

**LEPAP**

LEBANON ENVIRONMENTAL  
**POLLUTION ABATEMENT**  
PROJECT

# KASSATLY CHTAURA INDUSTRIAL FACILITY WASTEWATER TREATMENT PLANT PROJECT



## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

August 2018

## ABBREVIATIONS AND ACRONYMS

ASL	Above Sea Level
BOD	Biological Oxygen Demand
CIP	Cleaning In Place
COD	Chemical Oxygen Demand
EA	Environmental Audit
ECC	Environmental Compliance Certificate
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
ELVs	Environmental Limit Values
ESA	Environmental and Social Assessment
ESMP	Environmental and Social Management Plan
GRM	Grievance Redress Mechanism
GRB	Grievance Registry Book
HRD	Human Resources Department
L	Liters
LEPAP	Lebanon Environmental Pollution Abatement Project
m <sup>2</sup>	Square meters
m <sup>3</sup>	Cubic meters
MoE	Ministry of Environment
MoL	Ministry of Labor
MSDS	Material safety Data Sheets
NOx	Nitrogen Oxide
OHSAS	Occupational Health and Safety Assessment Series
O&M	Operation and Maintenance
PPE	Personal Protective Equipment
PVPP	Polyvinylpolypyrrolidone
RO	Reverse Osmosis
TSS	Total Suspended Solids
USD	United States Dollar
WB	World Bank
WWTP	Wastewater Treatment Plant

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# 1 INTRODUCTION

## 1.1 OVERVIEW

An Environmental Audit (EA) of the Kassatly Chtaura industrial facility was financed through a fund granted to the Ministry of Environment (MoE) from the IDF/Improve Capacity for Environmental Compliance Project under the activity “Supporting Industrial Pollution Abatement in Lebanon III” (Contract No. FC002). The EA report was submitted to the Ministry of Environment for review and was approved through the letter No. 1624/B dated 21 March 2018.

Wastewater resulting from the Kassatly Chtaura plant located in Makse Cadastral District (Zahle, Bekaa) is currently directly discharged into a nearby water stream without prior treatment. As part of its obligations towards the national legislations, Kassatly Chtaura is required to treat its effluent prior to its discharge into the nearby water stream.

In order to achieve environmental compliance in terms of wastewater discharge, Kassatly Chtaura is currently keen to implement an industrial wastewater treatment plant (WWTP) and is seeking financing under the Lebanon Environmental Pollution Abatement Project (LEPAP).

This document is an Environmental and Social Management Plan (ESMP), submitted to the LEPAP, for the WWTP of the “Kassatly Chtaura” industry.

## 1.2 THE OBJECTIVE OF ESMP

The WWTP foreseen to be implemented at “Kassatly Chtaura” is a category II subproject according to the ESA of LEPAP and the World Bank OP 4.01, hence an ESMP is required.

The overall objective of the ESMP is to assist in minimizing the impacts to the environment and the surrounding communities, and reach a set of environmental and social objectives. The ESMP ensures that the environmental and social objectives of the projects are met through monitoring in order to avoid or mitigate adverse effects on the environment.

The ESMP is compiled based on the Environmental Audit (EA) of Kassatly Chtaura in accordance with the Lebanese environmental laws and guidelines, the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines), the World Bank Safeguard Policies and best similar projects’ practices.

The WWTP will be constructed on plot No. 1003 of Jdita cadastral area, owned by Kassatly Chtaura and located just next to the industry’s premises. Therefore, the World Bank Operation policy (OP.4.12) on “Involuntary Resettlement” will not be triggered and thus an Involuntary Resettlement Plan will not be required.

## 1.3 BRIEF DESCRIPTION OF THE INDUSTRY

Kassatly Chtaura plant is located on plot No. 191 of Makse Cadastral District in an agricultural zone, at an altitude of 877 m Above Sea Level (ASL). The industrial facility is

surrounded by few residential houses, Alfa Interfood (preserved fruits and vegetables industry), an old farm and some agricultural lands. The nearest water body is a seasonal stream ending into the Litani River situated at 3.2 Km.



**Figure 1: Kassatly Chtaura Location and Surroundings**

The total allocated site area amounts to around 12,000 m<sup>2</sup> and is divided as follow:

- Process and storage area : 10.000 m<sup>2</sup>;
- Administrative/offices area: 2.000 m<sup>2</sup>.

The plant includes four buildings used for the winery, brewery, filling, and offices with a total built up area of 18,581 m<sup>2</sup>. The different buildings of Kassatly Chtaura are presented in Figure 2 below.



**Figure 2: Different buildings of Kassatly Chtaura**

The main products are red, white and rosé wine, beer, carbonated alcoholic and non-alcoholic beverages, fruit syrups, juices, jams, liqueurs, flower extract and rose extract.

The main production buildings of Kassatly Chtaura can be summarized as follows:

- **Brewery** with an average annual production capacity of 4,000,000 L/yr

The malt is first conveyed to a variomill where it is milled with hot water. The milled mixture is then sent to a mash tun where it is milled while adding calcium chloride, magnesium chloride, lactic acid and hot water.

Then the mash is transferred to lauter tun where it is separated into the clear liquid and the residual grains; the lauter tun is a closed system where spent grain is pumped through closed pipes to a tank, while the liquid remains in the tun.

The spent grains are used as animal feed while the liquid is transferred to a boiler where hops, zinc chloride, coloring agent and lactic acid are added. Then the mixture is transferred to whirlpool that separates the trub from the liquid.

The trub is disposed of with municipal waste. The remaining liquid is then cooled using ice water and sterile air before entering the fermentation process. In the fermentation process, yeast and glycol are added.

The filtration process is done while adding de-aerated water mixed with kieselghur, PVPP (Polyvinylpolypyrrolidone) and silica gel, color and CO<sub>2</sub> respectively. Then the beer is transferred to the filling process.

- **Winery** with a total capacity of 143,250 L/yr

The facility produces red, white, and rosé wine. The grapes are collected and stored in plastic crates then transferred to the cellar. The accepted grapes are transferred by pipes to the wine press. The solid wastes are used as fertilizers while the must is transferred by pipes to the fermentation tank where liquid sulfur and additives are added.

By organoleptic control, the must is filled into oak barrels for a period of time. The wine is then transferred to tanks where liquid sulfur and additives are added again.

Once the fermentation process is completed, the produced wine undergoes filtration to finally be filled in the bottles, labeled and packaged.

- **Beverages filling Unit** for carbonated alcoholic and non-alcoholic drinks, syrups, juices, liqueurs, rose and flower extracts with a total capacity of 13,600,000 L/y and 65,000 Kg of Jams.

The facility produces a wide range of syrups. Food additives, coloring agents, concentrates, sugar and flavors are mixed automatically in a stainless steel tank with cold water. The mixture is then filled bottles and pasteurized.

The carbonated alcoholic drink is produced by adding CO<sub>2</sub> to syrups with different tastes and different alcohol concentrations. First, the raw materials (food additives, coloring agents, sugar, flavors, and 96% alcohol) are added to the mixer with water. The solution is mixed,

undergoes filtration, is held for some time to settle, and is then diluted with water and undergoes carbonation. The solution is now ready to be filled in rinsed glass bottles or metal cans. The bottles are then capped using metal caps and goes to pasteurization, labeling, coding and packaging in carton trays.

The carbonated non-alcoholic drink process is similar to the carbonated alcoholic drink process but no alcohol is added.

Different types of juices are produced as well (orange, pineapple, guava, mango, and apple). The liquid concentrate is first heated, filtrated then pasteurized. Sugar is added to the concentrated juices produced before going to bottling and pasteurization. The juices are filled in glass bottles of 1.2 L and 0.3 L capacities.

Other productions lines at Kassatly Chatura include the following: liqueur, jams, rose and flower extracts.



**Figure 3: Process Area at Kassatly Chtaura**

#### 1.4 DESCRIPTION OF THE WORKFORCE

Kassatly Chtaura currently engages 240 employees of which 40% are female employees.

**Table 1 : Number of Employees**

Type	Number
Number of Managerial Employees	160
Number of Production Employees	80
Nationality of Employees	Lebanese
Female Employees	Around 96
Employees Residence	Close-by villages
Work Schedule	9.5 hr/day

Days per week:	5
Days per year:	260

Kassatly Chtaura has 30 employees in the main office based in Beirut and 210 employees in the production plant in Chtaura. Around 75% of the workers in the production plant are from the surrounding villages (Bar Elias, Kab Elias, Al Marj, Saadneyal, Jalala, Taalabaya, Zahle, and Jdita) and transportation by bus is provided to them by Kassatly Chtaura from their villages to the industry's premises. Moreover, all workers are Lebanese, fully insured, and with full-time contracts.

Around 40% of the employees are female and are mainly based in the production plant in Chtaura. The staff of the main office in Beirut is responsible for the transportation and distribution of the products; thus, the majority of them are men.

Kassatly Chtaura has a written code of conduct that includes the industry's mission, values, principles, and work ethics. It includes also a dress code, food safety guidelines, rights and duties of the employees, and specific job description for each position.

## 1.5 INDUSTRY GRIEVANCE REDRESS MECHANISM

Kassatly Chtaura has a grievance process for complaints raised by external parties or by employees/workers recruited by the company. It should be noted that the industry is planning to obtain the OHSAS 18001 certification related to the occupational health and safety assessment series which is expected to further detail the grievance mechanism redress, if deemed necessary.

It is also worth mentioning that a grievance redress mechanism is available at the LEPAP level and it allows all those who believe they are being affected by a LEPAP financed sub-project to raise their concerns and have them resolved. It is a complaints mechanism addressing the mitigation and monitoring of any potential negative impacts in a timely manner.

Any complaint received from an external party shall be handled directly by the upper management, who tries to solve the complaint reasonably with the minimum damage to all parties. Should it get complicated and transferred into a law suit, the company's lawyer will handle the case from a legal perspective.

With regards to the complaints raised internally, the applicable grievance mechanism is described in the sections below.

### 1.5.1. Purpose

Grievances are concerns, problems or complaints raised by an employee and must be made in writing. However, before using the grievance procedure it is expected that an employee will try to resolve their complaint informally if at all possible. The formal stage of the

procedure should only be used when the informal stage has failed to resolve the issue or is not making progress at reasonable speed.

A grievance shall be defined as a statement of dissatisfaction over any condition of work which supposedly has an adverse effect on the employee.

### **1.5.2. Policy**

It is the policy of Kassatly Chtaura to provide its employees with a fair and efficient process to present and resolve complaints and grievances arising out of the employment relationship based on the following principles:

- Any grievance must be made in written describing the decision, action or behavior causing problems and state what action or outcome the employee desires from the grievance resolution process;
- In all cases reference to the human resources department is recommended;
- All proceedings, whether informal or formal, should, so far as is practicable, remain confidential.

### **1.5.3. Domain of application**

This policy covers all departments.

### **1.5.4. Procedure**

GR: Grievant -The Grievant is the person lodging a grievance.

HOD: Head of Department

HRM: Human Resources Manager

PPO: Payroll & Personnel Officer

CEO: Chief Executive Officer

LM: Line Manager

E: Execute

P: Participate

1. An occurrence or condition giving rise to the grievance took place
2. The complaint is against the line manager?
3. If YES, the grievant should seek advice from the Payroll & Personnel Officer or the Human Resources Manager on how to deal with the complaint
  - 3.1. Grievance needed?
  - 3.2. If NO, the Payroll & Personnel Officer or the Human Resources Manager solves the complaint informally
  - 3.3. If YES, the grievant may proceed to the formal stage of the procedure by submitting the Grievance Form within five working days to the head of department
4. If NO, the grievant is encouraged to identify the grievance orally to his/her immediate supervisor, no later than seven working days after the occurrence or condition giving rise to the grievance.
5. Within five working days of such presentation, the immediate supervisor shall give his/her response to the employee with respect to the particular grievance, or shall advise the employee that additional time is needed to render a decision
6. Grievance solved?
7. If YES, the grievant continues his duties normally

8. If NO, the grievant may proceed to the formal stage of the procedure by submitting the Grievance Form within five working days to the head of department
9. The head of department shall investigate the matter and shall then meet with the employee and the employee's supervision responsible as deemed appropriate
10. The head of department shall respond in writing on the standard grievance form within seven working days starting the date on which he received the grievance.
11. Satisfactory Response?
12. If YES, the grievant continues his duties normally
13. The Payroll & Personnel Officer archives the record in a confidential file
14. If NO, the grievant may ask the appeal by head of department to forward the already completed grievance form to the Human Resources Manager
15. The Human Resources Manager will schedule a meeting with the employee, to allow him to freely present, receive, and exchange information and views on the situation
16. The Human Resources Manager will schedule a meeting with his direct supervisor and the head of department. The meeting should be held promptly
17. The Human Resources Manager will act as chairperson of the meeting, hear both sides of the dispute, render a written decision following the hearing, and provide the parties with copies of the decision within seven days of the appeal date.
18. Satisfactory Response?
19. If YES, the grievant continues his duties normally
20. The Payroll & Personnel Officer archives the record in a confidential file
21. If No, the grievant can request an appeal to the Chief Executive Officer
22. The Chief Executive Officer shall finalize the issue and send the final decision in writing to the Human Resources Manager within seven working days of the appeal
23. The Payroll & Personnel Officer archives the record in a confidential file.

The grievance procedure flow chart is presented in Figure 4 below.

## 1.6 LEBANON LABOR LAW

Kassatly Chtaura follows the stipulations of the Lebanese Labor Law, dated 23/09/1946 with Amendment Law No. 207 issued in 26/05/2000, however there is no written policy in this regards. It is worth mentioning that Kassatly Chtaura Management is engaged to reach a 50% ratio of females employed.

According to Article 22 of the Lebanese Labor Law, it is forbidden to employ employees aged less than 14 years. Kassatly Chtaura did not recruit any young employees (aged less than 15 years) in line with the stipulations of Article 23 and Annex 1 of the Lebanese Labor Law whereby the latter are not allowed working in industries engaged in the manufacturing of alcoholic beverages. Hence, exposing young employees (14 years of age) to risks affecting their life, health, physical, mental, spiritual, moral or social development is not possible within Kassatly Chtaura (see Table 5).

## 1.7 HEALTH AND SAFETY PROCEDURES

The Health and Safety Procedures implemented in Kassatly Chtaura can be summarized as follows:

- Anti-slip tiles flooring (R10-R11) are used in the production areas to eliminate any physical hazards.
- Personal Protective Equipment (PPE) such as protective clothing, hairnet, eye protection, and ear protection are worn in the different production areas.
  - Slip resistant shoes are worn in wet areas when necessary (i.e. in the fillers room)
  - Face protection masks are worn in the mixing rooms of the laboratory during mixing of powders with water.
  - Eye protection and protective clothing are worn during handling malt and chemicals.
  - Appropriate protective clothing, PVC or rubber gloves, and chemical goggles are worn during handling of hops.
  - Respiratory masks (Disposable half masks Type P3), goggles or safety glasses with side shields, and light-weight protective clothing are worn during handling Kieselguhr.
  - Safety glasses, lab coat, gloves (impervious), and dust respirator are worn while handling Citric Acid.
  - Face protection masks and gloves are worn when in contact with glass in the syrup room or in the pasteurization room where there is high pressure and a risk of breaking of the glass bottles.
- Fire detectors and fire hoses are present in the warehouse while only fire hoses are present in the production area.
- Mock drill trainings are conducted onsite.
- Emergency action and response plans are developed onsite.
- Fire alarm system and a first aid room are available onsite. It should be noted that three employees of Kassatly Chtaura are currently volunteers at the Lebanese Red Cross and are usually the ones responsible for providing the first aids needed in case of injuries and/or accidents.

- Completely closed systems are used onsite (i.e. silos and enclosed conveyors with anti-explosion systems are used for the transportation of barley); hence, no dust is generated.
- Ammonia, an environmentally friendly refrigerant, is being used for cooling purposes. However, since it is toxic, only specific trained personnel are allowed to handle it, and safety and control measures are being taken as specified by the supplier to avoid any leakage.
- Chemicals (raw material, preservatives, floor/equipment cleaning) are not stored in the same places.
- Oils and lubricants are stored in barrels.
- Fuel is stored in underground tanks.
- All compressors are in the same location and enclosed to avoid noise pollution.

Photos representing some of the existing health and safety measures implemented at Kassatly Chtaura are presented in the photos below:



**Figure 4 : Anti-slip tiles flooring (R10-R11)**



**Figure 5 : CIP Chemicals handling at the brewery**



**Figure 6 : Fire hoses and extinguishers**



**Figure 7 : Personal Protective Equipment (PPE) used: protective clothing, hairnet, eye protection, and ear protection are worn in the different production areas.**

Kassatly Chtaura Management is keen to provide continuous trainings to all employees and workers. The trainings are mostly technical and related to the different departments' responsibilities; no trainings on social aspects are currently delivered at Kassatly Chtaura.

The trainings addressed to workers are mainly related to personal hygiene and food safety. On another hand, the trainings addressed to the employees usually cover the following subjects: new software, new processes and procedures, specific engineering matters, etc.

## 1.8 MAIN ENVIRONMENTAL AND SOCIAL ISSUES

Kassatly Chtaura conducted an Environmental Audit (EA) in order to assess the impacts of its activities and to allow a better planning of the actions needed to avoid or reduce undesirable effects and/or impacts. The EA report was approved by the Minister of Environment through its Letter No. 1624/B on 21 March 2018.

The main environmental and social issues associated with Kassatly Chtaura as per the EA conducted are summarized here below:

- The process wastewater is not treated currently. It is collected without treatment into a central sump before being discharged into a nearby water stream. A WWTP shall be installed in order to treat the wastewater prior to discharge. Process wastewater quantities and sources are detailed in section 3, here below.
- The domestic wastewater is discharged in a septic tank and emptied by a tanker whenever it is full. However, the location of wastewater discharge is not acknowledged. The tanker should discharge the wastewater in the nearest wastewater network.
- High NO<sub>x</sub> concentrations have been detected at one of the generators (350 KVA Generator), which is located in a closed concrete room and operational only at night and during weekends. Frequent maintenance and emissions monitoring shall be conducted along with the installation of a catalytic converter for NO<sub>x</sub> concentration minimization.
- The silica gel, food additives, kieselgurh, and colored paper bags are currently disposed with domestic waste. These bags shall be returned to the supplier for reuse or sent for recycling.
- The Polyvinylpyrrolidone (PVPP) paper bags are currently disposed of with domestic waste. The product must be subject to a special treatment, for example in a certified center in order to respect the local official prescriptions.
- Oenological products plastic containers are sold to a third party (bought by different municipalities for re-use). These products shall be landfilled or incinerated in accordance with international regulations.
- Lactic acid empty gallons, malt bags, sugar bags, hops' metal containers, yeast nylon bags, flavors plastic containers, alcohol's plastic drums, liquid sulfur containers, sodium hydroxide plastic barrels, nitric acid plastic barrels, lubricants containers and colored gallons are sold to a third party (bought by different municipalities for re-use). These products shall be returned to the supplier for reuse or send for recycling.
- Noise measurements conducted at several locations of the facility showed an exceedance of the allowable noise levels; however, needed mitigation measures could not be identified since the measurements conducted did not take the baseline levels into consideration. It is suggested that additional noise monitoring shall be conducted prior to implementing any mitigation measure.

The compliance strategy for Kassatly has been divided into 12 sub-projects as per section 7.3 of the EA of Kassatly Chtaura. Sub-project No. 1 consists of the installation of a WWTP for the treatment of the domestic and industrial wastewater collected by the tanker into the nearest municipal wastewater network. The following ESMP will include all the necessary actions, mitigation measures, management and monitoring plan set forth in view of not compromising the potential of the sub-project and hence ensuring its sustainability.

## 2 SUB-PROJECT DESCRIPTION

As stated above, sub-project No. 1 consists of the installation of a WWTP for the treatment of the industrial wastewater. Since there is no nearby municipal wastewater network allowing the discharge of the domestic wastewater generated by Kassatly Chtaura; it shall be treated along with the industrial; wastewater in the planned WWTP.

### 2.1 WASTEWATER QUANTITIES AND SOURCES

Wastewater from flushing trub, flushing keiselghur, flushing spent yeast, pasteurization, cleaning crates, water washing fruits, Cleaning In Place (CIP) system, cleaning of the production areas, rinsing of bottles/jars, and backwash from the Reverse Osmosis (RO) are collected without treatment into a central sump before being discharged into a nearby water stream.

Domestic wastewater is discharged into a septic tank and emptied by a tanker whenever it is full.

**Table 2 : Wastewater Quantities and Sources in Kassatly Chtaura**

Sources of wastewater	Annual production (m <sup>3</sup> /year)	Daily flows (m <sup>3</sup> /day)
Flushing trub (brewery house)	115	0.45
Flushing keiselghur (filtration)	200	0.77
Flushing spent yeast	255	0.98
Pasteurization	5,200	20
Cleaning crates	35	0.13
Water washing fruits	100	0.38
CIP for all production lines – closed system	5,720	22
Cleaning of production areas – foaming guns and high pressure pumps	3,900	15
Rinsing of bottles/jars – high pressure	6,500	25
Water treatment reject (sand filters, carbon filters, softeners, CIP for RO)	7,800	30
Domestic wastewater	5,200	20
<b>TOTAL</b>	<b>35,025</b>	<b>135</b>

Daily flows are based on 260 days of annual operation as reported by Kassatly Chtaura.

At present, the total quantity of wastewater discharged is estimated at 135 m<sup>3</sup>/day; however, wastewater quantities are expected to reach 200 m<sup>3</sup>/d over the next ten years due to the expected increase in the production within the facility.

The WWTP shall allow Kassatly Chtaura to move towards environmental compliance by discharging treated wastewater with the following characteristics:

**Table 3 : Maximum Allowable Limits for Wastewater Discharge into Surface Water**

Substance	Maximum allowable limits for wastewater discharge into surface water according to Decision 8/1	Maximum allowable limits for wastewater discharge according to the WB EHS Guidelines for wastewater and ambient water quality
pH	6-9	6-9
Temperature (°C)	30	-
BOD (5 day, 20°C) (mg/l)	25	30
COD (dichromate) (mg/l)	125	125
Total Phosphorus (mg/l)	10	2
Total Nitrogen (mg/l)	30	10
Suspended solids (mg/l)	60	50
Oil and grease (mg/l)	30	10
Sulphates (mg/l)	1,000	-
Coliform bacteria (37°C in 100ml)	2,000	400

The limits values for the Biological Oxygen Demand (BOD), the Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS) are almost the same according to the requirements of the WB and the MoE. The allowable limits for total phosphorus, total nitrogen and oil and grease are more stringent according to the WB requirements.

The planned WWTP is expected to treat the effluent up to the standards of the WB especially that the total nitrogen and total phosphorus levels are not high.

Three (3) wastewater samples were taken at Kassatly industry during the environmental auditing Process:

- One sample from the discharge point of the main process wastewater collection sump that discharges to a nearby water stream;
- Another sample from the brewery - during the flushing operations from the brewery, following CIP of the related equipment;
- A third from the filling lines building during the CIP of the juices, extracts and syrup lines.

Wastewater contains high concentrations of organic compounds, measured by COD and BOD<sub>5</sub>, derived from sugars, citric acids, and organic additives. Concentrations of nutrients, like nitrogen, phosphorus and TSS are very low, relative to organic compounds. The organic compounds are soluble and thus the only reasonable method to remove them is the use of a biological process.

**Table 4 : Available Wastewater Measurements results during the auditing process and afterwards**

Substances	During the Auditing Process			After the Auditing Process	
	Measurements (April 2016)	Measurements (July 2016)	Measurements (November 2016)	Measurements (April 2017)	Measurements (July 2017)
pH	6.4	6.7	4.5	6.0	4.3
BOD (5 day, 20°C) (mg/l)	56	51	1,000	1,645	1,167
COD (dichromate) (mg/l)	4,700	4,480	1,360	2,688	9,696
Total Phosphorus (mg/l)	1.3	0.1	1.1	1.5	1.2
Total Nitrogen (mg/l)	17	7.3	<1	5.5	28
Suspended solids (mg/l)	48	14	119	27	215
Oil and grease (mg/l)	19	101	<5	45	55

The differences shown in the results above are mainly due to the sampling process adopted. The samples collected during the auditing process are spot samples while the ones conducted afterwards are composite samples collected during one complete production day.

## 2.2 PROJECT COMPONENTS AND DESIGN FEATURES

WWTP has a design capacity of 200 m<sup>3</sup>/day and shall be implemented on a 500 m<sup>2</sup> available space on plot No. 1003 – Jdita Cadastral Area – owned by Kassatly Chtaura.

The access road during the construction, operation, and decommissioning of the sub-project would be through the main entrance of the industry. Therefore, Kassatly Chtaura is required to develop and implement a traffic management plan and road safety procedures to avoid traffic congestion, and air and noise pollution.

The main treatment stages of the foreseen WWTP can be summarized as follow:

The wastewater resulting from the factory will be channeled through the sewer network into an effluent pump sump by gravity. Upstream of the pump sump, the effluent will pass through a bar screen to remove coarse objects and an oil trap consisting of a longitudinal channel equipped with an automatic oil removal system with a chain scraper.

From the pump sump, the wastewater will be pumped to a pretreatment unit consisting of the following:

- A rotary screen for the removal of large particles;

- An equalization tank equipped with a level measurement and control system and pH correction facilities;
- A calamity tank to collect high pH wastewater, which will be discharged in the pump sump, when the pH is normal again.

The effluent is then further treated in an activated sludge system. The system consists of an aeration basin and a clarifier in order to treat organic pollutants. The mixed liquor will be then separated into water and sludge in the secondary clarifier. The settled activated sludge is returned to the selector to avoid filamentous sludge growth, while excess sludge is pumped to the sludge dewatering. The aeration is done with air blowers through fine air bubble diffusers on the bottom of the aeration basin.

Sodium hypochlorite will be dosed at the outlet of the WWTP, since the domestic wastewater will be treated along with the industrial wastewater, for disinfection purposes.

Even though no odors are expected to be released outside the boundaries of the WWTP, an odor treatment system which includes the following will be implemented:

- Covers for basins and tanks;
- Vent air collection;
- Biofilter.

Excess sludge is drawn from the sludge recirculation line and goes to the mechanical sludge dewatering plant, consisting of a mechanical drum thickener and a belt filter press. The sludge is first conditioned for mechanical thickening and dewatering by addition of a flocculating polymer. The belt is continuously cleaned with clean high pressure wash water. Filtrate water and belt wash water are collected and pumped to the aeration tank. The dewatered sludge cake is dripped into a container and disposed of regularly.

The filter belt press has a relatively high efficiency with a moderate chemical consumption.

The inconveniences of the filter belt press include the following:

- Its startup and stoppage requires a long time;
- It requires odor treatment.

The dried sludge may be taken to the Zahle landfill, or alternatively further digested and potentially taken to a composting plant following proper testing.

The construction of the WWTP will require the following main general works:

1. Excavation of its foundations;
2. Concrete casting and related formwork;
3. Necessary waterproof painting (Epoxy);
4. Main pipe to supply wastewater to the WWTP;
5. Main electrical cable to supply energy to the WWTP;
6. Other related complementary works.

The above works will be executed over a period of two months through external contractors who will be responsible for mobilizing the necessary equipment as needed to complete the job. It is estimated that the following will be deployed:

- a) Excavator (1);

- b) Wheel Loader (1);
- c) Trucks (2);
- d) Bobcat (1);
- e) Concrete mixer trucks (number will vary depending on the time and the frequency of casting; the quantity of concrete is estimated at 1750 m<sup>3</sup>. Concrete will be supplied from nearby ready mix concrete plants. Each truck can load up to 10 m<sup>3</sup> of concrete.

It is expected that around 20 Labors on average will be hired by the construction contractor to execute the above-mentioned works. The mentioned labors will not reside on the premises of Kassatly Chtaura and will be transported onsite on a daily basis as needed.

Since the contractors' labors will not be mobilized specifically for the sub-project and thus no labor influx nor labor camp are expected, the contractor's labors will be obliged to abide by the environmental, health and safety regulations of Kassatly Chtaura during their interventions on the site.

Accordingly, the EHS requirements of Kassatly Chtaura which will be applied to the contractor and his workers also will constitute an integral part of the contract signed between the company and the contractor.

### 2.3 SUMMARY OF ENVIRONMENTAL AND SOCIAL LEGISLATIONS

The main Lebanese environmental and social legislations related to the sub-project are presented in the table below:

**Table 5 : List of national environmental and social legislations relevant to the sub-project**

Reference	Date	Description
Decree No. 8471/2012	12/07/2012	<p><b>Environmental Compliance for Establishments Decree</b></p> <p>According to this decree, industrial enterprises are required to carry out an EA including an Environmental Management Plan (EMP) at the facility level and to execute the required mitigation measures in order to be eligible to apply for the Environmental Compliance Certificate (ECC).</p> <p>The ECC is a three-year renewable certificate proving the adherence of the industry to environmental standards and application of an environmental management system.</p>
Decision No. 52/1	29/07/1996	<p><b>Environmental Quality standards for air, water and soil</b></p> <p>The Decision sets the National Standards for Environmental Quality and the Environmental Limit Values (ELVs) for Air and Water, as well as Maximum Permissible noise levels (Annex 10 of MOE Decision 1/52). It can be noted that the document encompasses a wide scope of Standards set forth by MoE.</p>

		<p>The following sections and tables relate most closely to the sub-project at hand:</p> <ul style="list-style-type: none"> <li>– Annex 10: Maximum Permissible noise levels,</li> <li>– Annex 14: Permissible Air Pollutant Content and Time of Exposure.</li> </ul>
Decision No. 8/1	01/03/2001	<p><b>Air emission standards and wastewater discharge</b></p> <p>The decision provides ELVs for wastewater discharge into different receiving media (sewerage system, surface water and sea). It should be noted that the decision No. 8/1 presents an update of some of the standards included in the previous decision No. 52/1.</p> <p>The following sections and tables relate most closely to the WWTP project :</p> <ul style="list-style-type: none"> <li>– Table 2: New standards of Environmental Limit Values for wastewater discharge (into the sea, into surface water, into the sewerage system) have been set.</li> </ul>
Decision 29/1	2018	<p><b>Work regulations for foreigners</b></p> <p>Restricts a substantive number of jobs to Lebanese citizens in order to protect the workforce and reduce unemployment. These consist of all jobs practiced by Lebanese citizens include tiling, plastering, gypsum board, iron, wood and aluminum profile installation and other decorative tasks. Engineering is also restricted to Lebanese citizens.</p> <p>On March 21, 2018, a clarification letter was issued by the Ministry of Labor (MoL) regarding Decision 29/1, which states that Syrians are allowed to occupy jobs in the construction sector that are not restricted to the Lebanese as per Decision 29/1 of 2018.</p>
Abolishment of article 522	2017	<p><b>The Committee for Administration and Justice of the Lebanese Parliament declares the abolition of Article 522 on 15 February 2017</b></p> <p>Abolishment of Article 522 of the Penal Code that exempts a rapist from punishment if he marries his victim.</p>
Decree 3791 (amending Decree 7426 of 2012)	2016	<p><b>Set and apply the official minimum wage for employees and workers subject to the labor law and the cost of living ratio</b></p> <p>Raises the minimum daily wage to USD 20</p>
Law 293	2014	<p><b>Law on Protection of Women and Family Members from Domestic Violence –</b></p> <p>Advances women's rights and safety. Establishes important protection measures and related policing and court reforms, but</p>

		leaves women at risk of marital rape and other abuse
Decree 8987	2012	<b>Forbids the employment of adolescents and children under 18 years of age in jobs that pose a risk to their health, safety and behaviour</b>
Decree 11802	2004	<b>Organizing occupational safety, safety and health in all institutions subject to labor law</b>  Provides the general regulations for the prevention of occupational hazards and accidents, and the promotion of health and safety in all industrial establishments subject to the Labor Law. These cover prevention and safety, occupational health, the safe use of chemicals at work, as well as occupational noise standards.
MoL Decision 49/1	1997	<b>Abolition of child labour</b>  Forbids the employment of adolescents and children less than 18 years of age in non-industrial settings, unless a medical examination proves them apt to perform such work.
Labor Law and its updates	23/09/1946  Amendment Law 207 passed in 26/05/2000	<b>Sets the framework and rules governing the relationship between employers and employees, including:</b> <ul style="list-style-type: none"> <li>• Minimum age of employment: 14 years (if the candidate is in good health); subject to yearly medical examinations until the age of 18.</li> <li>• Minimum age for employment in industrial workplaces and tedious tasks and works requiring substantial physical effort, or those posing health risks: 15 years.</li> <li>• Minimum age for employment on tasks and works that pose risks or hazards to health and safety: 16 years.</li> <li>• Employment record issued by the MoL specific to every employee, comprising name, nationality, employer name, photograph, specialty, health consultations, and dates of joining and leaving each establishment.</li> <li>• Working hours for employees under the age of 18 years: ≤ 6 hours, including a one-hour break following 4 continuous working hours. Working hours must exclude the period between 7:00 pm and 7:00 am.</li> <li>• Adolescent employees must be given a resting period of at least 13 consecutive hours between two working shifts. Overtime work and work during breaks, on weekends and holidays are forbidden for adolescents.</li> <li>• Minimum vacation days for adolescents: 21 days following employment for a complete year; 2/3 of which must be taken continuously.</li> <li>• No gender discrimination is allowed in the workplace regarding work type, remuneration, employment, promotion, training and clothing. Employment of women in industrial settings and other tedious and risky works is forbidden.</li> <li>• The right of women for a paid maternity leave (10 weeks</li> </ul>

		<p>according to the latest legislation).</p> <ul style="list-style-type: none"> <li>• It is forbidden to fire women during their maternity leave.</li> <li>• Maximum weekly working hours: 48 hours with a 1-hour break (mid-day).</li> <li>• Working hours can be reduced based on the level of physical effort required by the job.</li> <li>• Right of employees to a continuous 9-hour resting period during a working day.</li> <li>• The right of employees for a continuous 36-hour break every week.</li> <li>• The right of employees hired since at least 1 year to 15 days of vacation per year, without the right of employers to fire employees during their leave.</li> <li>• The right of employees to a paid occupational sick leave in case of occupational accident, the duration of which varies based on the case.</li> </ul>
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## 2.4 SCREENING OF THE PROJECT AND APPLICABLE WORLD BANK (WB) SAFEGUARD POLICIES

The Environmental and Social Assessment (ESA) Report of the LEPAP includes specific procedures for environmental assessment to be applied to activities and sub projects planned, according to the importance of their environmental impacts and in accordance with the safeguard policies of the World Bank mainly OP 4.01 on “Environmental Assessment”, taking also into consideration the national EIA Decree No. 8633 of 2012.

According to the LEPAP ESA, an industrial WWTP containing non-hazardous materials is considered as a category II sub-project and thus requires the preparation of an ESMP.

OP 4.01 is solely triggered among the WB’s environmental and social safeguards. The implementation of the WWTP at Kassatly Chtaura is not expected to cause any physical or economical displacement or lack of access to designated parks, therefore the Involuntary Resettlement Policy OP 4.12 would not be triggered in this sub-project.

It is to be noted that the WB issued the World Bank Group Environmental, Health, and Safety Guidelines (known as the "EHS Guidelines"). General EHS Guidelines contain information on crosscutting environmental, health, and safety issues potentially applicable to all industry sectors.

General EHS guidelines related to wastewater and ambient water quality as well as specific EHS for Water and Sanitation projects are presented in Annex 1 along with the specific EHS for breweries and for food and beverage processing. The relevant guidelines are summarized here below.

In the context of their overall EHS standards management system, facilities should be implemented with a vision to:

- Understand the quality, quantity, frequency and sources of liquid effluents in its installations;

- Plan and implement the segregation of liquid effluents principally along industrial, utility, sanitary, and stormwater categories, in order to limit the volume of water requiring specialized treatment;
- Identify opportunities to prevent or reduce wastewater pollution through such measures as input substitution, or process modification (e.g. change of technology or operating conditions/modes);
- Assess compliance of their wastewater discharges with the applicable discharge standards.

As for the specific EHS for water and sanitation, the wastewater from water treatment projects include filter backwash, reject streams from membrane filtration processes, and brine streams from ion exchange or demineralization processes. These waste streams may contain suspended solids and organics from the raw water, high levels of dissolved solids, high or low pH, heavy metals, etc.

Solid waste residuals generated by water treatment include process residuals, used filtration membranes, spent media and miscellaneous wastes. Process residuals primarily consist of settled suspended solids from source water and chemicals added in the treatment process, such as lime and coagulants.

Pre-sedimentation, coagulation (e.g. with aluminum hydroxide [alum] or ferric hydroxide), lime softening, iron and manganese removal, and slow sand and diatomaceous earth filtration all produce sludge. Composition of the sludge depends on the treatment process and the characteristics of the source water, and may include arsenic and other metals, radionuclides, lime, polymers and other organic compounds, microorganisms, etc.

Water treatment may involve the use of chemicals for coagulation, disinfection and water conditioning. In general, potential impacts and mitigation measures associated with storage and use of hazardous chemicals are similar to those for other industrial projects. Air emissions from water treatment operations may also include gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia).

The main recommended measures can be summarized as follows:

- Land application of wastes with high dissolved solids concentrations is generally preferred over discharge to surface water subject to an evaluation of potential impact on soil, groundwater, and surface water resulting from such application;
- Recycle filter backwash into the process if possible;
- Treat and dispose of reject streams, including brine, consistent with national and local requirements. Disposal options include return to original source (e.g. ocean, brackish water source, etc.) or discharge to a municipal sewerage system, evaporation, and underground injection.
- Minimize the quantity of solids generated by the water treatment process through optimizing coagulation processes;
- Dispose of lime sludge by land application if allowed;
- Dispose of ferric and alum sludge by land application, if allowed;
- Potential impact on soil, groundwater, and surface water, in the context of protection, conservation and long term sustainability of water and land resources, should be assessed when land is used as part of any waste or wastewater treatment system;

- Sludge may require special disposal if the source water contains elevated levels of toxic metals, such as arsenic, radionuclides, etc.;
- Regenerate activated carbon (e.g. by returning spent carbon to the supplier).
- Develop and implement a plan for responding to accidental chemical releases.
- Develop and implement a prevention program that includes identification of potential hazards, written operating procedures, training, maintenance, and accident investigation procedures;
- Store chemicals away from sunlight, moisture and high temperatures.

Process wastewater treatment standards shall also be consistent with applicable Industry Sector EHS Guidelines, i.e., in his case, specific EHS for breweries and for food and beverage processing.

Effluent streams from food and beverage processing may have a high biochemical and chemical oxygen demand (BOD and COD) resulting from organic wastes entering into the wastewater stream, and from the use of chemicals and detergents in various processes including cleaning (discussed below). In addition, effluent may contain pathogenic bacteria, pesticide residues, suspended and dissolved solids such as fibers and soil particles, nutrients and microbes, and variable pH. The effluent load should be reduced by preventing raw materials, intermediates, product, by-product and wastes from unnecessarily entering the wastewater system.

The pollutant load of brewery effluent is primarily composed of organic material from process activities. Brewery processes also generate liquids such as the weak wort and residual beer which the brewery should reuse rather than allowing to enter the effluent stream. The main sources of residual beer include process tanks, diatomaceous earth filters, pipes, beer rejected in the packaging area, returned beer, and broken bottles in the packaging area. The following preventive management measures can be taken to reduce the organic load of brewery effluent:

- Collect weak wort in a tank equipped with heating jackets and a slow speed agitator for use in the next brew. This reduces the organic load in the wastewater, saving raw materials and conserving water. Weak wort collection is particularly important for high-gravity brewing;
- Undertake procedural improvements to reduce the amount of residual beer, such as the emptying of tanks, good housekeeping, and efficient monitoring systems;
- Avoid overfilling of fermenting vessels which causes loss of partially-fermented wort and yeast;
- Ensure sedimentation of caustics from the bottle washer;
- Collect and reuse of rinsing water from the last cleaning in the first cleaning-in-place (CIP) cycle.

Techniques for treating industrial process wastewater of the food and beverage and brewery sectors include flow and load equalization; sedimentation for suspended solids reduction using clarifiers; biological treatment; biological nutrient removal for reduction in nitrogen and phosphorus; chlorination of effluent when disinfection is required; dewatering and disposal of

residuals. Additional engineering controls may be required to contain and neutralize nuisance odors. Grease traps, skimmers or oil water separators for separation of floatable solids are specially adopted for the treatment of the food and beverages processing wastewater;

**a. Occupational health and safety issues associated with the operation of food and beverage processing include the following:**

- Physical hazards include exposure to same-level fall hazards due to slippery conditions, the use of machines and tools, and collisions with internal transport equipment, such as forklift trucks. Industry-specific recommendations are presented below.
  - Maintain walking and working surfaces clean and dry by preventing spillages through equipment design and operation, providing workers with anti slip footwear where still necessary;
  - Ensure that the process layout reduces opportunities for process activities to cross paths, thus avoiding collisions and falls;
  - Ground all electrical equipment and installations;
  - Prepare emergency plans and train staff for emergency situations
- Workers can be exposed to lifting, carrying, and work-posture injuries resulting from heavy manual lifting and repetitive work, including the operation of slicing and vacuum-packing machines and poor working postures caused by inadequate workstation and process activity design.
- Exposure to noise in the canning plant, bottling machines, conveyors and blanching applications.
- Inhalation and ingestion of dust and aerosols causing skin irritation or other allergic reactions.

The following are recommendations for the prevention and control of exposures to biological hazards:

- Install exhaust ventilation equipped with filters, cyclones, etc., at sources of dust;
- Provide workers with PPE that is appropriate for the process activity, e.g. masks and gloves;
- Ammonia is often used as a primary refrigerant. It is a toxic substance and can form explosive mixtures with air. Guidance on the safe use of ammonia and other refrigerants is readily available from professional refrigeration institutions<sup>14</sup> and should be considered.

**b. Occupational health and safety hazards associated with brewery operations include:**

- Organic dust arising from grain storage, milling, and transport operations presents an explosion risk in the areas of the brewery where these operations occur. Recommendations to prevent and control dust accumulation are the following:
  - Frequent sweeping to control dust accumulation, and use of dust extraction and recycling systems to remove dust from work areas;
  - Provision of electrical grounding, spark detection and prevention;
  - Elimination of external ignition sources;

- Implementation of hot-work permits;
- Carbon dioxide is produced during fermentation and maturation processes. Uncontrolled release or inadequate ventilation, particularly in confined or enclosed spaces such as fermentation and maturation rooms can result in accumulation of sufficient concentration to present asphyxiation risk. Appropriate safety measures may include enhanced ventilation, guidance on safe working in confined spaces, and the use of personal gas detectors in high risk areas.
- Projects should try to reduce the number of accidents among project workers to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facilities should also maintain a record of occupational accidents, diseases, and dangerous occurrences and accidents.

**c. Occupational health and safety impacts associated with the operational phase of water and sanitation projects primarily include the following:**

- Wastewater treatment involves use of potentially hazardous chemicals, including strong acids and bases, chlorine, sodium and calcium hypochlorite, and ammonia. Water may contain radioactive substances and heavy metals, which typically accumulate in the water treatment sludge. Potential sources of exposure to radionuclides include: pumps and piping where mineral scales accumulate; lagoons, and flocculation and sedimentation tanks where residual sludge accumulate; filters, pumping stations, and storage tanks where scales and sludge accumulate; facilities where filter backwash, brines, or other contaminated water accumulates; facilities that are enclosed ; residuals processing or handling areas; and land disposal or application areas where residuals are shoveled, transported, or disposed. Oxygen may be displaced or consumed by microorganisms, thus resulting in an oxygen deficient environment in areas where wastewater or wastewater residues are processed. The following are recommendations to prevent, minimize, and control chemical exposure:
  - Implement a training program for operators who work with chlorine and ammonia regarding safe handling practices and emergency response procedures; ·
  - Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance.
  - Prepare escape plans from areas where there might be a chlorine or ammonia emission; ·
  - Install safety showers and eye wash stations near the chlorine and ammonia equipment and other areas where hazardous chemicals are stored or used;
  - Ventilate enclosed processing areas and ventilate equipment, such as pump stations, prior to maintenance.
  - Continuously monitor air quality in work areas for hazardous conditions (e.g. explosive atmosphere, oxygen deficiency);
  - Prohibit eating, smoking, and drinking except in designated areas;
  - Rotate personnel among the various treatment plant operations to reduce inhalation of potentially hazardous materials.
- Workers and staff at wastewater and sludge treatment facilities can be exposed to the many pathogens contained in sewage such as bacteria, viruses, molds, and fungi.

These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity.

Recommendations to prevent, minimize, and control exposure to pathogens include:

- Include in safety training program for workers, safe handling and personal hygiene practices to minimize exposure to pathogens and vectors;
- Use vacuum trucks or tugs for removal of fecal sludge instead of manual methods;
- Provide access to safe drinking water and sanitation facilities and encourage workers to wash hands frequently;
- Provide and require use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Especially provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes;
- Provide worker immunization (e.g. for Hepatitis B and tetanus) and health monitoring, including regular physical examinations;
- Reduce aerosol formation and distribution by planting trees around the aeration basin to shield the area from wind and to capture the droplets and particles; Advise individuals with asthma, diabetes, or suppressed immune systems not to work at WWTP, especially composting facilities, because of their greater risk of infection.

### 3 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
<b>Construction / installation phase</b>					
Emissions from construction equipment and vehicles	Air pollution	<ul style="list-style-type: none"> <li>▪ Equipment and vehicles shall be regularly maintained in line with manufacturers' recommendations to minimize polluting exhaust emissions</li> <li>▪ All new equipment and vehicles shall meet the relevant national regulations and WB directives for emissions standards</li> <li>▪ Vehicles and equipment shall be turned off when not in use</li> <li>▪ Construction equipment and vehicles shall be monitored periodically to ensure they meet the agreed standards</li> </ul>	Minor / included in construction costs	Weekly	Construction contractor and supervision consultant
Noise and vibration from construction works and equipment	Noise pollution and vibration	<ul style="list-style-type: none"> <li>▪ Construction activities shall be limited to normal daylight working hours. A works schedule shall be followed and/or other specific restrictions on works shall be established</li> <li>▪ Construction activities shall be limited to permissible work hours in rural, residential areas as per MoE Decree 52/1 Annex 10</li> <li>▪ All construction equipment and vehicles shall be in good working order and maintained in line with manufacturers' recommendations</li> <li>▪ Noise control engineering techniques shall be in use where practical i.e. the use of mufflers, silencers, enclosures etc. Noise emissions shall be monitored against set control targets to meet required standards.</li> </ul>	Minor / included in construction costs	Ongoing	Construction contractor and supervision consultant

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
Spills from construction vehicles and equipment	Soil and water pollution	<ul style="list-style-type: none"> <li>▪ Stringent onsite pollution control measures shall be applied to prevent soil and water contamination from oil and fuel. Condition of vehicles and equipment shall be periodically checked. Equipment and vehicles shall be regularly maintained in line with manufacturers' recommendations</li> <li>▪ Any spills shall be contained and cleaned up.</li> <li>▪ All vehicles shall carry absorbing pads</li> <li>▪ Protective equipment and trays shall be used when refueling or changing oil on vehicles and equipment</li> <li>▪ Designated areas shall be defined for the storage of fuel, lubricants, coolants, paint, solvents etc.</li> </ul>	Minor/ included in construction costs	Ongoing	Construction Contractor and Supervision consultant
Waste generation from construction activities (including hazardous waste)	Soil and water pollution	<ul style="list-style-type: none"> <li>▪ Proper waste collection and subsequent disposal shall take place at Zahle landfill</li> <li>▪ Hazardous wastes (oils and grease) shall be collected in closed tanks, temporarily stored in the recycling area and handed over to an authorized company for final treatment/disposal</li> <li>▪ Excavated materials will be transported for disposal at the Zahle Landfill</li> </ul>	Minor/ included in construction costs	Weekly	Construction contractor and supervision consultant
Disruption of existing services from implementation of drainage and connection works	Interruption of existing plant operation	<ul style="list-style-type: none"> <li>▪ Contractors shall protect existing installations and buildings from potential damage during the execution of works. In the event of damage, the contractor shall undertake repairs</li> </ul>	Minor/ included in construction costs	Ongoing upon occurrence	Construction contractor and supervision consultant
Traffic Congestion	Disruption, health and safety impacts as well as	<ul style="list-style-type: none"> <li>▪ Develop and implement a traffic management plan</li> <li>▪ Erect road safety features</li> </ul>	Included in construction costs	Quarterly	Construction contractor and supervision consultant

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
	social and economic impacts				
Accidents from construction activities	Construction health and Safety	<ul style="list-style-type: none"> <li>▪ Health, safety and environmental regulations shall be imposed on all employees and workers of Kassatly Chtaura in addition to the -contractors workers</li> <li>▪ Signature of an agreement between Kassatly Chtaura and the contractor shall include the enforcement of the environmental, health and safety measures applied by the industry on the contractors' workers during the whole construction works period</li> <li>▪ Provision of all necessary safety equipment, fire protection measures and monitoring instruments</li> <li>▪ Provision of PPE (helmets, boots, earplugs)</li> <li>▪ Provision of construction barriers and proper warning sign</li> <li>▪ Properly labelling and storing chemicals</li> <li>▪ Properly rating electrical installations and equipment</li> <li>▪ Trainings shall be provided to workers on the storage and handling of chemicals, lines of production and equipment use</li> </ul>	Minor/ included in construction costs	Daily	Kassatly Management, construction contractor and supervision consultant
Absence of sanitation, social and medical facilities and services;	Construction workers welfare / workforce social issues	<ul style="list-style-type: none"> <li>▪ Provision of good sanitation, social and medical facilities and services</li> <li>▪ Develop, implement and disseminate occupational health and safety guidelines</li> <li>▪ Employ qualified fist aider and safety officer</li> <li>▪ First aid kits to be available on site for use by the workers</li> <li>▪ The GRM developed by Kassatly chtaura shall be applicable to contractor's in order to help identify and</li> </ul>	included in construction costs	Continuous	Construction contractor and supervision consultant

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
		address potential problems during construction			
Employment Opportunities		<ul style="list-style-type: none"> <li>▪ Implementing clear and transparent procedures for recruitment of labor and sourcing of goods and services will enhance the positive impact</li> <li>▪ Preference will be given to residents of local communities, in the case of unskilled labor, and to local suppliers in the case of goods and services</li> </ul>	included in construction costs	Quarterly	Construction contractor and supervision consultant
<b>Operation phase</b>					
<b>Treatment Efficiency and Effluent Quality</b>					
Wastewater collection system (WCS)	Soil and water pollution	<ul style="list-style-type: none"> <li>▪ All sewers, collection channels and manholes shall be kept watertight.</li> <li>▪ Ongoing inspection and maintenance of the WCS shall be performed to monitor leaks, pipe corrosion etc.</li> </ul>	Included in O&M costs	Weekly	WWTP Operator
Discharge of effluent to recipient water stream	Water quality degradation	<p>WWTP will operate at an optimum efficiency levels commensurate with the design criteria and required compliance. In case of emergency conditions, special emergency actions shall be taken as per the Emergency Response Plan in order to avoid release of untreated effluent into the receiving water bodies</p> <p>As addressed in the monitoring plan below, effluent shall be regularly monitored to ensure water quality standards are in line with the requirements of Decision No. 8/1</p>	200 USD / Sample	Monthly	WWTP Operator
Inefficient WWTP operation	Inadequate effluent quality, water pollution	As addressed in the monitoring plan, effluent shall be regularly monitored to ensure water quality standards are in line with the requirements of Decision No. 8/1	200 USD / Sample	Continuous  Sampling: Regularly by the	WWTP Operator (Staff hired by Kassatly), third party (Environmental

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
		<p>An operation and maintenance manual and related procedures shall be set and made available, as recommended by the supplier. The document shall target, at a minimum, the following:</p> <ul style="list-style-type: none"> <li>▪ Operator and staff responsibilities</li> <li>▪ Staff guidance for emergency situations</li> <li>▪ Identification of MoE requirements and the obligation to meet these requirements</li> <li>▪ Operating procedures including a detailed description of each major treatment unit/process with relationship to related units, safe operating procedure for normal operation, including common operating problems, safe operating procedures for operating during emergency conditions, and any fail-safe features</li> <li>▪ A program of regularly scheduled inspection and maintenance</li> <li>▪ An emergency plan</li> </ul>	Cost of trainings and documentation included in the supplier's offer	<p>industry as required by the supplier and bi-annually by third party as required by the MoE</p> <p>Training: Yearly</p>	Laboratory)
Filter backwashing	Water pollution	Backwash wastewater shall be recycled into the system and treated	Included in operation and maintenance costs	Weekly, or when the filter gauge reads 10 psi higher than clean pressure.	WWTP operator
Disinfection additives	Environmental pollution	<ul style="list-style-type: none"> <li>▪ All disinfection substances used during the treatment phase shall be used in appropriate optimal dosage commensurate with influent and effluent quality as per supplier's recommendations. The storage, handling and disposal of waste shall be conducted in line with the Material safety Data Sheets (MSDS) obligations</li> </ul>	Included in operation and maintenance costs	Continuous	WWTP Operator

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
Pump failure	Outflow of wastewater	To prevent the accidental flow of water from the pumping station due to pump failure, spare pumps shall be provided and installed	Spare parts costs are included in the supplier's offer for the first year.  3% annually thereafter	During planning of the project and contract negotiations with supplier	Kassatly Management Team
Power outage	Malfunctioning of plant	In order to ensure that power is available to the plant at all times, a UPS shall be put in place to cater for the transitional period between the electrical outage and the operation of the generator set	20,000 USD	Continuous	Kassatly Management /maintenance team
Incident discharge of operational Wastewater to surrounding area	Water quality degradation	<ul style="list-style-type: none"> <li>▪ Implementation of a calamity tank to be used for storage in case of spills / bad product production, etc.</li> <li>▪ Continuous analysis of the influent and effluent quality in the on-site laboratory, as addressed in the monitoring plan</li> <li>▪ Regular monitoring of sewer line and manholes for visible leakages/ overflows</li> <li>▪ Immediate repair operation for the damaged portion of sewer line</li> <li>▪ De-siltation of blocked sewers/ manholes with sewage pumping machines storing and disposal at appropriate refusal area after treatment</li> <li>▪ Ensure proper covering of manhole and avoid dumping of solid waste to prevent chocking of sewer line</li> </ul>	Calamity tank and laboratory costs are included in the supplier's offer.  Included in O&M costs	Continuous  As per the monitoring plan	WWTP Operator
<b>Sludge Generation</b>					
Additives	Health and	All substances used during the sludge dewatering phase	Included in operation	Continuous	WWTP Operator

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
	Safety	(such as adding catalysts to increase sludge drying etc.) shall be used in appropriate optimal dosage commensurate with sludge quality as per supplier's recommendations, and shall be appropriately stored and handled as per the requirements of the MSDS	and maintenance costs		
Disposal of residual solid products (sludge) from mechanical screening, and sludge treatment	Soil and water pollution (problems arising due to bad odour, insects, polluted air, etc.)	Safety procedures for transportation and disposal of stabilized sludge shall be established. The sludge shall be adequately collected in skips and disposed of in Zahle sanitary landfill. Other options for sludge stabilization and disposal, such as lime injection, incineration, could be considered in future stages, taking into account for example the eventual future establishment of waste to energy projects	Included in Operation and maintenance costs	Continuous	WWTP Operator
<b>Odor generation</b>					
Odor generation due to WWTP operation	Odor	<ul style="list-style-type: none"> <li>▪ A complete odor treatment unit is included as part of the suppliers' offers (Ventilators and Biofilter System)</li> <li>▪ Ensuring tank seals, where available, are well maintained.</li> <li>▪ Ensuring redundancy is introduced into the system for upset conditions such as power or dosing pump failures</li> <li>▪ Spill management procedures to ensure immediate clean-up</li> <li>▪ Maintaining an odour complaint logbook and in the event of a complaint, immediate investigation of any odour sources, together with appropriate actions to eliminate them.</li> <li>▪ Facility workers shall be equipped with all needed protection devices as per "Health and Safety" here below.</li> </ul>	Between 19,000 – 29,000 USD according to the adopted treatment technology	Continuous	WWTP Operator

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
Odor emissions from sludge transportation	Odor	<ul style="list-style-type: none"> <li>▪ Traffic management procedure to coordinate the collection of sludge at a time when meteorological conditions are most favourable to air dispersion, namely during highest daily solar radiation (midday) and light breezes.</li> <li>▪ Transfer of solids from sludge tanks for removal offsite to be carried out via a closed system in order to minimize fugitive emissions.</li> </ul>	Included in Operation and maintenance costs	As needed	WWTP Operator
Waste disposal from preliminary and mechanical treatment, etc.	Odor, as well as Health and safety issues	<ul style="list-style-type: none"> <li>▪ Waste management plan shall be established and duly implemented.</li> <li>▪ Non-hazardous wastes shall be disposed of at the Zahle sanitary landfill.</li> <li>▪ Wastes deemed as hazardous shall be stored separately until handed over to an authorized company for their final treatment/disposal</li> </ul>	Included in operation and maintenance costs	Continuous	WWTP Operator
<b>Health and safety</b>					
Exposure of workers to toxic gases and obnoxious odors (MSDS of the chemicals used in the treatment process are presented in Annex 2)	Health and safety hazard for WWTP personnel	<ul style="list-style-type: none"> <li>▪ Wear respirator, or gas mask, when exposed to harmful aerosols, dusts, vapours or gases</li> <li>▪ Personnel of the WWTP shall undergo periodical medical checks to ensure no negative impacts arise from their employment at the WWTP</li> <li>▪ Training and education programs shall be organized for employees</li> </ul>	<p>Included in O&amp;M costs</p> <p>Training cost included as part of supplier's offer</p>	Continuous	WWTP Operator, Kassatly Chtaura Management
Hazards related to (i) entry into confined spaces and suffocation due to oxygen deficiency, as well as (ii)	Health and safety hazard of WWTP personnel	<ul style="list-style-type: none"> <li>▪ Do NOT mix substances without the supervision of a qualified personnel or safety professional</li> <li>▪ Obey all safety-instructions regarding the storage, transport, handling or pouring of substances.</li> </ul>	<p>Included in O&amp;M costs</p> <p>Training cost</p>	Continuous	WWTP Operator, Kassatly Chtaura Management

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
burns, by steam or hot vapors, by splashes of hot liquids or by contact with hot surfaces		<ul style="list-style-type: none"> <li>▪ Training and education programs shall be organized for employees.</li> <li>▪ Personnel of the WWTP shall undergo periodical medical checks to ensure no negative impacts arise from their employment at the WWTP.</li> </ul>	included as part of supplier's offer		
Acute intoxication caused by erroneous drinking of untreated wastewater, as well as poisoning by phosgene, which may be formed if a worker smokes in the presence of chlorinated-solvent vapors, or if welding or other flames or arcs are used.	Health and safety hazard of WWTP personnel	<ul style="list-style-type: none"> <li>▪ Take extreme care when handling highly corrosive agents such as liquid or gaseous chlorine, concentrated acids or alkalis, or when toxic gases may be emitted from the reagents, etc.</li> <li>▪ Training and education programs shall be organized for employees.</li> <li>▪ Personnel of the WWTP shall undergo periodical medical checks to ensure no negative impacts arise from their employment at the WWTP.</li> </ul>	Included in O&M costs  Training cost included as part of supplier's offer	Continuous	WWTP Operator, Kassatly Chtaura Management
Damage to eyes by splashes of irritating or corrosive liquids.	Health and safety hazard of WWTP personnel	<ul style="list-style-type: none"> <li>▪ No smoking, eating or drinking in areas where chemical or biological contamination is allowed.</li> <li>▪ Provision of water rinsing stations / lavatories</li> <li>▪ Training and education programs shall be organized for employees.</li> <li>▪ Personnel of the WWTP shall undergo periodical medical checks to ensure no negative impacts arise from their employment at the WWTP.</li> </ul>	Included in O&M costs  Training cost included as part of supplier's offer	Continuous	WWTP Operator, Kassatly Chtaura Management
Slips and falls on floors made slippery by water, aqueous solutions or solvents; as well as Falls into ponds, pits, clarifiers or tanks causing injuries or	Health and safety hazard of facility personnel	<ul style="list-style-type: none"> <li>▪ Use safety shoes or boots with non-slip soles.</li> <li>▪ Training and education programs shall be organized for employees.</li> </ul>	60 USD / Personnel Safety shoes  Training cost included as part of supplier's offer	Continuous	WWTP Operator, Kassatly Chtaura Management

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
drowning					
Fire and explosions due to the potential formation and release of flammable gases during processing (e.g., methane, hydrogen)	Health and safety hazard for WWTP personnel	<ul style="list-style-type: none"> <li>▪ Fire extinguishers of the “dry” type will be provided in all buildings containing electro-mechanical equipment and electrical installations, which are in-line with applicable standards.</li> <li>▪ An outdoor hydrant network will be constructed at the plant, in accordance with the appropriate regulations</li> </ul>	2,500 USD	During construction and operation	Construction contractor / maintenance team
<b>Social</b>					
Health and safety hazard: Airborne hazards not only create unpleasant odors but also pose the risk of respiratory and gastrointestinal infections for people living in close proximity to the WWTP.	Social Impact (Human Health Cost)	<ul style="list-style-type: none"> <li>▪ Wear respirator, or gas mask, when exposed to harmful aerosols, dusts, vapours or gases</li> <li>▪ Personnel of the WWTP shall undergo periodical medical checks to ensure no negative impacts arise from their employment at the WWTP</li> <li>▪ Training and education programs shall be organized for employees.</li> </ul>	Included in O&M costs	Continuous	Kassatly Management / WWTP Operator
Human health benefits for the general public from the implementation of the WWTP.	Social Impact	<ul style="list-style-type: none"> <li>▪ Ensuring WWTP operation commensurate with design criteria and required compliance levels, through the cumulative interaction of the various measures addressed here above, hence ensuring the targeted higher quality of effluent discharged into receiving water bodies, and related increased health conditions and improved quality of life to local residents</li> </ul>	Included in O&M costs  Training cost included as part of supplier's offer	Continuous	Kassatly Maintenance Team / WWTP Operators
Absence of a mechanism for the reporting of the informal complaints submitted by the employees and workers	Social Impact	<ul style="list-style-type: none"> <li>▪ The existing grievance mechanism shall be updated to include the need for a record of all the complaints submitted by the employees or workers recruited at Kssatly Chtaura including the formal and informal ones</li> </ul>		Continuous	Kassatly Management

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
<b>Post - Operation / Decommissioning phase</b>					
Transport, installation and decommissioning of the WWTP may pose potential safety risks to local communities and workers.	Technical and Operational Impacts / Health and Safety	<ul style="list-style-type: none"> <li>▪</li> <li>▪ The responsible contractor(s) and sub-contractor(s) shall submit closure plans for approval before starting the decommissioning works. In the closure and demolition of abandoned facilities, any residual wastewater or solids must be properly disposed.</li> <li>▪ Clear warning / danger signs shall be installed to alert employees of Kassatly Chtaura of decommissioning works.</li> <li>▪ Personal protective equipment shall be provided to workers.</li> <li>▪ Safety management plan required to be submitted by the contractor(s) and sub-contractor(s), shall be implemented and monitored for compliance during decommissioning.</li> <li>▪ Workers shall undergo specific orientation and regular training on safety during decommissioning.</li> <li>▪</li> </ul>	Included in Decommissioning costs	Ongoing	Decommissioning Contractor and Supervision consultant
WWTP that are removed from use may contain residual wastewater and sludge. Abandoned equipment from the WWTP may pose physical risks to humans who may come into contact with them, along with any number of long term environmental risks, risks to	Environmental/ Health and safety/ Social Impacts	<ul style="list-style-type: none"> <li>▪ Residual wastewater may often be discharged to a nearby sanitary sewer, when available; alternatively, the responsible party may hire a licensed wastewater hauler to remove residual liquid wastes.</li> <li>▪ Sludge and other solids shall be adequately collected and disposed of in the solid waste management facility operational and licensed for such purposes at the time of decommissioning. Other options for sludge stabilization and disposal, such as lime injection, incineration, could be considered in future stages, taking into account for</li> </ul>	Included in Decommissioning costs	Ongoing	Decommissioning Contractor and Supervision consultant

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
wildlife, regulatory issues, and liabilities to the owner.		<p>example the eventual future establishment of waste to energy projects.</p> <ul style="list-style-type: none"> <li>▪ Tanks cannot be abandoned. Tanks from the WWTP shall be either removed from site or filled in place using an inert solid or other such approved fill material.</li> </ul>			
Left over treatment or laboratory chemicals	Environmental Pollution	<ul style="list-style-type: none"> <li>▪ Left over treatment or laboratory chemicals shall be removed from the site. If possible, the responsible party could arrange to return the chemicals to the manufacturer, or alternatively sell or give the chemicals to a different WWTP to be used for their intended purpose, or have them disposed of properly.</li> </ul>	Minor / Included in Decommissioning costs	Ongoing	Decommissioning Contractor and Supervision consultant
Noise and vibration from demolition works and equipment	Noise pollution and vibration	<ul style="list-style-type: none"> <li>▪ Decommissioning activities shall be limited to normal daylight working hours. A works schedule shall be followed and/or other specific restrictions on works shall be established.</li> <li>▪ All construction equipment and vehicles shall be in good working order and maintained in line with manufacturers' recommendations.</li> <li>▪ Noise control engineering techniques shall be in use where practical i.e. the use of mufflers, silencers, enclosures etc. Noise emissions shall be monitored against set control targets to meet required standards.</li> </ul>	Minor / Included in Decommissioning costs	Ongoing	Decommissioning Contractor and Supervision consultant
Introduced flora and weed species	Environmental Impact	<ul style="list-style-type: none"> <li>▪ Top-soiling and planting of the site with native, locally sourced plants or grasses; and / or</li> <li>▪ Grading, levelling and re-contouring to ensure no voids or uneven surfaces; and</li> <li>▪ Rendering the site safe for future land use.</li> </ul>	Included in Decommissioning costs	Ongoing	Decommissioning Contractor and Supervision consultant

Activity	Expected environmental and social impacts	Proposed Mitigation Measures	Cost associated with implementing mitigation measures	Period of implementing mitigation measures	Responsibility for implementing mitigation measures
Emissions from decommissioning equipment and vehicles	Air pollution	<ul style="list-style-type: none"> <li>▪ Equipment and vehicles shall be regularly maintained in line with manufacturers' recommendations to minimize polluting exhaust emissions.</li> <li>▪ All new equipment and vehicles shall meet the relevant national regulations and WB directives for emissions standards.</li> <li>▪ Vehicles and equipment shall be turned off when not in use.</li> <li>▪ Decommissioning equipment and vehicles shall be monitored periodically to ensure they meet the agreed standards.</li> </ul>	Included in Decommissioning costs	Ongoing	Decommissioning Contractor and Supervision consultant
Waste generation from decommissioning activities (including hazardous waste)	Soil and water pollution	<ul style="list-style-type: none"> <li>▪ Proper waste collection and subsequent disposal shall take place at the solid waste management facility operational and licensed for such purposes at the time of decommissioning.</li> <li>▪ Hazardous wastes (oils and grease from grease trap) shall be collected in closed tanks, temporarily stored in the recycling area and handed over to an authorized company for final treatment/disposal.</li> </ul>	Minor/ Included in Decommissioning costs	Weekly	Decommissioning Contractor and Supervision consultant
Disruption of existing services from implementation of drainage and connection works	Interruption of existing plant operation	<ul style="list-style-type: none"> <li>▪ Contractors shall protect existing installations and buildings from potential damage during the execution of works. In the event of damage, the contractor shall undertake repairs</li> </ul>	Minor/ Included in Decommissioning costs	Ongoing upon occurrence	Decommissioning Contractor and Supervision consultant

## 4 ENVIRONMENTAL AND SOCIAL MANAGEMENT MONITORING PLAN

Monitoring Parameters	Sampling Location	Type of Monitoring Equipment	Monitoring Frequency	Estimated Cost	Responsibility
<b>Construction / Installation phase</b>					
Air quality <ul style="list-style-type: none"> <li>▪ Exhaust emissions from vehicles and equipment</li> <li>▪ Level of dust (amounts of sediment particles and airborne particles)</li> </ul>	Working area	Visual inspection, Measurement devices (if needed)  Check vehicle and equipment service history	Once a week in the dry season during construction, and after complaints	300 USD/ Measurement event	Construction contractor
Noise level	Sensitive receptors in the plant vicinity	Monitoring through site inspection and measurement devices	Regularly during construction, as appropriate, or upon complaints from citizens	300 USD/ Measurement event	Construction contractor
Waste generation and management	Working area	Visual inspection, disposal records	Regularly during construction, as appropriate. Internal reports on amounts and disposal records to be prepared daily and monthly	Included in construction costs	Construction contractor
Water tightness	Collectors, pipes and WWTP facilities	Test certificate; visual inspections	During construction	Included in construction costs	Construction contractor
Health and safety	Working area	Visual observation and photographic documentation.	continuous, during construction	Included in construction costs	Construction contractor

Monitoring Parameters	Sampling Location	Type of Monitoring Equipment	Monitoring Frequency	Estimated Cost	Responsibility
		<p>Maintaining a record of injuries and accidents specifying cause and location description.</p> <p>Maintaining a record of all the training activities (and their frequency) related to health and safety</p>			
<b>Operation phase</b>					
<p>Two types of wastewater monitoring are to be implemented: (1) Internal, to ensure good WWTP operation, as per supplier's requirements, an (2) By third party, as required for the MoE in order to confirm compliance in terms of wastewater discharge.</p> <p><u>Wastewater chemical and physical parameters:</u></p> <ul style="list-style-type: none"> <li>▪ Temperature</li> <li>▪ pH,</li> <li>▪ conductivity</li> <li>▪ total suspended solids (TSS) (mg/l)</li> <li>▪ BOD5 (mg O<sub>2</sub>/L)</li> <li>▪ COD (mg O<sub>2</sub>/L)</li> <li>▪ total phosphorus concentration (mg P/L)</li> <li>▪ total nitrogen concentration</li> <li>▪ total oil and grease concentration (mg/L)</li> </ul>	Plant inlet and outlet	Laboratory testing	<p>Regularly as required by the supplier</p> <p>Bi-annually by third party</p>	<p>Included in Plant Operation</p> <p>200 USD/sample</p>	Kassatly Management and WWTP operator and third party (needed when reporting to MoE)

Monitoring Parameters	Sampling Location	Type of Monitoring Equipment	Monitoring Frequency	Estimated Cost	Responsibility
<p><u>Sludge quality:</u></p> <ul style="list-style-type: none"> <li>▪ Daily quantity of treated and dewatered sludge (m<sup>3</sup> /d)</li> <li>▪ daily sludge dry substance content (l/d)</li> <li>▪ Total nitrogen concentration (mg N/kg D.S.)</li> <li>▪ Total phosphorus concentration (mg P/kg D.S.)</li> <li>▪ Total potassium concentration (mg K/kg D.S.)</li> <li>▪ Total heavy metals concentration (mg /kg D.S.)</li> </ul>	Stabilized and dewatered sludge tank	<p>Tests of quality of dewatered sludge</p> <p>Visual observation and photographic documentation</p> <p>Maintaining a record of type, quantity, and disposal location of generated sludge</p>	<p>Once per semester for all analyses, except for total heavy metals to be carried out once per year</p> <p>Once per month</p>	500 USD / measurement event	<p>WWTP Operator for sampling</p> <p>Third party for analysis</p>
Noise levels	<p>WWTP Boundary</p> <p>sensitive receptors</p>	Measurement devices	<p>Site inspection: once a month Ad hoc monitoring to be undertaken as appropriate</p> <p>Testing: Once a year during operation, baseline analysis needed</p>	300 USD / Measurement event	Kassatly Management
Compliance with legal regulations and internal procedures for safe material handling	On site	<p>Visual observation and photographic documentation</p> <p>Maintaining a record of injuries and accidents specifying cause and location description</p>	Periodic	Included in operation costs	Kassatly Management and Maintenance / WWTP Operators

Monitoring Parameters	Sampling Location	Type of Monitoring Equipment	Monitoring Frequency	Estimated Cost	Responsibility
<b>Post Operation / Decommissioning phase</b>					
Air quality <ul style="list-style-type: none"> <li>▪ Exhaust emissions from vehicles and equipment</li> <li>▪ Level of dust (amounts of sediment particles and airborne particles)</li> </ul>	Working area	Visual inspection, Measurement devices (if needed)  Check vehicle and equipment service history	Once a week in the dry season during decommissioning, and upon complaints	300 USD/ Measurement event	Decommissioning contractor
Noise level	Sensitive receptors in the plant vicinity	Monitoring through site inspection and measurement devices	Regularly during decommissioning, as appropriate, or upon complaints from citizens	300 USD/ Measurement event	Decommissioning contractor
Waste generation and management	Working area	Visual inspection, disposal records	Regularly during decommissioning, as appropriate. Internal reports on amounts and disposal records to be prepared daily and monthly	Included in Decommissioning costs	Decommissioning contractor
Health and safety	Working area	Visual observation and photographic documentation.  Maintaining a record of injuries and accidents specifying cause and location description.	continuous, during decommissioning	Included in decommissioning costs	Decommissioning contractor

**NB:** It is to be noted that the grievance mechanism as outlined in section 1.5 will be applied throughout the project life-cycle

## 5 POTENTIAL RISKS AND CONTINGENCY MEASURES

Monitoring efforts would be in vain in the absence of an organized record keeping practice. It is normally the responsibility of the project administration (Kassatly Management through its Operation and Maintenance teams) to ensure the development of a database that includes a systematic tabulation of process indicators, performed computations, maintenance schedules and logbook and process control/performance monitoring outcomes. Such a historical database benefits both the project administrator and surrounding communities.

The project administrator should submit a periodic report to the assigned regional authority, namely the MoE - twice per year according to MoE requirements.

Contingency measures and plans in case of emergency have been addressed briefly throughout this report, including namely:

- Stand-by equipment (pumps, dewatering equipment, etc.);
- Back-up power supply (electrical generators) maintaining the operation of the WWTP in case of any local power failure;
- Overflows for WWTP in case of plant failure (at the various stages of treatment);
- Regular checkups and preventive maintenance;
- Corrective maintenance;
- Process operational procedures;
- Leakage detection system where needed;
- Firefighting system;
- Signs as needed;
- Ladders as needed;
- PPE as needed;
- Training of personnel;
- Assigned personnel for emergency situations
- Organization chart providing a list of relevant personnel/people to contact in case of emergencies with their respective phone numbers. The chart should be easily accessed by all staff/workers and available in Arabic.

Throughout the construction and operation of the project, the workforce is to be continuously informed of any hazardous issue that may materialize during these periods. Moreover, residents in the project area and relevant municipalities and authorities should in turn be informed accordingly should a hazard persist during the operational period.

Stringent emergency procedures are to be assigned in the aim of intercepting any pollution that may occur as a result of structural damage due to any natural disaster occurrences.

A Pollution Incident Control Plan shall be prepared to cover unintended emissions to the environment. As noted in the Environmental and social Management Plan here above, an emergency plan shall be included as part of the Operation and Maintenance Manual.

The emergency plan shall be designed to ensure effective operation of the treatment works under emergency conditions, and shall consist, at a minimum, of the following elements:

- A vulnerability analysis which shall estimate the degree to which the treatment works would be adversely affected by each type of emergency situation which could reasonably be expected to occur, including but not limited to those emergencies caused by natural disaster, civil disorder, strike, sabotage, faulty maintenance, negligent operation or accident;
- The vulnerability analysis shall include, but is not limited to, an estimate of the effects of such an emergency upon the following: (1) Power supply; (2) Communication; (3) Equipment; (4) Supplies; (5) Personnel; (6) Security; and (7) Emergency procedures to be followed.
- An evaluation of the possible adverse effects on public health and the environment due to such an emergency; and
- An emergency operation plan for ensuring, to the maximum extent possible, uninterrupted operation of the treatment works and a manual of procedures for the implementation of such plan, including procedures for the notification of the MoE and municipal authority. The plan and manual shall address each of the emergency situations described in the vulnerability analysis.

A requirement should be set in the contract signed between Kassatly Chtaura and the supplier, which requires the awarded contractor to perform regular and frequent maintenance checkups of the facility.

These preventive measures and design considerations will ensure a continuous and uninterrupted operation of the facility while catering for any potential environmental or social adverse impact.

## 6 STAKEHOLDERS MEETING

A Consultation meeting for the Environmental and Social Management Plan of the WWTP was held at the Municipality of Makse on Friday 16 March 2018 in the presence of the following attendees:

**Table 6 : List of Attendees of the Consultation meeting held at the Municipality of Makse on Friday 16 March 2018**

No.	Name	Institution	Telephone	E-mail
1	Georges Khazzaka	Alpha Interfood SAL	08/540800 03/444280	<a href="mailto:alfa@alfainterfood.com">alfa@alfainterfood.com</a>
2	Mahmoud Dahrouj	Dahrouj Dairy	03-262819	<a href="mailto:info@dahroujdairy.com">info@dahroujdairy.com</a>
3	Samer Harmouch	Kassatly Chtaura	08/543500 03/625437	<a href="mailto:samer@kassatly.net">samer@kassatly.net</a>
4	Atef El Mays	Mayor, Makse Municipality	03-267222	-
5	Marwan Rizkallah	LEPAP	03-958088	<a href="mailto:marwan.rizkallah@undp.org">marwan.rizkallah@undp.org</a>

The meeting involved mainly the potential impacted stakeholders whom are the neighboring industries and the mayor Municipality of Makse.

The ESMP of the WWTP planned for execution at Kassatly Chtaura was presented by Mr. Marwan Rizkallah, LEPAP Project Manager, with specific emphasis on the potential negative impacts of the WWTP and the planned mitigation measures during various phases on construction and operation.

The Mayor of Makse was happy to know about the plan of Kassatly Chtaura to implement a WWTP which will have a positive impact on the close by Litani River and has expressed his wish that other industries in the region would follow the lead of the mentioned industry and manage their wastewater properly.

The attendees expressed their content that mitigation measures on odors, noise and sludge were taken into consideration and they were informed about the exact location of the WWTP within the premises of Kassatly Chtaura.

Finally, Mr. Rizkallah highlighted that monitoring reports will be submitted twice per year to the MoE and accordingly the MoE and LEPAP team will be closely following up on the construction and operation of the WWTP; thus, the attendees can communicate any concerns they have in the future.



**Figure 8 : Consultation meeting for the ESMP of the WWTP, Makse Municipality, 16 March 2018**