up by Municipal decrees, and will represent on average very small payments to the affected population (about \$.50 monthly per household). These have been in place since 2012 when the first decree was issued and have shown to be a reliable source of revenue.

5. **Currently EMAPAG EP's debt obligations include Loans from the Ecuadorian Development Bank (BEDE), IBRD and EIB and investment obligations as counterpart funding.** The additional debt obligations terms for the proposed Loan are not defined at this point, and therefore informed estimates for debt service were carried out. The analysis indicates that the debt has been steadily growing, in pace with infrastructure investments, and that the proposed AF will increase debt service by an average of 40 percent.

6. **Nonetheless EMAPAG EP's projected revenue is above debt service and investment obligations for all years considered.** As shown in the table below, the revenue/debt service ratio is lowest in 2020, when counterpart funding obligations are high and revenues from betterment levies have a temporary



decline. Thereafter the ratio improves to a peak of almost 2 but declines temporary in 2036 when full capital payments for the Original loan kicks in.

Table A6.1: EMAPAG EP – DEBT and Revenue ratios

	2018	2019	2020	2030	2036
Revenue	44.5	44.5	41.3	43.6	38.3
Debt Service	36.9	36.5	36.5	21.9	30.4
Rev/Debt Service	1.21	1.22	1.13	1.99	1.26

B. Fiscal Analysis of the Municipality

7. **This assessment focuses on the fiscal situation of the Municipality of Guayaquil and its capacity to serve its current and projected obligations.** This assessment updates the original financial analysis carried out in 2013 for the original loan, and is based on actual financial results of the Municipality of Guayaquil for the 2014-2017 period, the approved 2018 budget and projections made to 2036. As mentioned, Guayaquil currently transfers \$40 million annually to EMAPAG EP to cover all financial obligations including the ongoing IBRD loan. However, as Guayaquil owns 100 percent of EMAPAG EP, and will issue a debt repayment solidary guarantee for the AF loan to the Ministry of Finance, this financial analysis assesses the capacity of the municipality to serve all its financial obligations, including those to be repaid through EMAPAG EP.

8. **The municipality of Guayaquil has a solid financial situation.** Guayaquil continues to be the most important business hub and port of the Country and in 2016 contributed 25 percent of the country's GDP. During the 2013-2017 period Guayaquil generated an average of US\$170 million per year of current revenues, and maintained a healthy current revenue/current expenses ratio, which oscillated around 2.0 and which is expected to be 1.5 for 2018. As mentioned, the municipality has continued to make annual transfers to EMAPAG EP, increasing from the original \$30 million to now \$40 million which represent a 5 percent of total revenues and 15 percent of its expected current revenues for 2018. Thus, this commitment poses no threat to the financial situation of the municipality.

9. **Since the approval of the Project, the Municipality of Guayaquil has subscribed new loan agreements with other bilateral and multilateral financial organizations.** These loan agreements are mainly for investments in infrastructure sectors, particularly in water and sanitation and urban transport. As of today, the municipality has six active loans with the Latin America Development Bank (CAF) for the funding of road programs, a relatively small bond issued in 2016, and a loan from the French Development Agency for an urban cable car. Outstanding total debt stock in December 2017 was US\$327 million which represents 41 percent of total revenues expected for 2018. The debt growth has been higher than revenue growth and the ratio of debt stock over revenue less capital revenue has been increasing over time. However, servicing this debt has been relatively easy, and the projections anticipate that Guayaquil will have sufficient capacity to serve its obligations.

10. **Projected debt indicators were calculated for Guayaquil's current debt stock of \$327 Million and compared with the two debt ceilings established under the Ecuadorian Legislation⁵⁰, i.e.: (i) maintaining the debt stock to total non-financial revenue ratio below 200 percent; and (ii) the debt service to total**

⁵⁰ Codigo Organico de Planificacion y Finanzas Publicas



non-financial revenues ratio below 25 percent. As Guayaquil is the owner of EMAPAG EP, the analysis also included the municipality debt capacity in terms of the mentioned ceilings established by Law. The results for the current Debt stock and debt service indicators is presented in the table below.

Table A6.2: Municipality of Guayaquil – Projections of Debt Indicators

Maintaining the debt stock to total non-financial revenue ratio below 200 percent								
	2018	2019	2020	2021	2022	2023	2024	2025
Not considering EMAPAG EP financial obligations	26%	21%	17%	13%	9%	8%	7%	7%
Considering EMAPAG EP financial obligations*	49%	64%	84%	79%	75%	72%	69%	68%
Maintain the debt service to total non-financial revenues ratio below 25 percent								
	2018	2019	2020	2021	2022	2023	2024	2025
Not considering EMAPAG EP financial obligations	6%	6%	7%	6%	7%	5%	4%	3%
Considering EMAPAG EP financial obligations*	6%	7%	8%	9%	9%	8%	7%	6%

* Assumes the \$40.0 million annual transfer to EMAPAG EP continues

11. **The results summarized above table clearly indicate that the municipality is able to cover all obligations including the ones to be repaid by EMAPAG EP, and in addition to the proposed \$233.6 additional Loan.** Both the Debt Service and the Debt Stock indicators are below the official ceilings established under the law. The maximum point reached for these indicators in the period shown is obviously when EMAPAG EP is included and reaches 84 percent in 2020 for the Debt Stock ratio and 9 percent expected for year 2021 for the Debt service indicator. Projections show that debt service peaks again around 2030 when the proposed Loan is expected to begin full capital amortization payments. Nonetheless both indicators remain below those shown for 2025. A sensitivity analysis was carried out, which considered a decrease in revenue sources by 1 percent from 2019 to 2022 and thereafter maintaining all current revenues at the level of 2022. This analysis shows a marginal impact in the debt stock indicator which peaks to 86 percent in 2020 and the debt service indicator now peaking at 10 percent in 2022.



ANNEX 7: ECONOMIC AND FINANCIAL ANALYSIS OF ADDITIONAL FINANCING

1. **A cost-efficiency analysis has been developed as part of the economic analysis of the AF.** The environmental and municipal authorities have established that only sewerage connections are allowed in the Project area, as other on-site solutions are increasing pollution due to poor maintenance and high groundwater level in the area. For the effluent quality, the law has established limits for BOD₅ and TSS concentrations at effluent discharges. The cost-effectiveness analysis took into consideration the regulations and selected among different alternatives the most cost-effective that comply with effluent regulations. Three alternative treatment technologies complying with the regulation on effluent discharges were studied: (a) Option 1: CEPT followed by aerated stabilization ponds; (b) Option 2: Dissolved Air Flotation (DAF) followed by aerated stabilization ponds; and (c) Option 3: Up flow Anaerobic Sludge Blanket Digestion (UASB). Associated investment and operating costs were estimated through a life-cycle analysis for the alternatives for a 30-year period. Unsurprisingly, results show that the CEPT solution is also the most cost-effective alternative for Los Merinos WWTP, as it was for Las Esclusas WWTP financed under the Parent Project (they are both plants of a similar size, working under the same weather conditions, receiving raw wastewaters of similar characteristics and located in urban areas, which limit land availability).

2. **Additionally, a cost-benefit analysis has been developed as part the economic analysis of the AF.** This analysis has been performed as to estimate the positive externalities generated by the project related to improved environmental conditions and reduced incidence of water-borne diseases in the city of Guayaquil. The cost-benefit analysis was performed considering two scenarios: with and without intervention. The Economic Rate of Return (ERR) was estimated discounted at present values with accrual of direct and indirect (shadow prices) costs and benefits that resulted from the intervention, without considering investments in capacity building or project management activities. These “soft” components also lead to intangible benefits that are not estimated through this methodology. The results show that the AF has an ERR of 17.5 percent, with total costs at net present value (NPV) of US\$440.7 million and total benefits at net present value US\$457.3 million, with a benefit-cost ratio of 1.10 at present values, and indirect benefits reaching US\$80.6 million and US\$32.3 of reduction in GHG emissions at present values using a discount rate of 10 percent.

3. **Besides the economic analysis, the Project was also evaluated from a financial perspective.** The financial analysis focused on studying whether the infrastructure developed through the Project could be sustainably managed with currently applicable WSS tariffs, what would be the eventual tariff increase required and its consequences on tariff affordability. The results show that current tariffs will not be enough to cover the additional cost of operation of the wastewater treatment system, and that the sewerage tariff should increase from the current 80 percent to 95 percent of water charges. This in turn would imply an increase on the average water bill of US\$18.7 per month, equivalent to 4.3 percent of the average 2014 personal wage in Guayaquil⁵¹. On that same year water expenditures represented between 2 and 3.2 percent of the overall annual expenditures of the average household of Ecuador.

⁵¹ US\$ 18.7 is the average monthly water bill paid by INTERAGUA’s clients. The average bill paid by clients consuming less than 15 m³/month, which represent more than 50 percent of INTERAGUA’s client base, is \$5.27.



A. Cost-efficiency analysis of the Additional Financing

4. **This technique evaluates what alternative creates the wanted result at a lower cost.** The cost-effectiveness analysis is a technique used in weighing the effectiveness of a project against its cost. In this approach, the benefits deriving from the project or the alternatives considered are not monetized. This approach was used to compare various alternatives that deliver roughly similar outcomes and benefits. Three alternatives were studied for treating and discharging wastewater produced in the northeastern area of the city of Guayaquil. They correspond to the following technologies: (a) Option 1: CEPT followed by aerated stabilization ponds; (b) Option 2: Dissolved Air Flotation (DAF) followed by aerated stabilization ponds; and (c) Option 3: Up flow Anaerobic Sludge Blanket Digestion (UASB). These are the three technologies that as per feasibility study performed, could treat wastewater effluents to meet applicable standards and that could be applied taking into consideration existing land availability constraints.

5. **The economic evaluation, undertaken as part of the feasibility study by EMAPAG EP, conducted a microeconomic lifecycle cost analysis.** In this approach, only specific equipment and operating costs that differ among alternatives were included (i.e. costs associated to capital investments and operation and management activities that are common to all three analyzed alternatives were not considered) to calculate the incremental 30-year operation Net Present Value (NPV) associated to each of the three technologies. The scenario considered contemplates the installation of a secondary treatment process in year 15 of operation for all three solutions. This is to consider the impact of a likely future change in applicable environmental regulations implying stricter limits to wastewater discharges standards. If this happens, which is a reasonable consideration, chemical additions under CEPT could be discontinued, significantly reducing O&M costs under this alternative. Table A6.1 presents the costs that vary among alternatives estimated in the feasibility study and the corresponding NPV. Discount rate considered is 6 percent. As per this analysis the CEPT option is the most cost-effective among viable alternatives considered.

Table A7.1: NPV of incremental capex and opex associated to viable alternatives considered

Cost Item	CEPT	DAF	UASB
Incremental Capital investment	26,070,000	24,874,000	60,200,000
Years 0-15 annual O&M costs	2,393,000	3,646,000	1,370,000
Years 15-30 annual O&M costs	165,000	1,418,000	1,370,000
NPV	49,980,000	66,031,000	79,058,000

B. Cost-benefit analysis of the Additional Financing

6. **In addition to the cost-effectiveness analysis, a cost-benefit analysis was conducted for the economic assessment of the AF, assuming scenarios with and without AF interventions, for the**



assessment of the positive health, economic and environmental externalities associated to the construction of wastewater treatment facilities and sewer expansion activities. Benefits monetized for Component 1 activities included the reduction of the burden of sanitation-related diseases among the population that are getting connected to the sewer system thanks to the project; productivity gains and the reduction of the time spent by beneficiary households using sanitation facilities. On the other hand, Component 3 direct benefits were determined considering the opportunity cost of the treated wastewater effluent and the shadow price of removed pollutants. Component 3 benefits were divided into the direct benefits based on the value of treated water per 15m³ and indirect benefits based on avoided environmental damage (shadow price) from chemical and oxygen removal from wastewater treatment processes.

7. Cost considered in the cost-benefit analysis include both project capital investments and operation and maintenance costs associated to the infrastructure developed under the Project. Investment costs were distributed evenly in a 5-year period. O&M costs associated to the wastewater treatment infrastructure that will be decommissioned as part of the AF were deducted from O&M cost estimates developed by EMAPAG EP for Los Merinos WWTP, to come up with incremental operational costs associated to the AF. The discount rate used for the economic analysis was based on the minimum 6 percent recommended by the World Bank's guideline, and additional 4 percentage points that incorporates country and sector risks. A 30-year period was used to discount values and estimates streams of benefits and costs of the additional financing intervention. Benefits were estimated for lifetime of the project but accrued 5 years after the completion of the intervention.

8. Reduction of the burden of sanitation-related diseases among the population that are getting connected to the sewer system thanks to the AF. According to World Health Organization (WHO) data, in 2016 the burden of lower respiratory infections, enteric and other sanitation-related⁵² diseases in urban areas of Ecuador was equivalent to 300,000 Disability Adjusted Life Years (DALY)⁵³ with annual days lost due to disease of 29,755 per 100,000 people and 4,200 days associated to sanitation. Through this approach, benefits assume avoided days of disease related to sanitation-borne illnesses. Also, according to the Institute of Health Metrics, World Health Organization⁵⁴ and recent literature estimates, on average 24 percent of the burden of infectious diseases in urban areas in Ecuador are attributable to the lack of access to improved water and sanitation, predominantly on diarrheas, intestinal and lower respiratory infections. Based on this, and considering that the project is expected to get 82,500 people connected to the sewerage system with the additional financing⁵⁵, representing 4 percent of the total Ecuadorian urban population lacking access to improved sanitation, it is estimated that the project will contribute reducing

⁵² Diseases considered for this analysis were diarrheal diseases, lower respiratory infections, neglected tropical diseases and malaria, intestinal nematode infections, ascariasis, hookworm disease, food-borne enteric disease, and other intestinal infectious diseases

⁵³ DALY is an indicator reported by the Institute of Health Metrics and the World Health Organization. The indicator is an estimate of the country-based global burden of disease that estimates the days in life lost due to disability, mortality and morbidity from major diseases, injuries and risk factors to health at global, national and regional levels. Data for Ecuador is for 2016.

⁵⁴ The country data of DALYs is available at <http://ghdx.healthdata.org/gbd-results-tool>. The data is generated by the Institute of Health Metrics of the University of Washington and the World Health Organization (WHO).

⁵⁵ Further, approximately 120,000 benefited with the Parent Project.



the burden of disease of sanitation-related DALYs by 60 percent per year. Decreasing health benefits are assumed at 5 per cent per year, after first five years of accrual. To prevent overestimation of these benefits, the standard value of the poverty line⁵⁶ was used to estimate the basic monetary values of avoided DALYs from disease.

Table A7.2: Main sources of data and hypothesis employed to estimate the expected impact of project interventions in the burden of sanitation-related diseases

Concept	Unit	Quantity	Source
Burden of disease (sanitation-related)	DALYs	300,000	IHM-WHO
Burden of disease fraction attributable to lack of access to improved WSS*	%	23.8	IHM-WHO
Number of people without access to improved WSS	People	171,000	Project Data
Number of people gaining improved access thanks to the project***	People	82,500	Project Data
Expected reduction of DALYs thanks to the project **	DALYs	60%	WSP/ESI/ Literature
Poverty line value	US\$/month/per capita	84	World Bank

*Includes the following sanitation-related diseases: diseases, lower respiratory infections, neglected tropical diseases and malaria, intestinal nematode infections, ascariasis, hookworm disease, food-borne enteric disease, and other intestinal infectious diseases. The Burden of disease is 23.8 for all diseases. However, sanitation-related diseases account for 40% of total infectious diseases in urban areas.

** Prüss-Ustün, Annette et al. (2014) "Burden of Disease from Inadequate Water, Sanitation and Hygiene in Low- and Middle-Income Settings: A Retrospective Analysis of Data from 145 Countries." *Tropical Medicine & International Health* 19.8: 894–905. PMC. Web. 13 Feb. 2018.

*** For AF only. Including Parent Project figures, the additional beneficiaries are 120,000.

9. **In addition to the avoided days of illnesses, investing in sanitation infrastructure in Guayaquil produces indirect economic benefits to households⁵⁷.** These indirect benefits relate to time savings enjoyed by households that are getting connected to the sewerage system thanks to the AF that before did not have access to an improved sanitation facility at the household level. Time savings are enjoyed due to closer physical access and less waiting time for improved WSS services. The amount of time savings is based on reviews conducted in previous economic studies (Hutton et al. 2007) and more recent surveys on sanitation practices in Southeast Asia (Hutton et al. 2012). Sanitation access time saved per person moving from open defecation to private latrine is 28.6 minutes per day per person. On the other hand,

⁵⁶ The national poverty line (in monthly per capita terms) for 2014 used is US\$84.

⁵⁷ This approach avoids double counting by targeting avoided days lost due to illness and compounding separately the indirect gains as reported in the economics of sanitation literature.



according to World Bank calculations using Livelihoods Conditions Survey (ECV in its Spanish Acronym) data, in 2014, 8 percent of the urban population of Guayaquil that was not connected to the sewer system did not have access to any type of sanitation solution at the household level, i.e. relied on shared facilities or practiced open defecation. Based on this data, aggregated time savings were calculated and monetized using the hourly rate of the national legally-established minimum wage (US\$ 366 per month). These benefits assumed a decreasing rate over 30 years of 5 percent per year, after first five years of accrual after completion of project infrastructure works.

10. **Benefits analyzed for wastewater collection and treatment investments contemplated under Component 3 of the Project.** The cost-benefit analysis performed for component 3 activities was developed considering the value of water treated (US\$0.25 per 15 m3 per month)⁵⁸, based on production and unit costs; and the wastewater treatment as a productive process in which a desirable output (treated water) is obtained together with a series of undesirable outputs (suspended solids and BOD) using inputs (capex and opex). This production perspective makes it possible to estimate the shadow prices of pollutants. A shadow price for these undesirable outputs would be the equivalent of the environmental damage avoided if these pollutants are removed, avoided or recovered. Therefore, they can be interpreted as an estimate of the environmental benefits gained from the treatment or recovery process. Reference price of water and the estimated shadow prices for TSS, BOD and COD removal used for this economic analysis where the ones determined by Hernandez-Sancho et al. (2015) for wastewater treatment plants which effluent discharge into rivers. These benefits involved the total economic value of environmental benefits resulting from wastewater treatment based on the volume of pollutants removed by treatment and their shadow prices (\$/ton). These indirect benefits were accrued after full implementation of the project (2022/23) up until the life time of the project (2048). After 10 years of indirect benefits accrual, diminishing returns of these benefits were considered an average of 7 percent decline per year.

Table A7.3: Characteristics of Los Merinos WWTP effluent and reference price of water and estimated shadow prices for undesirable outputs considered for the economic analysis (source: Hernandez-Sancho et al., 2015)⁵⁹

Reference price of raw water (US\$/m3)	Estimated Shadow Prices for Undesirable Outputs (US\$/ton)		
	TSS	BOD	COD
0.25	90.1	47.6	53.6
Los Merinos WWTP outflow (m3/s)	Expected removal of undesirable outputs (tons/year)		
	TSS	BOD	COD
3.75	9,741	10,972	20,627

11. **The expected reduction of GHG emissions was also translated into economic terms.** The GHG

⁵⁸ This value of water represents market valuation for wastewater assuming reuse of the wastewater treated effluents. In principle, the economic gains from this component lies on the opportunity cost of not treating water and avoided revenue streams. The potential of reuse, however, depends on how the company uses efficiently the treated residuals from wastewater treatment processes for productive purposes like farmland irrigation or irrigation of parks and recreation areas.

⁵⁹ Economic Valuation of Wastewater—The Cost of action and the cost of no action. Francesc Hernández-Sancho (University of Valencia), Birguy Lamizana-Diallo (UNEP), Javier Mateo-Sagasta (IWMI) and Manzoor Qadir (UNU-INWEH). United Nations Environment Programme (UNEP)



estimates based on project’s features are estimated at 2.7 million tCO2-eq at baseline values, with a gross level of emissions of 1.2 million tCO2-eq and net emissions of -1.4 million tCO2-eq. These figures were incorporated in the economic analysis as economic benefits, assuming a cost of carbon of US\$60/ton until 2020, and US\$75/ton up until 2030, per World Bank’s guidelines, with a constant growth rate of 2.25 percent per year that is implicit between the 2020 and 2030.

12. **The results show that AF investments will have an economic rate of return (ERR) of 17.5 percent,** with total costs at net present value (NPV) of US\$440.7 million and total benefits at net present value US\$457.3 million with a benefit-cost ratio of 1.10 (and with indirect benefits GHG emission reductions, the value of benefits reaches US\$543.95 million). The net value flows (benefits-costs) at present values, over a 30-year period, reach US\$0.8 million per year. When indirect benefits are added to the analysis, the ERR increases to 23.0 percent. The distribution of costs at present values showed that 13 percent correspond to component 1 interventions, 68 percent to Component 3 investments, and close to 19 percent to O&M. Contrastingly, the benefits at present value were mostly explained by wastewater environmental benefits (83 percent), followed by health benefits (14 percent) and productivity gains (3 percent). The distribution of the cost structure at present values is presented below:

Table A7.4: Distribution of project’s capital and O&M costs and benefits at NPV

	2018-2022	2023-2027	2028-2038	2039-2048
Capital and O&M (US \$ millions at NPV)				
Investment costs	242.3	110.6	0.0	0.0
Operations and maintenance (cumulative)	8.0	12.3	22.5	45.1
Benefits (US \$ Millions at NPV)				
Health and Productivity Benefits	0.0	12.0	19.3	25.2
Environmental and wastewater benefits	0.0	130.6	155.9	114.3
Indirect Benefits (separate ERR)	0.0	24.5	30.1	32.0

13. **Sensitivity analysis.** The sensitivity analysis conducted, which considered 30 percent cost overrun and a 30 percent reduction in benefits throughout the project life time of 30 years, shows that the ERR is more sensitive to changes in costs than in benefits, given that the majority of the investment costs are concentrated in one component (wastewater) and the distribution of benefits entails multiple sources of benefits (health, environmental, productivity gains, waste water values). The ERR assuming a 30 percent cost overrun reaches 7.7 percent using a 10 percent discount rate. The ERR with the benefit reduction is reduced to 13.5 percent. Similarly, the estimated ERR for only the AF (and without the parent investment program) reaches 7.5 percent only with health and environmental benefits, which indicates that the financial and economic complementarity of these systems is justified.

C. Financial analysis of the Additional financing

14. **The financial analysis focuses on studying whether the infrastructure developed through the Project could be sustainably managed with currently applicable WSS tariffs,** quantifying the eventual tariff increase required to ensure the financial sustainability of wastewater management service provision and assessing the consequences of this tariff increase on service affordability.



15. **AF financed infrastructure will be transferred from EMAPAG EP to Interagua for operation and maintenance once construction is finalized.** Interagua is currently in a healthy financial situation. Operating costs have been fully covered by revenues along the years. The operating margin has been about 21.1 percent between 2010 and 2016, which has allowed Interagua to pay for its financial obligation and taxes. Net income generated has been about 12 percent of revenues (2015). The Operating Ratio, measured as operating costs to revenues, has been 0.84 on average since 2015.

16. **The concession contract limits the equity to liabilities ratio, which must be above 35 percent, and contemplates two tariff revisions mechanisms to ensure the financial equilibrium of the concessionaire:** (i) *automatic tariff revisions*, which take place every year through the indexation of the tariff to the consumer price index, labor cost and energy costs indexes; and (ii) *Extraordinary tariff revisions*, which should be processed when incremental costs associated to a change in taxation, environmental regulations or the applicable legal framework; a case of force majeure; or to the incorporation to the WSS system of new infrastructure implying an increase of O&M unit costs (per household connection of per m³ of water); are equal to or higher than 5 percent of the total annual costs.

17. **Incremental operation and maintenance cost of Los Merinos WWTP and ancillary wastewater treatment facilities are estimated at US\$ 7.6 million at 2017 prices,** which if added to the Las Esclusas WWTP O&M costs, estimated at US\$ 8.4 million, will represent 14.2 percent of Interagua's total operating costs in 2016. If revenues are not increased, the operating ratio will deteriorate and the operating surplus will not be enough to cover financial obligations, risking Interagua's financial sustainability. To avoid this situation the addenda to the concession contract signed in July 2016⁶⁰ establishes the formula for the extraordinary tariff revision⁶¹ to be undertaken once Las Esclusas and Los Merinos WWTP are transferred to the concessionaire for operation. According to this formula, tariffs should be increase as to ensure that incremental annual costs associated to the operation and maintenance of these facilities is compensated by a similar increase of revenue derived from the application of the revised tariff structure.

18. **Interagua's tariff revenues will have to increase 11.2 percent to cover Las Esclusas and Los Merinos WWTP operating costs,** 5.6 percent when Las Esclusas is commissioned in 2020 and the remaining 5.6 percent when Los Merinos enters in operation in 2023. The addenda to the concession contract gives EMAPAG EP the flexibility to decide how to modify the water tariff structure to cover this cost increase. This could be done either increasing the sewerage service tariff, which is defined as a percentage of the variable water tariff and is only charged to clients connected to the sewerage network; increasing the water tariff charged to all clients receiving water supply services; or through a combination of both alternatives. If, as planned by EMAPAG EP, the second option is chosen, the average variable water tariff will have to increase from US\$ 0.80 per m³ to US\$ 0.88 per m³ and to US\$ 0.95 per m³ when Las Esclusas and Los Merinos are commissioned.

19. **The impact on the bills paid by lowest level consumers will be limited.** Interagua applies a block tariff structure through which the tariff applied for lower consumption levels is cross subsidized by high

⁶⁰ Based on the *Convenio Modificatorio al Contrato de Concesion (Revision Ordinaria de Estructura Tarifaria)*, INTERAGUA-EMAPAG EP (EOM-GG-06953-2016)

⁶¹ Including also an ordinary revision that changes tariffs according to inflation.



level consumers. In this sense, the 284,158 users consuming less than 15 m³ per month, which represent 51 percent of Interagua's client base, pay US\$ 0.31 per m³, i.e. 38 percent of the average variable tariff. If the relationship between the tariffs applied for the different consumption levels is maintained, the average monthly bill paid per connection within this consumption level receiving both water supply and sewerage services, will increase from US\$ 5.27 to US\$ 5.67 per month when Las Esclusas starts operating (9 percent increase) and to US\$ 5.96 per month when Los Merinos is transferred to Interagua (additional 9 percent, all values in 2017 constant prices). It should be noted that US\$ 5.96 represents just 2.6 percent of the average household income of the poorest urban quintile at the national level (US\$223.32)⁶² and 0.6 percent of the average household income in the area of influence of activities considered under the additional financing (US\$956.45⁶³).

⁶² 2017 data from the Ecuadorian Central Bank

⁶³ Data from the socio-economic survey conducted in the area of influence of the AF as part of the Environmental and Social Impact Assessment.



ANNEX 8: MAP OF PROJECT INTERVENTIONS

