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Environmental and Social Impact Assessment for Rural Clusters under Phase 1 of ISSIP II Project
Assiut Governorate
Updated ESIA Report

April 2017
Updated Environmental and Social Impact Assessment for Rural Clusters under Phase 1 of ISSIP II Project

September 2016
### List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AST</td>
<td>Above ground storage tank</td>
</tr>
<tr>
<td>BOD</td>
<td>Biological Oxygen Demand</td>
</tr>
<tr>
<td>CAA</td>
<td>Competent administrative authority</td>
</tr>
<tr>
<td>CDA</td>
<td>Community development association</td>
</tr>
<tr>
<td>COD</td>
<td>Chemical oxygen demand</td>
</tr>
<tr>
<td>CAAs</td>
<td>Competent Administrative Authorities</td>
</tr>
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<td>EEAA</td>
<td>Egyptian Environmental Affairs Agency</td>
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<tr>
<td>EHS</td>
<td>Environment, Health and Safety</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
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<tr>
<td>EMU</td>
<td>Environmental Management Unit</td>
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<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
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<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
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<tr>
<td>ESIAF</td>
<td>Environmental and Social Impact Assessment Framework Study</td>
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<tr>
<td>FM</td>
<td>Force Main</td>
</tr>
<tr>
<td>FS</td>
<td>Feasibility Study</td>
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<tr>
<td>HC</td>
<td>House Connections</td>
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<td>HCWW</td>
<td>Holding Company for Water and Wastewater</td>
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<tr>
<td>IC</td>
<td>Inspection Chamber</td>
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<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organization</td>
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<tr>
<td>ISSIP</td>
<td>Integrated Sanitation and Sewerage Infrastructure Project</td>
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<tr>
<td>LGU</td>
<td>Local Governmental Unit</td>
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<tr>
<td>MoH</td>
<td>Ministry of Health</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisations</td>
</tr>
<tr>
<td>NOPWASD</td>
<td>National Organization for Potable Water &amp; Sanitary Drainage</td>
</tr>
<tr>
<td>PAP</td>
<td>Project Affected Party</td>
</tr>
<tr>
<td>PM</td>
<td>Particulate Matter</td>
</tr>
<tr>
<td>PW</td>
<td>Potable Water</td>
</tr>
<tr>
<td>PS</td>
<td>Pumping Station</td>
</tr>
<tr>
<td>RSU</td>
<td>Rural Sanitation Unit</td>
</tr>
<tr>
<td>SBR</td>
<td>Sequencing batch reactors</td>
</tr>
<tr>
<td>TDS</td>
<td>Total Dissolved Solids</td>
</tr>
<tr>
<td>TKN</td>
<td>Total Kjeldahl Nitrogen</td>
</tr>
<tr>
<td>TOR</td>
<td>Terms of References</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Suspended Solids</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environment protection Agency</td>
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<tr>
<td>UST</td>
<td>Underground storage tank</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>WB</td>
<td>World Bank</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Executive Summary

In 2014, an environmental and social impact assessment (ESIA) for the Rural Clusters under Phase 1 of the second phase of the Integrated Sanitation and Sewerage Infrastructure Project (ISSIP 2) in Assiut was completed and approved in October 2014 by the Egyptian Environmental Affairs Agency (EEAA) and World Bank. The Holding Company for Water and Wastewater (HCWW) is the proponent of the project; meanwhile the financing has been supported by the World Bank (WB).

In July 2016, EcoConServ (the ‘Consultant’) was notified that the location of the wastewater treatment plant (WWTP) proposed to be located on a vacant plot of land east of the Nawawara village in Assiut had shifted approximately 1 km west from its originally approved location, consequently prompting the completion of an updated ESIA. The shift was a result of the project being located outside the boundaries defined in the land allocation decree, which was issued after the EEAA’s approval.

The updated ESIA is required to 1) assess the environmental and social impacts of the new site; 2) determine if the conclusions of the original ESIA will change based on the new location of the WWTP; and 3) assess the impacts of the timber forest as an associated facility to the WWTP.

Although previously addressed in the original ESIA for the project, the updated ESIA puts more emphasis on the following concerns:

- Odour impacts, taking into consideration the WWTP’s proximity to urban areas, buffer zones stipulated national and international guidelines and already existing WWTPs in the area.
- Public health impacts and spread of disease vectors.
- Land issues, such as the history of land in the representative site, ownership, land uses, compensation and the impacts of the WWTP on neighboring communities.
- Groundwater impacts due to leaching of wastewater.
- Assessing whether or not the tree forest area is sufficient to receive the effluent under different stages of expansion until reaching the full WWTP capacity.
- Potential impacts on close by agriculture lands from invasive plants.

Based on site visits carried out by the Consultant in August 2016, only levelling activities have taken place at the newly proposed site. Given the slight shift in the site’s location, and based on field observations during the site visit carried out on August 7th and August 8th 2016, and the analyses detailed later in this report, the content and conclusions of the updated ESIA remain the same; findings of the updated ESIA show that the identified environmental and social impacts of the newly shifted WWTP are the same as those previously identified in the ESIA completed and approved in 2014.
**Introduction**

While fresh drinking water is now regularly supplied to rural regions across Egypt, appropriate sanitation services do not have the same coverage. Wastewater services systems have been implemented in most cities and towns, however, small rural villages have been largely overlooked. This is because their remote locations and small populations make sanitation infrastructure especially costly for the government.

Households in rural villages collect their sewage in cesspits and then evacuate the collected sewage into waterways or empty lands. The lack of sanitation in rural households is causing severe health, hygiene and environmental concerns. Sewage cesspits often leak into the surrounding environment and groundwater creating a significant health hazard, especially in areas where people rely on groundwater for drinking. In addition, the sewage discharged into watercourses has contributed to a noticeable degradation of freshwater resources, especially in Lower Egypt and the Nile Delta region. The increased in organic and pathogenic contamination poses a risk to soil and crops.

In response to this situation the Government of Egypt (GoE) has initiated an ambitious plan for providing sanitation services to rural areas in the country. According to the National Rural Sanitation Strategy issued in 2008, the government aims to expand coverage of sanitation services to all villages in Egypt by the year 2022.

In January 2009, the HCWW, with support from the World Bank (WB), launched the Integrated Sanitation and Sewerage Infrastructure Project (ISSIP). The purpose of the project is to extend basic sanitation services to rural areas and reduce pollution in irrigation and drainage canals to improve surface water quality and combat related health hazards. Based on the size of the population being served – two main types of sanitation systems can be provided:

- For settlements with more than 5000 inhabitants, a centralized system will be installed whereby sewage collection networks will be connected to a nearby Waste Water Treatment Plant (WWTP)
- For settlements with less than 5000 inhabitants and do not have a nearby WWTP, a decentralized system that discharges into a simple treatment facility will be installed.

One of the main component of the first phase of the project (ISSIP II) is establishment of a new treatment plant for sewage at El-Nawawra village, El-Badari, Assiut. The project also aims to expand sustainable sanitation services, reduce pollution in irrigation channels to protect the groundwaqter and surface water and prevent the health risks, as well as to improve services to users.

EcoConServ has been commissioned by the HCWW to complete the required ESIAEs for the WWTP in Al Nawawra and the timber forest associated to the treatment plant.

**ESIA Objectives and Purpose of the Report**

Assessment of the environmental and social impacts is a prerequisite for implementing developmental projects both by the Egyptian Environmental Affairs Agency (EEAA) and the WB. Accordingly, this study has been prepared for performing an Environmental and
Social Impact Assessment (ESIA), following Terms of Reference (ToRs) prepared by HCWW, aiming at providing a detailed analysis of the anticipated environmental and social safeguard issues associated with the second phase of ISSIP II; and to develop an environmental management and monitoring plan to be implemented during the construction and operation of the project.

According to the EIA guidelines and procedures manual published by the Ministry of Environment – EEAA January 2009 (amended in October 2010). The ISSIP II project falls under category B projects.

This ESIA report has been compiled as part of the EIA process in accordance with Egyptian Environmental Law number 4 for the year 1994 amended by law number 9 for the year 2009 and Law 105 for the year 2015. It has taken into account the environmental regulations and requirements of funding institutions including the WB safeguard policies. The ESIA report will be submitted to the Egyptian Environmental Affairs Agency (EEAA) after reviewing and acceptance from HCWW and the funding institutions in order to seek environmental approval for the proposed project. The report includes the identification and evaluation of the potential environmental impacts due to the construction and operation of different components of the project. It also includes proposed mitigation and monitoring measures to control/minimize the effects of the identified negative impacts.

The detailed findings included in this ESIA study will provide decision makers with the needed information in order to minimize the unfavourable impacts and develop the best compensation strategy, if needed.

Approach And Methodology

The ESIA is a systematic process where the potential negative and positive impacts of the project on the bio-physical and socio-economic environment are identified, assessed and – if avoidance is not feasible - mitigated. The following sections include the methodologies that were adopted by the Consultant during the different stages of the ESIA process.

Environmental Impact Assessment phase

General Methodology

The methodology that the Consultant used for the impact assessment was a semi-quantitative process, based on scores. The overall score for the significance of the impacts was evaluated taking into accounts the following four factors:

A. Probability of occurrence
B. Spatial scale
C. Temporal scale
D. Intensity of the impact (which also considers the sensitivity of the receptors)

<table>
<thead>
<tr>
<th>Impact Parameters</th>
<th>Spatial Scale</th>
<th>Temporal Scale</th>
<th>Impact intensity</th>
<th>Probability of Score</th>
<th>Overall Score</th>
<th>Score range</th>
<th>Impact Significance</th>
</tr>
</thead>
</table>

Table 1. Impact intensity criterion adopted for the impact assessment

Holding Company for Water and Wastewater (HCWW)
Social Impact Assessment

EcoConServ has adopted a multistage analysis strategy, several data collection methods and tools were applied using the Participatory Rapid Appraisal approach. This approach ensures that local community groups participated to the study. Data was collected in coordination with relevant stakeholders including local administration units (district and village levels) and the local NGO’s.

A number of quantitative and qualitative data collection tools were applied to ensure different community groups participated to the study. The consultant has also reviewed relevant secondary data sources such as: studies, reports and previous literature. The research team has conducted several field visits to assess the baseline conditions. The applied methodology in the social impact assessment can be summarized as follows:

A. Secondary data:
The consultant has reviewed previous studies, reports, data sources and information available on the internet, in addition to data provided by HCWW, such as the ESIAF for ISSIP project as well as the ESIAAs for the first phase of ISSIP II. The consultant has also reviewed several data sources such as: The Human Development Report 2010, the Annual Statistical Yearbook, the 2006 National Census data, and the Description of Egypt by information in addition to statistical data available at the district and village information centres.

B. Primary data:
Primary data was collected using different methods such as in depth interviews and focus group discussions (FGDs). Primary data sources are an important source for information that the consultant has used to provide deep understanding of the surrounding community as well as identify potential impacts related to the project.

C. Field Observation
The consultant has also applied the field observation data collection tool to support the findings at the current stage. Transect walks around the proposed construction sites were organized in coordination with the local community leaders and informants. An observation
The sheet was designed and completed by the survey team in addition to a group of photos to document the current situation.

D. Stakeholder’s Analysis:
Stakeholder’s analysis is one of the tools that helped the consultant identify relevant groups of stakeholders and their interest in the project as which may facilitate different project activities. Stakeholder’s analysis is an important tool at the initial stages of the project which might contribute to define and mitigate several negative impacts at an early stage. Stakeholder's can help enhance the social benefits related to the project at the local community level.

Analysis of collected data
Data from the interviews and data sheets was carefully recorded. The consultant has reviewed the raw data for concluding experiences / sentences / lessons learnt to be added to the qualitative analysis of the data.

Summary Of The National Legislation Pertinent To The Project
The legislations listed below represent the national legislation pertinent to the project:

**Egyptian legislation related to environmental aspects**
- Law No 93 for Year 1962 for discharge on the public sewer network and protection and treatment of wastewater wastes and safe discard methods of the treatment by products, amended with Decree No 44 for Year 2000.
- Law No 48 for Year 1982 for the protection of the Nile river, agricultural drains, ponds and aquifer from pollution, and the ER amended with Decree No 92 for Year 2013.
- Law No 12 for Year 2003 for the protection, occupational health and safety for the workers, which is amending Law 137 for Year 1981 and its executive decrees.
- Law No 102 for Year 1983 for natural habitats.
- Law No 38 for Year 1968 for the public cleanliness, which is amended by Law No 31 for Year 1976.

**Egyptian legislation related to social aspects**
  - Paragraph 6.4.3 Requirements for Public Consultation
Paragraph 6.4.3.1 Scope of Public Consultation
Paragraph 6.4.3.2 Methodology of Public Consultation
Paragraph 6.4.3.3 Documentation of the Consultation Results
Paragraph 7 Requirement and Scope of the Public Disclosure

- Land acquisition and involuntary resettlement (The project will not result in resettlement activities.)
  - Law 94/2003 on the National Council for Human Rights (NCHR)
  - Constitutional Declaration 30th of March 2011
  - Law 10/1990 on property expropriation for public benefit
  - Other laws governing expropriation

- Protection of human rights
- Law no. 94/2003 on establishing the National Council for Human Rights
- Unified structure Law No 119 of year 2008
- Presidential Decree No. 135 of year 2004 related to the establishment of WWHC

International requirements

The WB has identified ten environmental and social safeguard policies that should be considered in its financed projects. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. WB Safeguards policy and their applicability to the ISSIP II project were investigated in the ESIA report. The key investigated safeguards policies and procedures during the preparation of Assuit ESIA are:

- Environmental Assessment (OP/BP 4.01)
- Involuntary Resettlement (OP/BP 4.12)
- World Bank’s Access to Information Policy

Project Description

The first phase of the ISSIP II Project in Assiut governorate will involve providing sewerage collection and treatment services for a cluster of villages including; Al Nawawra, Al Etmania and Wadi Al Sheih. Figure 3.1 shows the cluster covered under the first phase. Sewage is collected in Al Etmania and Wadi Al Sheih through a network of gravity sewers which ends at the main pump station (PS). The collected sewage is pumped through the force-mains (FMs) - pressurized pipeline - to Al Nawawra. The total sewage collected from both villages are then pumped to the main WWTP which is located in a desert area east of Al Nawawra.

The capacity of Al Nawawra WWTP is 6,000 m$^3$/day until 2030, and 12,000 m$^3$/day by 2050. Total population served is around 56,000 capita; 16,000 in Al Etmania and Wadi Al Sheih and 40,000 in Al Nawawra.

The project will be operated by Assiut Water and Wastewater Company.

Project Components in Al Etmania Village
Al Etmania village is a small village near the mountain area at the east and the army farms. This is the area where the main pumping station will be established. The nearest two buildings to the pumping station are: a house (25m) and the natural gas storehouse (50m). Figure 1 below shows the location of the station.

**Project components in Al Nawawra Village**

A new pumping station will be established, in Al Nawawra village, at a distance of 25 m from the old one (Figure 2).

The main WWTP serving Al Etmania and Al Nawawra villages will be established at the desert area, near Al Nawawra and the army farms. Figure 3 shows the location of the old and new proposed locations of the WWTP. Table 3 presents the distances of old and new WWTP locations relative to various settlements.
Figure 1. Location of the pumping station in Al Etmania village.
Figure 2. Location of the pumping station at Al Nawawra
Table 2. Distance from nearest settlements

<table>
<thead>
<tr>
<th></th>
<th>Old WWTP Location</th>
<th>New WWTP Location</th>
</tr>
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<tbody>
<tr>
<td><strong>Distance [km]</strong></td>
<td><strong>Distance [km]</strong></td>
<td></td>
</tr>
<tr>
<td>Mosque</td>
<td>≈ 1.45</td>
<td>≈ 0.31</td>
</tr>
<tr>
<td>Abdel Samad Youth Center:</td>
<td>≈ 1.71</td>
<td>≈ 1.3</td>
</tr>
<tr>
<td>Official Residential Area</td>
<td>≈ 2.6</td>
<td>≈ 1.5</td>
</tr>
<tr>
<td>Scattered buildings (unofficial)</td>
<td>≈ 2.0</td>
<td>≈ 0.92</td>
</tr>
<tr>
<td>ISSIP 2 Offices</td>
<td>≈ 1.95</td>
<td>≈ 0.82</td>
</tr>
<tr>
<td>Nearest Agricultural Land</td>
<td>≈ 1.48</td>
<td>≈ 0.42</td>
</tr>
</tbody>
</table>

Baseline Conditions

Water resources

Surface water

Assiut Governorate depends mainly on the Nile water for irrigation and drinking. The estimated amount of discharged water to Assiut governorate is about 1599 million m³ per year. The main canals at the governorate are: Ibrahimeya canal which serves to irrigate Using Holding Company for Water and Wastewater (HCWW)
about 79,407 feddans, Nag Hammadi West canal, which serves to irrigate about 141 thousand feddans and Nag Hammadi East canal which irrigates about 88 thousand feddans.

The impact of the human activities is clear on the water quality at residential areas. The research team has conducted a water quality analysis for surface water. Water samples were collected and analyzed to identify water quality. The results have indicated that the total and fecal coliform bacteria level in canals are high as presented below.

**Drains**
Available drains at the governorate are Assiouty, Zawya, El Siel, Ababnoub, El Bahary, Bani Mohamed, El Badara main drain, Abou Tieg, Beni Samie el Qebly, El Asaya and El Kom El Ahmar.

**Groundwater**
Groundwater represents the second source of water at the governorate after surface water. Water is extracted from the quaternary aquifer of the Nile valley and the surrounding desert area. Groundwater is used at towns and villages in the valley as a main source for potable water.

Groundwater level at the villages of Nawawra and Atamna is more than 20 m below ground. The two villages previously depended on the groundwater for drinking purposes. Community members dug individual wells for supplying their needs. Water from these wells is characterized by an increased percentage of minerals. After the water network has been connected, the Ministry of Health and the Water Company have banned the inhabitants from using these wells. The research team was not able to collect samples to identify the quality of groundwater, since the wells were dry.

**Storm water**
Assiut governorates suffered from the worst storm water disaster during 1994 at Doronka district. The Egyptian governorate has restored the storm water drains. Several of these drains were maintained afterwards.

The closest drains to the project area are the storm water drains at Wadi Abu Al Sheih, Etmania and Hemamia: Four extenuation barrages are used. Excess water from the barrages is discharged to Nawawra Sharkeya canal then to the Nile using the extenuation drains. Storm water collected at the Wadi Abu Al Sheih and Etmania drains is discharged to Nawawra Sharkeya canal then to the Nile using the extenuation drains. Storm water collected at the Wadi Sheih and Atamna drains is discharged to Nawawra Sharkeya canal then to Nag Hamadi Sharkeya canal through pipeline near the end then finally to the Nile through the following drains:

- Khazendarya
- El Mamtar
- El Maana
- New El Maana drain to the Nile
These drains are very important since they are located at the villages of Wadi Sheih and Etmania, where the project will be constructed. It is planned to construct the pump station at an area away from the storm water drains.

The proposed site for the establishment of the WWTP has been evaluated based on the geological and geomorphological characteristics in order to determine the extent to which the site would be affected during heavy precipitation on the region.

**Air Quality**

Most of Assuit districts are characterized by rural atmosphere mostly clear of pollutants, though several areas in Assuit are industrial areas. Heavily polluting establishments exist in Assuit such as fertilizers, Petroleum refining, cement and power generation projects. These establishments mainly exist away from residential areas. Badara district is located far from air polluting projects in Assuit. It must be noted that Badara is the highest populated district in Nile East side in Assuit, therefore more human activities can be expected. The impact of desert environment can be noted on the air quality at Badara district since it is located close to the East desert where the ground level rises higher than the villages close to the valley and to the river Nile.

The research team has conducted air quality measurements at carefully selected locations. The measurement locations were selected to represent all project areas. The most important negative factor noted was the foul odors at the streets resulting from the septic tanks especially during evacuation process. At some places septic tanks suffered from leakages which has increased the impact of the odors, in addition to the impacts of the Nawawra Sharkeya canal passing through residential area and the emissions caused by burning domestic waste. These features are common of most of the villages that do not possess sanitation networks.

The project area can be classified as a desert area (the area designed for the wastewater treatment plant) and an agricultural rural area (Nawawra and Etamania villages). The research team measured the following elements: SO2, NOx, NH3, TSP, PM1, PM7, PM2.5 and PM10. The results show that the air is free from the gaseous pollutants but the dust level (represented by PM) is high in the ambient air (as compared with permissible limits in the Egyptian law for the protection of the environment).

<table>
<thead>
<tr>
<th>Al Badary District</th>
<th>EL Etmaniya</th>
<th>Al Nawawra</th>
<th>Al Nawawra-WWTP</th>
<th>Permissible limits</th>
<th>Averaging time</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CO)</td>
<td>1000</td>
<td>880</td>
<td>950</td>
<td>10000</td>
<td>8</td>
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<tr>
<td>(SO2)</td>
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<tr>
<td>(NOx)</td>
<td>54</td>
<td>60</td>
<td>64</td>
<td>150</td>
<td>8</td>
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<tr>
<td>(NH3)</td>
<td>Nd</td>
<td>Nd</td>
<td>Nd</td>
<td>120</td>
<td>8</td>
</tr>
<tr>
<td>(TSP)</td>
<td>.347</td>
<td>.237</td>
<td>.267</td>
<td>0.23</td>
<td>8</td>
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</tbody>
</table>

Table 3. Air quality measurement results

Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project Assiut–Final
Noise
Rural nature prevails in the project area where residential settlements represent islands between cultivated lands, lying close to the desert regions. Through monitoring and inspection of the sites where the pump stations and the pipeline network will be constructed, it was found that the main sources of noise in these areas are the movement of cars and operating water pumps. No other sources of noise were noted in the desert area where the wastewater treatment plant will be established. Environmental measurements show the high level of noise in two locations, as explained in the following table.

Table 4. Noise measurement results

<table>
<thead>
<tr>
<th>Period</th>
<th>EL Etmaniya</th>
<th>Al Nawawra</th>
<th>Al Nawawra-WWTP</th>
<th>Permissible limits</th>
<th>Averaging time</th>
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</thead>
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<tr>
<td>7:00 am – 10:00 pm</td>
<td>60.5</td>
<td>64.4</td>
<td>45.5</td>
<td>50 dB</td>
<td></td>
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</table>

The measurements were performed by “measurements and calibration lab (MCL) faculty of engineering Cairo university”.

Soil Quality
It is planned to construct the pipeline network and the pump stations at AL Etmania and AlNawawra villages which are all considered rural areas with limited soil pollution. No industrial activities exist in the area. One new WWTP will be established at the desert area of Al Nawawra village. Soil pollutants are limited to the domestic waste scattering along the streets and on the banks of the canals or drains. A soil sample was collected at the area planned for construction of the WWTP to represent the baseline conditions prior to the occurrence of any potential pollution in cases of inadequate environmental management for the generated sludge/treated effluent during the treatment process. The results show that the soil does not contain any pollutants. The sampling and analysis was performed by “measurements and calibration lab (MCL) Faculty of engineering- Cairo University”. Six boreholes advanced to 15 m below ground surface in the oxidation ponds’ proposed site in April 2016 revealed that soil in the area is characterized as being mostly silty clay with small amounts of sandy gravel. No groundwater was encountered during the investigation. The full geotechnical report is presented in annex 3.

Protectorates
El Wadi El Assiuty protectorate
Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project Assiut–Final

![EcoConServ](image-url)
El Wadi el Assuity is the only protectorate located in Assuit governorate. It is located on the eastern side of the Nile. Figure E.7 shows the location of the protectorate in Assuit. Assuit governorate is characterized by a wide variety of habitats that contribute to the enrichment of biodiversity. About 188 species are monitored at El Wadi el Assuity protectorate, including 78 species of insects, 59 species of birds, 30 species of plants, 13 species of reptiles, 8 species mammals, along with many species of insects, amphibians and fish at the River Nile.

El Wadi el Assuity was declared as a breading and multipurpose protectorate. It was declared protected in 1989, by the decree of the Prime Minister No. 942 of 1989, as amended by Resolution No. 710 of 1997. It has an area of 35 km² and is located 400 kilometers south of Cairo.

It was noted during the field visit and from the maps that the project location is far from any protected areas. Al Wadi el Assuity protectorate is located more than 25 km from the area.

Archaeological sites
Assuit governorate includes historical sites from all eras: Pharaonic, Coptic and Islamic. Badara district includes Pharaonic monuments from pre and dynastic eras. Hemameya area

Figure 4. location of Al Wadi El Assuity protectorate relative to the project location
is the main Pharaonic site close to project. The closest historic sites to the project location are Ezbet Youssef Tombs and Hemameya monuments.

**Ezbet Youssef Tombs in Atamna**
It is the closest to the project site. These tombs are located in a desert area away from the residential area in Etamnia village, at least 2 kms towards the north. Figure 5 shows its location relative to the project.

**Hemameya monuments**
These monuments are located 5km towards the north of the project’s site Figure 6 shows its location relative to the project.

![Figure 5. Location of Ezbet Yousef relative to the nearest project’s area (Etmania)](image)
Analysis Of Alternatives
The objective of analysing different project alternatives is to evaluate the project options, which have been considered during the ISSIP II design phase, from the environmental perspective. This analysis of alternatives shall help in reaching/confirming optimum options for the project design from both the economic, social and environmental points of view.

No Project Alternative

The ISSIP II is expected to result in significant environmental improvement in the project areas. The existing situation, in which target areas are deprived from sanitation services, leads to major environmental and health problems to inhabitants. Even though there are some impacts associated with ISSIP II construction and operation as previously indicated, the overall environmental impacts are expected to be positive. The ISSIP II institutional structure will have a Monitoring and Evaluation unit (M&E) to verify the expected improvements of ISSIP II to surface water quality. Operation of
the ISSIP II will be designed to achieve maximum possible improvement, which will be continuously monitored by the M&E Unit.

**Alternatives for WWTP Land Selection**

The newly proposed WWTP location was selected based on its economic and environmental merits. Economically speaking, the newly proposed WWTP is located in the north western corner of the area designated for the project, strategically making use of the project area, rather than leave unused spaces as was originally case for the previously proposed WWTP location. The newly selected location, as was the previous one, does not require any resettlement or compensation for locals as it is situated in barren desert land with no known historical or current uses. Therefore, the newly proposed WWTP is not likely to have an impact on the livelihood of locals. The WWTP has also been strategically located based on climate data, such as wind direction, in order to avoid potential odor impacts.

**Alternative Techniques For Biological Treatment**

Options for biological treatment include:
- Extended aeration activated sludge process
- Trickling filters
- Rotating Biological Contactors
- Up-flow Anaerobic Sludge Blankets
- Stabilization ponds

The first four alternatives depend on engineered methods for enabling aerobic (or anaerobic in UASBs) bacteria to stabilize organic matter in wastewater. Whereas stabilization ponds utilize on natural systems for the stabilization process.

With the exception of minor environmental concerns associated with methane venting or flaring in the USAB process, there is no clear preference among the first four alternatives. Although the activated sludge process is more common it will be left to the PIU to select the best feasible alternative from contractors’ offers, given that these offers include mitigation measures recommended in the EMP.

The stabilization ponds alternative is less expensive in operation while achieving similar treatment objectives. The disadvantage is the large area requirements which will lead to a greater loss of agricultural land. Therefore the stabilization ponds alternative is the least preferable.

**Alternatives to the Utilization Of Sludge**

The sludge generated from WWTPs could be utilized in conditioning agricultural lands, after being subjected to a stabilization and hygienization process as previously discussed in Chapter 5. Sending to cement factories as RDF is a second option, and the third option is to
dispose of it in landfills. Various environmental risks associated with these options have already been discussed.

The utilization of sludge as RDF is the preferred option, followed by the use on agricultural land, providing there are safe concentration levels of heavy metals, safe biological properties, and safe land application rates followed according to the specifications of Law 93/1962 and the guidelines of USEPA. The reason for this preference over landfill disposal is that volume of waste received in disposal sites will be reduced and an equivalent quantity of fuel/chemical fertilizers, associated with an environmental cost for their production, will be saved.

On the other hand, the sustainability of using sludge as a land conditioner will be doubtful if the costs for sludge quality monitoring are not covered by revenues from sale of the sludge. In other words if revenue from the sale of sludge does not cover the extra WWTP operating costs resulting from stabilization processes and monitoring activities recommended in the ESMP, it will be better to go for the disposal alternative.

Although land disposal of sludge will be practiced by a waste contractor as mentioned in the EMP, the process could be easily monitored by the RSU to check its compliance with the waste disposal contract. However, as previously presented in Chapter 5, the landfill disposal of sludge has the following risks/negative environmental impacts:

- Loss of resources
- Waste directives in many parts of the world prohibit the disposal of organic wastes (or place an upper limit of around 5% of total organic carbon in the waste for it to be accepted for disposal). The potential of applying similar laws in Egypt during the life cycle of the project exit and this puts a risk on the sustainability of the landfill disposal option.
- Although the waste contractor could be monitored, random/illegal dumping of the sludge on agricultural lands or water streams still remains possible.
- Nearby disposal sites have not been identified during the site visits at most of the villages and the practice of waste burning has been observed. So the risk of not finding a close disposal site exists.

The co-composting of sludge with solid waste is a fourth option and will result in environmental benefits but the main disadvantage will be that the handling of sludge will not be within the control of the ISSIP. Adequate sludge handling methods, in terms of the safe application of land will not be guaranteed in the composting plant location. Furthermore, the mixing with solid waste may cause degradation of the sludge quality as a land conditioner because most of the existing solid waste composting plants do not separate impurities efficiently, especially glass.

However, the conclusion which could be made is that under the current conditions, the following options are listed in order of preference:

- RDF
- Stabilization and soil fertilizer
- Controlled landfill disposal.
- Co-composting with solid waste
Alternatives for Irrigation Water Resources
According to a USAID report issued in 2010 on the reuse of treated wastewater, Egypt has 57 billion cubic meters of renewable water resources available to it per year. With 97% of that quantity coming from the Nile, and the remaining 3% from precipitation (mainly confined to the north coast), the quantity of supply is fixed, meanwhile demand continues to rise. The use of treated wastewater will relieve the demand for freshwater resources while simultaneously recharging groundwater resources.

Alternatives for Treated Wastewater Use
Treated wastewater, if not reused, will be left in oxidation ponds with no useful purpose. This may result in its disposal, therefore incurring costs on the project proponent, or its dumping in directly in the desert. Instead, using the treated wastewater will allow the WWTP to continue operating at its designed capacity, while accruing environmental and economic benefits to both the area and project proponent.

Alternatives for Timber Forest Land Selection
The proposed location of the timber forest was selected based on its economic and environmental merits. Economically speaking, the timber forest surrounds the newly proposed location for the WWTP located in the north western corner of the area designated for the project; therefore, strategically making use of the project area, rather than leave unused spaces. The timber forest’s area does not require any resettlement or compensation for locals as it is situated in barren desert land with no known historical or current uses. Therefore, the timber forest is not likely to have an impact on the livelihood of locals.

Environmental and Social Impact Assessment
Introduction
The Consultant has assessed the environmental impacts of the different components of the ISSIP II project in Assiut governorate during both the construction and operation phases. The project’s components covered in the EIA assessment include:

1. House connections and gravity sewers;
2. Pump stations including all sub-components;
3. Force mains;
4. Nawawra WWTP; and
5. Timber forest

The construction and operation of some/all of the components of the project listed above will also create additional activities/processes such as:

1. Solid hazardous and non-hazardous waste generation during both construction and operation phases.
2. Liquid waste generation during construction and treated effluent discharge during operation.
3. Sludge generation, handling, storage and disposal/reuse, during operation of the existing WWTP.
4. Development of on-site workers’/staff workshops, offices and housing units during construction.

The Consultant has assessed the impacts due to the construction and operation of the main four components listed above, in addition to those resulting from the aforementioned additional four activities/processes.

The key receptors which the Consultant has considered include 1) air (air quality and ambient noise); 2) Soil (soil quality, erosion, landscape); 3) water (water quality and resource consumption); 4) Biological environment (Fora and Fauna); 5) Human environment (Occupational health & safety, Community safety, Visual impacts, Cultural heritage and Archaeology impacts, traffic impacts and the Socio-economic and Health impacts).

The environmental and social impact assessment methodology that the consultant has adopted is presented briefly in Section 3.

**Positive impacts during the construction phase**

**Pumping Stations**

Positive impacts during construction of the pump station can be summarized as follows:

1. Creating job opportunities for companies working in construction of sewage networks. The company usually hires around 60 workers, technicians and engineers during construction of the pump stations, divided as follows: 3 engineers, 3 administrative support staff, 35 skilled workers (drivers, artisans, etc.) and 20 non-skilled workers generally from the local community (excavation and construction).
2. Reviving economic activities for shops supplying construction materials in the area, due to selling unnecessary construction material.
3. Reviving some restaurants and small shops which sell meals for workers. Especially were workers will be living in the village.

**Gravity sewers and FM**

1. Creating opportunities for companies working in contracting and construction of sewage networks. The expected number of employed labourers will be about 300 persons divided as follows: 5% engineers, 40% skilled workers, and 60% non-skilled workers (from the surrounding area).
2. Reviving economic activities for some restaurants and workers in the business of selling meals to the workers, especially were workers will be living at the area.

**Positive impacts during operation phase**
Pumping Stations
1- Creating job opportunities for engineers, technicians and non-skilled workers at the stations. It is expected that 10 job opportunities can be offered in the stations, including 4 opportunities for the local community (administrative and services).

Gravity sewers and FMs
1- Provision of sewage services to wide sector of the community as part of the government development plan to deliver quality services to citizens.
2- Ending the current problems related to sewage and sanitation.
3- Provision of sewage services to the four clusters will decrease the demand on evacuation cars, leading to improving evacuation services at other villages.
4- Increasing the value of houses after connecting to the sewage network.
5- Possibility for provision of other infrastructure services afterwards such as natural gas.
6- Improving the health conditions of the population especially school children who are currently suffering
7- Improving the quality of produced vegetables and fruits, as a result of stopping irrigation with untreated water
8- Improving the socio-economic conditions of families by saving the amounts paid currently for evacuation services. This was posing a lot of economic burden upon families.
9- Improving the quality of the groundwater, as a result of stopping leakage from septic tanks to the ground aquifer.

Potential negative impacts

The potential negative impacts of the ISSIP II project during both the construction and the operation phases are summarized in following two tables, respectively.

Environmental and Social impact during Construction phase:

Positive Impacts

Direct Impacts:

- Creating job opportunities for skilled and unskilled during construction of the project different components.
- Creating opportunities for companies working in contracting and construction of sewage networks.
- Reviving economic activities for shops supplying construction materials in the area, due to selling necessary construction material.
- Reviving some restaurants and small shops which sell meals for workers, especially were workers will be living in the villages.

Indirect impacts:

1. Benefiting from developing uninhibited land plots that are causing spread of rodents and insects.
Negative impacts:

- The need for some land plots to establish the PSs. These plots are currently used in agriculture or waste collection which may adversely affect the community. However, that required areas are limited and then this effect is limited.
- Noise generated during construction may have an inconvenient impact on the surrounding populations, especially that some plots are located near some sensitive receptors such as primary schools, youth centres and mosques as well as other residential areas.
- Dust generated during excavation may have some health impacts especially on individuals who suffer from allergy.
- Storing of construction materials and excavation waste on the streets may affect the traffic, especially that some streets may be less than 6 meters wide.
- Risks that accidents may occur as a result of failure to adhere to the safety and occupational health requirements among workers.
- Accidents may occur at the excavation sites especially among children in case there is failure to implement safety measures.

Environmental and Social impact during Operation phase:

Positive impacts

- Creating job opportunities for some engineers, labours and skilled workers at the PS.
- Provision of sewage service to a wide sector of the population according to the national plans to increase access to sanitation services.
- Diminishing the current problems related to sewage especially health problems.
- Increasing the market value of houses that will be connected to the sewage service.
- Other infrastructure services may be provided later to the community such as natural gas.
- Improving health conditions among the local population, especially school children who suffer as a result of the current sanitation conditions.
- Improving the quality of crops, as a result of increasing the quality of surface water which improves the health conditions among the local population.
- Upgrading the socio-economic conditions among the population as a result of relieving the burden of excavation cost.
- Improving the quality of surface water.
- Improving groundwater quality in most of the project areas through the prevention of sewage leaking into groundwater.
- Although there may be limited impacts related to odours as a result of the PS or the WWTP, it is expected that positive impacts will lead to decreasing the odours and spread of insects significantly.
- Improving the living conditions at target areas as a result of upgrading the health conditions, reducing water–borne diseases, relieving psychological pressures related to spread of foul odours, stagnant waters and insects.
Negative impacts:
- Spread of some foul doors to the surrounding residential areas
- Noise related to the operation of the PS

Sewage networks
- Lack of regular maintenance may lead to technical problems that has an impact on the surrounding areas, such as sewage overflow
- If the households are not connected properly, adverse impacts may occur on the network.

Positive impacts on women and marginalized groups
- The project has several positive impacts on women and marginalized groups, the sanitation system will spare women the effort of carrying water and getting rid of it in the septic tanks or on the streets. The improved health conditions especially among children will relief social burdens imposed upon women in this sense as they take care of sick children and elderly groups.
- Provision of sewage services will benefit the mostly the poorest groups who suffer from financial burdens related to excavation. Poorest groups will also feel that the government is keen to improve their access to services.
- Students will benefit from the project especially that the Water Company will hold awareness raising events at schools.

Public Consultation Activities
Consultation activities conducted during August 2016:

1- The study team visited the project area in order to define the various stakeholders and visit the new location of the WWTP.
2- The study team engaged with the surrounding neighbours in discussions to ensure they have clear perceptions about the expected impacts including the group who submitted the grievance.
3- Based on the identification of stakeholders, various questionnaires and guidelines were prepared in order to engage: i) the residents in the project areas, ii) the residents of the villages situated in the vicinity of the project areas, iii) the NGOs, iv) the agriculture directorates, v) the health department, vi) the state property administrator, vii) directors of the closest sensitive receptors including Ezbet Abdel Samad youth center and schools.
4- The study team divided the various engagement of the project to 1) scoping phase, 2) data collection phase and final consultation phase.
5- All activities conducted were documented with photos and lists of participants in order to warrantee appropriate level of transparency
## During Field Work

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## During Public Consultation

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### Total consulted persons during August 2016

<p>| Total                    |                   | 179    |</p>
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<td>Activities causing the impact</td>
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<td>Operation of gravity sewers and house connections</td>
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<td>Operation of the PSs including all sub-components</td>
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<td>Operation of FMs</td>
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CHAPTER 1 INTRODUCTION, APPROACH AND METHODOLOGY

In 2014, an environmental and social impact assessment (ESIA) for the Rural Clusters under Phase 1 of the second phase of the Integrated Sanitation and Sewerage Infrastructure Project (ISSIP II) in Assiut was completed and approved in October 2014 by the Egyptian Environmental Affairs Agency (EEAA) and World Bank. The Holding Company for Water and Wastewater (HCWW) is the proponent of the project; meanwhile the financing has been supported by the World Bank (WB).

In July 2016, EcoConServ (the ‘Consultant’) was notified that the location of the wastewater treatment plant (WWTP) proposed to be located on a vacant plot of land east of the Nawawara village in Assiut had shifted approximately 1 km west from its originally approved location, consequently prompting the completion of an updated ESIA. The shift was a result of the project being located outside the boundaries defined in the land allocation decree, which was issued after the EEAA’s approval.

The updated ESIA is required to 1) assess the environmental and social impacts of the new site; 2) determine if the conclusions of the original ESIA will change based on the new location of the WWTP; and 3) assess the impacts of the timber forest as an associated facility to the WWTP.

Although previously addressed in the original ESIA for the project, the updated ESIA puts more emphasis on the following concerns:

- Odour impacts, taking into consideration the WWTP’s proximity to urban areas, buffer zones stipulated national and international guidelines and already existing WWTPs in the area.
- Public health impacts and spread of disease vectors.
- Land issues, such as the history of land in the representative site, ownership, land uses, compensation and the impacts of the WWTP on neighboring communities.
- Groundwater impacts due to leaching of wastewater.
- Assessing whether or not the tree forest area is sufficient to receive the effluent under different stages of expansion until reaching the full WWTP capacity.
- Potential impacts on close by agriculture lands from invasive plants.

Based on site visits carried out by the Consultant in August 2016, only levelling activities have taken place at the newly proposed site. Given the slight shift in the site’s location, and based on field observations during the site visit carried out on August 7th and August 8th 2016, and the analyses detailed later in this report, the content and conclusions of the updated ESIA remain the same; findings of the updated ESIA show that the identified environmental and social impacts of the newly shifted WWTP are the same as those previously identified in the ESIA completed and approved in 2014.

1.1 BACKGROUND
Drinking water supplies have been introduced to the rural areas in Egypt few decades ago. However, the sanitation services were not developed in parallel. This situation has resulted in many problems that could be summarized as follows:

1- Households use sewage cesspits that are often leaking to the surrounding environment and underground water causing various health risks, especially in areas where people rely on underground water.

2- Continuous discharge from sewage cesspits has raised the groundwater level, especially in northern parts of the country where groundwater level is relatively high.

3- Due to the absence of centralized sanitation services, discharge of untreated sewage in canals and drains is taking place. This has increased organic and pathogenic contamination in surface water, and subsequently raised contamination risks to soil and crops.

Recently the Government of Egypt (GoE) has initiated an ambitious plan for providing sanitation services to rural areas in the country. The Ministry Of Housing and Urban Development (MOHUD) and its technical arm, the NOPW ASD, have set a plan to cover all villages in Egypt with sanitation services by the year 2022. In 2004 a Presidential Decree has been issued for establishing HCWW with mandate of managing and operating water and wastewater utilities. The establishment of HCWW represented an important step for a reform program adopted by the GoE for the water/wastewater sector focusing on commercialization, privatization and regulation of its utilities. HCWW has consolidated 14 water and wastewater utility companies in the country under its supervision as affiliate companies.

In January 2009, HCWW, with support from the WB, has initiated the ISSIP which is providing deprived villages in Gharbeya, Beheira and Kafr El Sheikh with sanitation services. The developmental objective of ISSIP is to improve health conditions of rural inhabitants in the project area and to improve surface water quality in selected irrigation command areas. The first phase of ISSIP (ISSIP-I) is implementing centralized sanitation systems in about 222 villages within 14 clusters and decentralized systems in about 120 villages with smaller populations. In order to widen the coverage areas of the ISSIP and to increase number of beneficiaries HCWW has planned to implement a second phase of the ISSIP (ISSIP-2) in which the geographic coverage of the project will be extended to another 2 Lower Egypt Governorates, namely Menoufeya and Sharkeya Governorates, and 2 Upper Egypt Governorates, Assiut and Sohag Governorates. The proponent of the ISSIP II is HCWW, along with its the subsidiary companies in the new project areas. HCWW has requested the assistance of the WB for implementing the ISSIP II. NOPWASD is no longer a proponent for ISSIP-II project.

The project aims at expanding sustainable and basic sanitation services; reduce pollution in the irrigation and drainage canals in order to protect ground and surface water and eliminate/reduce health hazards; and improve beneficiary services. The First Stage of ISSIP II is targeting four governorates Assiut, Sohag, Menoufia and Sharkia. The project involves the construction of four new WWTPs located in Assiut (El Etmania), Menoufia (Danasaur), Sharkia (Kanteer and Debaig).

EcoConServ has been selected as the consultant responsible for performing the ESIA study for all the governorates. This report presents the findings for Assiut governorate.
1.2 ESIA OBJECTIVES AND PURPOSE OF THE REPORT

Assessment of the environmental and social impacts is a prerequisite for implementing developmental projects both by the Egyptian Environmental Affairs Agency (EEAA) and the WB. Accordingly this study has been prepared for performing an Environmental and Social Impact Assessment (ESIA), following Terms of Reference (ToRs) prepared by HCWW, aiming at providing a detailed analysis of the anticipated environmental and social safeguard issues associated with the ISSIP; and to develop an environmental management and monitoring plan to be implemented during the construction and operation of the project.

According to the EIA guidelines and procedures manual published by the Ministry of Environment – EEAA January 2009 (amended in October 2010). The ISSIP II project falls under Category C projects, number 55 under the category of Energy and infrastructure projects.

This ESIA report has been compiled as part of the EIA process in accordance with Egyptian environmental Law number 4 for the year 1994 amended by law number 9 for the year 2009. It has taken into account the environmental regulations and requirements of funding institutions including the WB safeguard policies. The ESIA report will be submitted to the Egyptian Environmental Affairs Agency (EEAA) after review and acceptance from HCWW and the funding institutions in order to seek environmental approval for the proposed project. The report includes the identification and evaluation of the potential environmental impacts due to the construction and operation of different components of the project. It also includes proposed mitigation and monitoring measures to control/minimize the effects of the identified negative impacts. In general, the objectives of the ESIA study were to:

- identify the various elements that may affect human health and safety as well as have an impact on different ecosystems;
- describe the environmental and social baseline conditions of the communities hosting the project in order to measure the severity of impacts related to it;
- highlight and review the legislations under which the project will be implemented;
- determine the social and environmental impacts in a quantitative manner whenever possible taking into account different projects activities at various stages (planning, construction, operation and decommissioning) and their impact on environmental and social issues;
- compare the identified social and environmental impacts, against relevant local and international regulations and standards. This includes the WB safeguard policies;
- propose, analyze and select the most appropriate alternatives based upon the analysis and evaluation of environmental and social concerns;
- prepare the environmental and social management plan (ESMP) to mitigate adverse impacts (social and environmental). The ESMP includes performance indicators and monitoring requirements for the impacts in accordance with relevant environmental and social laws and regulations.
- Develop a monitoring program in order to identify; 1) any unexpected cases which may appear during the project’s implementation; and 2) the effectiveness of the identified mitigation measures during implementation;
- assess the capacity of the implementing bodies to apply the proposed social and environmental management and monitoring plans, as well as make recommendations.
for a capacity building program in case of identified gaps in the capacities of the implementing bodies with regards to social and environmental procedures;

- analyze the stakeholders in order to investigate the possibility of community engagement during the implementation phase of the project.
- consult and disseminate the project data at an early stage as well as after the completion of the ESIA study. Results from the first public consultation sessions were taken into consideration in the ESIA study. Vulnerable groups were taken into consideration such as women, children, elderly, poor, minorities, and any other group that has seen to be vulnerable to social or environmental impacts. These groups are less capable of having access to decision makers within the community.

The findings included in this ESIA study will provide decision makers with the needed information in order to minimize the unfavorable impacts and develop the best compensation strategy, if needed.

1.3 REPORT STRUCTURE

The structure of this ESIA report is as shown in the Table below:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1 Introduction, approach and methodology</td>
<td>Contains a brief description of the proposed activity and an outline of the report structure. Outlines the approach to the ESIA study and summarizes the process undertaken for the project to date.</td>
</tr>
<tr>
<td>Chapter 2 Regulatory Framework</td>
<td>Outlines the legislative, policy and administrative requirements applicable to the proposed development.</td>
</tr>
<tr>
<td>Chapter 3 Project Description</td>
<td>Includes a detailed description of the proposed activities and the alternatives.</td>
</tr>
<tr>
<td>Chapter 4 Environmental and Social Baseline</td>
<td>Describes the environmental and social baseline conditions in the project region.</td>
</tr>
<tr>
<td>Chapter 5 Environmental and Social Impact assessment</td>
<td>Describes and assesses the potential environmental and socio-economic impacts of the proposed project on different receptors and describes relevant mitigation measures. Cumulative impacts are also qualitatively assessed.</td>
</tr>
<tr>
<td>Chapter 6 Analysis of Alternatives</td>
<td>Describes and assesses the project alternatives</td>
</tr>
<tr>
<td>Chapter 7 Environmental and Social Management Plan</td>
<td>Describes the identified mitigation measures in the environmental management and monitoring plan</td>
</tr>
<tr>
<td>Chapter 8 Public Consultations</td>
<td>Describes the public consultation activities</td>
</tr>
</tbody>
</table>

1.4 APPROACH AND METHODOLOGY
The ESIA is a systematic process where the potential negative and positive impacts of the project on the bio-physical and socio-economic environment are identified, assessed and – if avoidance is not feasible - mitigated. The following sections include the methodologies that were adopted by the Consultant during the different stages of the EIA process.

1.4.1 Environmental Impact Assessment phase

1.4.3.1 General Methodology

The methodology that the Consultant used for the impact assessment was a semi-quantitative process, based on scores. The overall score for the significance of the impacts was evaluated taking into account the following four factors:

- E. Probability of occurrence
- F. Spatial scale
- G. Temporal scale
- H. Intensity of the impact (which also considers the sensitivity of the receptors)

A. Probability of occurrence

Three probability levels were used as shown in the Table 1.1 below

<table>
<thead>
<tr>
<th>Probability score</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High and very high probability of occurrence, 75-100% confidence that the impact will take place</td>
</tr>
<tr>
<td>0.5</td>
<td>Medium probability of occurrence, 25-75% confidence that the impact will take place</td>
</tr>
<tr>
<td>0.25</td>
<td>Low probability of occurrence, less than 25% confidence that the impact will take place</td>
</tr>
</tbody>
</table>

1.1.1.1 B. Spatial scale

Table 1.2 shows the different scores adopted by the Consultant in order to quantify the impact based on its area of influence.

<table>
<thead>
<tr>
<th>Score</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Site)</td>
<td>Impact area is up to 1 km²</td>
</tr>
<tr>
<td>2 (Limited)</td>
<td>Impact area is up to 10 km²</td>
</tr>
<tr>
<td>3 (Area)</td>
<td>Impact area is up to 100 km²</td>
</tr>
<tr>
<td>4 (Regional)</td>
<td>Impact area exceeds 100 km²</td>
</tr>
</tbody>
</table>

1.1.1.2 C. Temporal scale

Table 1.3 shows the different scores adopted by the Consultant in order to quantify the impact based on the expected duration of the impact of concern.

Table 1.3 – Temporal Scale criterion adopted for the impact assessment

<table>
<thead>
<tr>
<th>Score</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Site)</td>
<td></td>
</tr>
<tr>
<td>2 (Limited)</td>
<td></td>
</tr>
<tr>
<td>3 (Area)</td>
<td></td>
</tr>
<tr>
<td>4 (Regional)</td>
<td></td>
</tr>
</tbody>
</table>
1.1.1.3 Impact intensity

Table 1.4 shows the different categories for the expected impact intensity and the scoring criteria. The sensitivity of the receptor is taken into account when determining the relative intensity.

<table>
<thead>
<tr>
<th>Score</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Negligible)</td>
<td>Environmental changes are within the existing limits of natural variations</td>
</tr>
<tr>
<td>2 (Low)</td>
<td>Environmental changes exceed the existing limits of natural variations. Natural environment is completely self-recoverable.</td>
</tr>
<tr>
<td>3 (Medium)</td>
<td>Environmental changes exceed the existing limits of natural variations and result in damage to the separate environmental components. Natural environment remains self-recoverable.</td>
</tr>
<tr>
<td>4 (High)</td>
<td>Environmental changes result in significant disturbance to particular environmental components and ecosystems. Certain environmental components lose self-recovering ability.</td>
</tr>
</tbody>
</table>

I. Integrated Assessment of Impact

The overall assessment (i.e. score) for the impact of concern will be the multiplication result of the B. Spatial score, C. Temporal score, and D. Intensity score. The overall score will determine the category of severity (i.e. impact significance) based on the score range it falls into. Table 1.5 shows the upper and lower limits of each impact significance category, assuming a probability of occurrence of 1 (A. Probability score).

<table>
<thead>
<tr>
<th>Impact Parameters</th>
<th>Overall Score</th>
<th>Impact Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Scale</td>
<td>Probability of occurrence</td>
<td>Score range</td>
</tr>
<tr>
<td>Site</td>
<td>Short-term</td>
<td>Negligible</td>
</tr>
<tr>
<td>Limited</td>
<td>medium-term</td>
<td>Low</td>
</tr>
<tr>
<td>Area</td>
<td>Long-term</td>
<td>Medium</td>
</tr>
<tr>
<td>Regional</td>
<td>permanent</td>
<td>High</td>
</tr>
</tbody>
</table>

1.4.2 Social Impact Assessment phase

EcoConServ has adopted a multistage analysis strategy, several data collection methods and tools were applied using the Participatory Rapid Appraisal approach. This approach enables collecting necessary data during a limited period of time, by including community groups in preparing the
SIA study as part of the integrated ESIA and the RPF studies. A number of quantitative and qualitative data collection tools were applied to ensure different community groups participated to the study. The consultant has reviewed relevant secondary data sources such as: studies, reports and previous literature. The research team has conducted several field visits to assess the baseline conditions. Data was also collected from relevant stakeholders including local administration units and the local NGO’s.

The applied methodology can be summarized in the following figure:

**Figure 7.1: Methodology and data collection tools matrix**

1.1.1.4 **Data collection and reviewing**

E. **Secondary data:**

The consultant has reviewed previous studies, reports, data sources and information available on the internet, in addition to data provided by HCWW. The consultant has previously prepared the ESIAF for the ISSIP project, which has provided a wide range of information that has facilitated conducting the study. The consultant has also reviewed several important resources such as: the Human Development Report 2010, the Annual Statistical Yearbook, the 2006 National Census data, and the Description of Egypt by information.

F. **Primary data:**

Primary data was collected using different methods such as surveys, questionnaires and interviews. Primary data sources are an important source for information that the consultant has used to provide deep understanding of the surrounding community as well as identify potential impacts related to the project. The consultant has applied three data collection methods: quantitative data, qualitative data and field observation. First data collection tools were designed,
later the field research team was trained to the designed data collection tools, and field supervision was applied to ensure quality of the collected data. The research team has coordinated with the local NGO's to participate in the data collection activities.

B.1. Quantitative data:
The research team has collected quantitative data from the direct beneficiaries in order to provide a complete picture about their living conditions, type of sanitation systems and problems related to the current sanitation practices. The data has included also surveying the willingness to pay based upon the sustainable livelihood approach.

B.2. Qualitative data:
The qualitative research has helped to collect in depth information about the current living conditions at the project area and the possible impacts. The consultant has tried to target a wide range of social groups and stakeholders in the qualitative research. In addition to focusing on different typed of local communities at beneficiary areas surrounding the project. FGD’s and a number of in depth interviews were conducted.

B.3. Additional Data collection tools:
- Stakeholder's Analysis:
Stakeholder's analysis is one of the tools that helped the consultant identify relevant groups of stakeholders and their interest in the project as which may facilitate different project activities. Stakeholder’s analysis is an important tool at the initial stages of the project which might contribute to define and mitigate several negative impacts at an early stage. Stakeholder’s can help enhance the social benefits related to the project at the local community level.

<table>
<thead>
<tr>
<th>Stakeholders group</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCWW</td>
<td>Is the owner of the project, the main government authority concerned with supervising the project activities and implementation of the project.</td>
</tr>
<tr>
<td>EEAA</td>
<td>Is the authority responsible for approving the ESIA study as part of the implementation requirements.</td>
</tr>
<tr>
<td>Local Governmental Units at main and satellite villages</td>
<td>Are responsible for providing and financing infrastructure services at local areas. They are also able to coordinate among different development projects and initiatives. Environment department is responsible for monitoring.</td>
</tr>
<tr>
<td>Natural leaders at the local community</td>
<td>The main stakeholders, they have the experience and the knowledge and they have a strong impact on the local community especially at rural areas.</td>
</tr>
<tr>
<td>Beneficiaries (community members, schools, government authorities)</td>
<td>Are the main beneficiaries from the project, may be subject to some positive/negative impacts. They play a significant role in project success and sustainability.</td>
</tr>
<tr>
<td>NGO's</td>
<td>Participating in providing sanitation services or loans from donor bodies to serve the community</td>
</tr>
<tr>
<td>Evacuation service providers, and current sanitation services</td>
<td>Are the main group which will be affected as a result of the project, they will lose their job opportunities.</td>
</tr>
</tbody>
</table>
1.1.1.5 **Field observation**

The consultant used the field observation to describe the current situation at the local community. Natural leaders and local data collections participated in facilitating this activity. They designed the checklist that was completed by the field team. Field observation was supported by photographs to document the current situation.

1.1.1.6 **Field Work Conducted during August, 2016**:

The social team has conducted several data collection methods at Nawawra village in order to assess the impacts of the WWTP and the timber forest. The data was collected and the meetings were held between 8 to 11 August, 2016. The following table gives a brief description of the data collection activities conducted:

<table>
<thead>
<tr>
<th>Data collection method</th>
<th>Targeted Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus Group Discussions</td>
<td>5 sessions (34 persons) The FGDs targeted community members to assess their perception towards the WWTP including both groups that are supporting the project as well as community members who submitted the grievance to the World Bank.</td>
</tr>
<tr>
<td>NGO'S</td>
<td>1 Interview</td>
</tr>
<tr>
<td>Individual Interviews</td>
<td>6 Interviews (local community members) including the Owner Of The closest piece of land from WWTP</td>
</tr>
<tr>
<td>Governorate Stakeholders</td>
<td>The team conducted several interviews with stakeholders from the government level, including the following figures:</td>
</tr>
<tr>
<td></td>
<td>- Head of El-Nawawra Local Government Unit</td>
</tr>
<tr>
<td></td>
<td>- State property administrator (Local Government Unit)</td>
</tr>
<tr>
<td></td>
<td>- Agricultural Association Director</td>
</tr>
<tr>
<td></td>
<td>- Monitoring and environment administrator (Local Government Unit)</td>
</tr>
<tr>
<td></td>
<td>- Head of roads and Enterprise Development Department (Local Government Unit)</td>
</tr>
<tr>
<td></td>
<td>- Vice Director of Abdul Samad Primary school</td>
</tr>
<tr>
<td></td>
<td>- The Health Unit Director</td>
</tr>
<tr>
<td></td>
<td>- Director the youth center of Ezbet Abd Samad</td>
</tr>
</tbody>
</table>
1.1.1.7 **Analysis of collected data**

Data from the questionnaires, interviews and data sheets was carefully recorded. Special software packages were used for quantitative analysis of the data (SPSS ver. 19). The consultant has reviewed the raw data for concluding experiences / sentences / lessons learnt to be added to the qualitative analysis of the data.

1.1.1.8 **Sample design**

The study team has selected a representative sample from the areas where the project will be implemented. The sample varied according to the used data collection tool:

A. **Quantitative data collection tools:** The sample size was (151) respondents distributed according to the size of household connections that will be installed at each community. The questionnaires were distributed according to the ratio of the community size to the total governorate share of household connections. Taking into consideration that at least 25 questionnaires should be completed in each village. The sample size in Etmania Village and Naga'ElSheih reached (62) households and (89) individuals in El Nawawra village.

B. The head of households were targeted, consequently 78.1% of the total respondents were the head of household. In the meantime, their wives represents 8.6% of the total sample. The total consulted male reached 83.4%, while females represents 16.6%. The proportion varied among different villages, males represents 89.9% of the sample surveyed in Nawawra, while the males represented only 60.0%.

C. Due to targeting the head of households, the married group represented 89.8%. However, the widow represented 4.1%. The aforementioned category is identified as vulnerable group as they are female headed families that should be cared about.

![Distribution of the sample by district](image)
Taking into consideration the age distribution of the sample, the percentage of respondents less than 30 years represents about 25% of the sample, while the percentage of those 30 – 40 years was about 18.5% of the sample. Due to targeting the head of households those aged 50 years and more are about 53.0% of the total sample surveyed.

The educational status: the total percentage of illiterate respondents was about 60%. The prevailed type of education reported among the sample was 21.7%. The education varied among the selected areas (Etmania and Nawawra villages). Those who completed the university education is about 10.0% of the sample there, while the educational proportion of the sample in Nawawra village never exceeded the vocational education.
A. The qualitative sample were as follow:

- The staff of Rural Sanitation Unit (RSU) and those work in septic tanks evacuation
- The head of local governmental units in Nawawra and Etmania, as well as Mere district where Hasan Abd El Reheim and Mehana
- Some religious leaders and other community leaders
- Some students at schools
- One NGO

It is worth mentioning that some of the promoters working within one of the NGOs participated in the process of data collection. That will be illustrated in citizen engagement chapter.

1.1.1.9 Geographic coverage

The final selection of the project areas encompasses Al Badary District (Markaz) in Al Etmania and Wadi El Sheih and Al Nawawra villages. The study team covered the all the areas identified.
CHAPTER 2 LEGAL FRAMEWORK

This Chapter describes the legal and administrative framework for the proposed project. It lists the national laws and international requirements pertinent to the project. Following an overview of the requirements of international institutions and international conventions, the requirements of Egyptian legislation are compared with those of the WB Environmental and Social Policy, and presented in a tabular form of gap analysis.

The World Bank has defined 10 environmental and social safeguard policies that must be considered to its financed projects. Applicability of such policies to this project is overviewed and discussed in subsequent sections.

2.1 NATIONAL ADMINISTRATIVE AND LEGAL FRAMEWORK

The following is a description of the different national authorities and institutions of relevance to this project.

The Egyptian Environmental Affairs Agency (EEAA) is an authorized state body regulating environmental management issues. Egyptian laws identify three main roles of the EEAA:

- It has a regulatory and coordinating role in most activities, as well as an executive role restricted to the management of natural protectorates and pilot projects.
- The agency is responsible for formulating the environmental management (EM) policy framework, setting the required action plans to protect the environment and following-up their execution in coordination with Competent Administrative Authorities (CAAs).
- EEAA is responsible for the review and approval of the environmental impact assessment studies as for new projects/expansions undertaken.

The Environmental Management Unit (EMU) at the governorate and district level is responsible for the environmental performance of all projects/facilities within the governorates premises. The governorate has established EMUs at both the governorate and city/district level. The EMUs are responsible for ensuring the protection of the environment within the governorate boundaries and thus are mandated to undertake both environmental planning and operation-oriented activities. The EMU is mandated to:

- Follow-up on the environmental performance of the projects within the governorate during both construction and operations to ensure the project abides by laws and regulations as well as mitigation measures included in its EIA approval. Investigate any environmental complaints filed against projects within the governorate.
- The EMUs are affiliated administratively to the governorate yet technically to EEAA. The EMUs submit monthly reports to EEAA with their achievements and inspection results.
- The governorate has a solid waste management unit at the governorate and district level. The units are responsible for the supervision of solid waste management contracts.

Law 4/1994 stipulates that applications for a license from an individual, company, organization or authority, subject to certain conditions, require an assessment of the likely environmental impacts.

The Competent Administrative Authorities (CAAs) are the entities responsible for issuing licenses for project construction and operation. The EIA is considered one of the requirements of licensing. The CAAs are thus responsible for receiving the EIA studies, check the information...
included in the documents concerning the location, suitability of the location to the project activity and ensure that the activity does not contradict with the surrounding activities and that the location does not contradict with the ministerial decrees related to the activity. The CAA forwards the documents to EEAA for review. They are the main interface with the project proponents in the EIA system. The CAA is mandated to:

- Provide technical assistance to Project Proponents
- Ensure the approval of the Project Site
- Receive EIA Documents and forward it to EEAA
- Follow-up the implementation of the EIA requirements during post construction field investigation (before the operation license)

Figure 2.1 demonstrates the process procedures.

After submission of an ESIA for review, the EEAA may request revisions in the ESIA report within 30 days, including additional mitigation measures, before issuing the approval of the report. In case of disapproval, HCWW will have the right to issue an appeal within 30 days from its receipt of the EEAA’s decision. It should be noted that once the ESIA has been approved, the ESMP as will be presented in the report, will be considered an integral part of the project; and the HCWW will be legally responsible for the implementation of that plan, depending on their involvement in the construction or operation process. It is therefore worth mentioning that the HCWW must ensure that all mitigation measures and environmental requirements described in the ESMP have been clearly referred to in the tender documents for the construction works, the construction contracts, and have been respected. HCWW will follow-up on the construction contractor to ensure that the ESMP is adequately implemented in the construction phase.
2.2 SUMMARY OF THE NATIONAL LEGISLATION PERTINENT TO THE PROJECT

The legislations listed below and described in more details in the following sections represent the national legislation pertinent to the project:

2.2.1 Egyptian legislation regarding buffer zones

The Egyptian code for the design and implementation of sewage treatment plants, issued by Ministerial Decree No. 169 of 1997, states that the distance between a WWTP and the nearest urban area or village is 1 to 3 km.

The Ministry of Health Decree No. 27 of 1997 states that the distance between the proposed WWTP site and any residential area should not be less than 500 m.

Egyptian legislation related to social aspects

  - Paragraph 6.4.3 Requirements for Public Consultation
  - Paragraph 6.4.3.1 Scope of Public Consultation
  - Paragraph 6.4.3.2 Methodology of Public Consultation
  - Paragraph 6.4.3.3 Documentation of the Consultation Results
  - Paragraph 7 Requirement and Scope of the Public Disclosure
- Land acquisition and involuntary resettlement (The project will not result in resettlement activities.)
  - Law 94/2003 on the National Council for Human Rights (NCHR)
  - Constitutional Declaration 30th of March 2011
  - Law 10/1990 on property expropriation for public benefit
  - Other laws governing expropriation
- Protection of human rights
- Law no. 94/2003 on establishing the National Council for Human Rights
- Unified structure Law No 119 of year 2008
- Presidential Decree No. 135 of year 2004 related to the establishment of WWHC

2.2.2 Egyptian legislation related to protection of Antiquities, archaeology and cultural heritage

- Law 117/1983
2.2.3 Egyptian legislation related to environmental aspects


- Law No 93 for Year 1962 for discharge on the public sewer network and protection and treatment of wastewater wastes and safe discard methods of the treatment by products, amended with Decree No 44 for Year 2000.

- Law No 48 for Year 1982 for the protection of the Nile river, agricultural drains, ponds and aquifer from pollution, and the ER amended with Decree No 92 for Year 2013.

- Law No 12 for Year 2003 for the protection, occupational health and safety for the workers, which is amending Law 137 for Year 1981 and its executive decrees.

- Law No 102 for Year 1983 for natural habitats.

- Law No 38 for Year 1968 for the public cleanliness, which is amended by Law No 31 for Year 1976.


2.3 INTERNATIONAL REQUIREMENTS

International funding agencies, such as the WB require that the projects they finance be in compliance with both the country’s national standards as well as their own environmental and social policies. Therefore, in addition to the national regulations, the project aims at complying with the WB safeguard policies and guidelines. The policies help to ensure the environmental and social soundness and sustainability of investment projects. They also support integration of environmental and social aspects of projects into the decision-making process. In addition, the policies promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats. The ISSIP II project is classified as category C project by EEAA, which requires mandatory full Environmental and Social Impact Assessment (ESIA) as it may have significant implications on the environment. The project is classified as Category B according to the WB classification criteria.

The WB has identified ten environmental and social safeguard policies that should be considered in its financed projects. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. WB Safeguards policy and their applicability to the ISSIP II project are described in Table 2.1 below:

<table>
<thead>
<tr>
<th>Table 2.1 – WB Safeguard Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safeguard Policy</strong></td>
</tr>
<tr>
<td>Environmental Assessment</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project Assiut–Final

EcoConServ
ENVIRONMENTAL SOLUTIONS
mitigation measures is described in the following chapters.

**Natural Habitats**

<table>
<thead>
<tr>
<th>(OP/BP 4.04)</th>
<th>No</th>
<th>The Site is assessed as arid areas, with scarce plant cover and low density of wildlife.</th>
</tr>
</thead>
</table>

**Forests (OP/BP 4.36)**

| No | Site is described as arid areas, with scarce plant cover and low density of wildlife with no forests. |

**Pest Management (OP 4.09)**

| No | The proposed project will not involve purchasing or using Pesticides. |

**Physical Cultural Resources**

| (OP/BP 4.11) | No | The ESIA for the proposed project identifies no sites of cultural or religious significance to local communities. In addition, chance finds procedures will be included |

| No | No indigenous people are present in project areas. |

**Indigenous Peoples (OP/BP 4.10)**

| No | The project will not result in resettlement activities. |

| No | Regarding triggering OP/BP 4.12, an RPF has been prepared for the project in 2011 to be readily available as guidelines in case OP4.12 is triggered. However after the project design was completed and the process of obtaining land took place it was clear that OP4.12 will not be triggered since the lands acquired for Nawawra’s WWTP, Etmania’s and Nawawra’s PSs are all state owned lands. (Detailed description of land original ownership, land acquisition and land approvals are presented in Chapter 3 - Section 3.6, and detailed assessment and due diligence of land acquisition is presented in Chapter 5 – Section 5.6.8) |

**Safety of Dams (OP/BP 4.37)**

| No | Not relevant to the proposed project |

**Projects on International Waterways (OP/BP 7.50)**

| No | Not relevant to the proposed project |

**Projects in Disputed Areas (OP/BP 7.60)**

| No | Not relevant to the proposed project |

The IFC General EHS guidelines have been considered during the course of the study. These Guidelines contain the performance levels and measures that are normally acceptable to WB and are generally considered to be achievable in new facilities at reasonable costs by existing technology. Also the General EHS Guidelines cover four areas of international good practice, these are:

- Environmental;
- Occupational Health & Safety (OHS);
- Community Health & Safety (CHS); and
- Construction and Decommissioning.
According to the WB’s EHS Guidelines for Water and Sanitation, “when host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent”. The EHS Guidelines state that in order to prevent, minimize and control liquid effluents, wastewater treatment facilities should be designed, constructed, operated and maintained to achieve effluent water quality consistent with applicable national requirements or internationally accepted standards, such as the US EPA Regulations at 40 CFR Part 133 regarding Secondary Treatment.

Treated wastewater and sludge used for land applications should also be carried out in a manner consistent with the World Health Organization (WHO) Guidelines for the Safe Use of Wastewater, Excreta and Greywater and applicable national requirements. The Project proponent will commit to applying the applicable national requirements or internationally accepted standards and be consistent with the WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Actually, as also later indicated in Section 2.7.2.2, the national requirements for using secondary treated wastewater for irrigation is more stringent than the guideline requirements of WHO Guidelines for helminthes eggs and fecal coliforms. The standards for using treated sludge in irrigation are equivalent (1/1000 g for fecal coliforms).

2.4 INTERNATIONAL CONVENTIONS AND AGREEMENTS

Egypt has signed and ratified a number of international conventions that commit the country to conservation of environmental resources. The following is a list of the key conventions:

- International Plant Protection Convention (Rome 1951)
- African convention on the conservation of nature and natural resources (Algeria 1968)
- UNESCO Convention for the protection of the world cultural and natural heritage (Paris, 16 November 1972)
- United Nations Framework Convention on climate change and Kyoto Protocol (Kyoto 1997)
- Convention on biological diversity (Rio de Janeiro 1992), which covers the Conservation of habitats, animal and plant species, and intraspecific diversity.
- Convention for the protection of the ozone layer (Vienna 1985)
- Convention for the prevention and control of occupational hazards caused by carcinogenic substances and agents (Geneva 1974)
- Convention for the protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (Geneva 1977).
- ILO core labor standards: core labor standards are to be adhered to/reached during the project implementation. Egypt has been a member state of the ILO since 1936, and has ratified 64 conventions that regulate the labor standards and work conditions. In 1988, Egypt has ratified the Occupational Safety and Health Convention of 1979 (No 152).
2.5 DETAILED DESCRIPTION OF NATIONAL LEGISLATION RELATED TO SOCIAL ASPECTS

Table 2.2 below presents a more detailed description of the Egyptian legislation related to the social aspects.

<table>
<thead>
<tr>
<th>Title of legislation</th>
<th>Summary and how this legislation applies to this project</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEAA ESIA guidelines related to the Public Consultation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title of legislation</td>
<td>Summary and how this legislation applies to this project</td>
<td>Year</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Based on Law number 4/1994 on Environmental Protection</td>
<td>Consultation of the community people and concerned parties with the needed information about the project. All stakeholders should be invited. Paragraph 6.4.3 of Law 4/1994 on Environmental Protection provides detailed information on the scope of public consultation, methodology and documentation. Paragraph 6.4.3 Requirements for Public Consultation in the EEAA ESIA Guidelines¹</td>
<td>1994</td>
</tr>
<tr>
<td></td>
<td><strong>Paragraph 6.4.3 Requirements for Public Consultation in the EEAA ESIA Guidelines¹</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paragraph 6.4.3.1 Scope of Public Consultation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paragraph 6.4.3.2 Methodology of Public Consultation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paragraph 6.4.3.3 Documentation of the Consultation Results</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paragraph 7 Requirement and Scope of the Public Disclosure</td>
<td></td>
</tr>
<tr>
<td>Land acquisition and involuntary resettlement (The project will not result in resettlement activities)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. The procedures start with the declaration of public interest pursuant to the presidential decree accompanied with memorandum on the required project and the complete plan for the project and its structures (Law 59/1979 &amp; Law 3/1982 provided that the Prime Minister issues the decree);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. The decree and the accompanying memorandum must be published in the official newspapers; • A copy for the public is placed in the main offices of the concerned local Government unit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This law has specified, through Article 6, the members of the Compensation Assessment Commission. The commission is made at the Governorate level, and consists of a delegate from the concerned Ministry’s Surveying Body (as President), a delegate from the Agricultural Directorate, a delegate from the Housing and Utilities Directorate, and a delegate from the Real Estate Taxes Directorate in the Governorate. The compensation shall be estimated according to the prevailing market prices at the time of the issuance of the Decree for Expropriation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title of legislation</th>
<th>Summary and how this legislation applies to this project</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Law 577/1954 about property expropriation for public benefit (cancelled by law 10/1990)</strong></td>
<td><strong>Law 577/1954</strong>, which was later amended by Law 252/1960 and Law 13/1962, and establishes the provisions pertaining to the expropriation of real estate property for public benefit and improvement.</td>
<td>1954</td>
</tr>
</tbody>
</table>
| **Law 27/1956 about property expropriation for public benefit (cancelled by law 10/1990)** | **Law No. 27 of 1956**, which stipulates the provisions for expropriation of districts for re-planning, upgrading, and improvement, and the amended and comprehensive Law No. 10 of 1990 on the Expropriation of Real estate for Public Interest.  
  The first article of Law No. 27 of 1956 allows for the expropriation of districts for their improvement, upgrading, re-planning, and reconstruction. Article 24 of Law 577/1954 also stipulates that in case only partial expropriation of real estate property is required, and the remaining un-expropriated part will not be of benefit to the owner; the owner shall be given the right to submit a request within 30 days (beginning from the date of final disclosure of the list of the expropriated property) for the purchase of the entire area.  
  It should be noted, that the new law has not restricted the right to request the purchase of the remaining un-expropriated portion of real estate regardless whether it is a building or land. | 1956 |
| **Civil code 131/1948** | **Articles 802-805 recognize private ownership right.**  
  - Article 802 states that the owner, pursuant to the Law, has the sole right of using and/or disposing his property.  
  - Article 803 defines what is meant by land property  
  - Article 805 states that no one may be deprived of his property except in cases prescribed by Law and would take place with an equitable compensation. | 1948 |
<table>
<thead>
<tr>
<th>Title of legislation</th>
<th>Summary and how this legislation applies to this project</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of communities Human Rights Laws</td>
<td>The Law on Establishing the National Council for Human Rights (NCHR) aims to promote, ensure respect, set values, raise awareness and ensure observance of human rights. At the forefront of these rights and freedoms are the right to life and security of individuals, freedom of belief and expression, the right to private property, the right to resort to courts of law, and the right to fair investigation and trial when charged with an offence. This Constitution came into force after a public referendum on 11 September 1971 and was amended on 22 May 1980 to introduce the Shoura Council and the press.</td>
<td>2003</td>
</tr>
</tbody>
</table>

### 2.6 DETAILED DESCRIPTION OF NATIONAL LEGISLATION RELATED TO ARCHAEOLOGY AND CULTURAL HERITAGE

#### Table 2.3 – Egyptian legislation related to Archaeology and cultural heritage

<table>
<thead>
<tr>
<th>Laws and regulations related to archaeology</th>
<th>Definition of monuments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Law 117/1983</td>
<td>Article 1 defines a monument as a building or movable property produced by different civilizations or by art, sciences and literature and religions from prehistoric era and during successive historical eras until a hundred years ago or historical buildings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Article 2 states that any building or movable property that has an historical, scientific, religious, artistic or literary value could be considered as a monument whenever the national interest of the country impose its conservation and maintenance without adherence to the time limit contained in the preceding Article no.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Article 5 of the law states that the Supreme Council of Antiquities (SCA) is the competent authority responsible for antiquities in Egypt</td>
<td></td>
</tr>
</tbody>
</table>

#### Construction license

Article 20 states that licenses of construction in archaeological sites or land are not permitted, and it is prohibited to make any installations or landfills or digging channels or constructing roads or agricultural land or for public benefits in the archaeological sites or land within its approved border lines. Also, Article 20 states that a buffer zone around the monument or the site
is defined as three kilometres in the uninhabited areas or any distance determined by the SCA to achieve environmental protection of the monument in other areas (article 20-Ch.1). The provisions of this article (20) apply on land which appears to the SCA - based on conducted studies – that there is a probable existence of monuments in the subsoil. The provisions of this article are also applied on desert and areas where quarrying work is licensed.

Article 22 states that: licenses of construction in the immediate vicinity of archaeological sites within populated areas could be delivered by the competent authority, after the approval of SCA. The competent authority must state in the license; the conditions which the SCA emphasizes to guarantee that the building does not have a negative visual impact on the monument and its direct buffer zone that protects the archaeological and historical surroundings. The SCA has to pronounce its verdict on the license demand within 60 days of the date of submission. Otherwise, the elapsing of this period is regarded as a decision of refusal.

**During Construction**

Article 23 states that the SCA should take the necessary steps to expropriate land that is found in or kept in place and registered according to the roles of this Law. (Article 23- Ch.1). [These roles are defined in the second chapter of the Law 117 – articles 26-30].

Article 24 states that everyone who finds by chance the part or parts of a fixed monument in its place must promptly inform the nearest administrative authority within forty-eight hours.
2.7 DETAILED DESCRIPTION AND GAP ANALYSIS OF NATIONAL ENVIRONMENTAL REQUIREMENTS AND WB REQUIREMENTS FOR KEY ENVIRONMENTAL ASPECTS

Whenever there is a discrepancy between national requirements and international requirements, the most strict requirements shall be adopted.

2.7.1 Air Quality

2.7.1.1 Regulations

<table>
<thead>
<tr>
<th>Issue</th>
<th>Requirements of Egyptian legislation</th>
<th>Inflections</th>
<th>Requirements of WB</th>
<th>Inflections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reference</td>
<td>Inflections</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Article 34 of Law 4/1994 amended by</td>
<td>Standards for ambient air quality</td>
<td>OP 4.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>law 9/2009 and Article 34 of its Executive Regulation (ERs), and</td>
<td></td>
<td>IFC GENERAL EHS GUIDELINES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decree 710/2012 Annex 5 of the ERs</td>
<td></td>
<td>Air Emissions and ambient air quality (Section 1.1, WHO Ambient Air Quality Guidelines)</td>
<td></td>
</tr>
</tbody>
</table>
2.7.1.2 Standards and limits

<table>
<thead>
<tr>
<th>Issue</th>
<th>Requirements of Egyptian legislations (µg/m³)</th>
<th>Requirements of WB ( (\mu g/m^3))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient air parameters</td>
<td>Ambient air pollutants threshold (Egyptian)</td>
<td>Ambient air pollutants threshold According to WHO</td>
</tr>
<tr>
<td>Exposure period</td>
<td>1 hr</td>
<td>8 hr</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>CO ( \mu g/m^3 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfur dioxide SO(_2)</td>
<td>350</td>
<td>N/A</td>
</tr>
<tr>
<td>( \mu g/m^3 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen oxides NO(_x)</td>
<td>300</td>
<td>N/A</td>
</tr>
<tr>
<td>( \mu g/m^3 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particulates PM(_{10})</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>( \mu g/m^3 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particulates PM(_{2.5})</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>( \mu g/m^3 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSP ( \mu g/m^3 )</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ozone</td>
<td>180</td>
<td>120</td>
</tr>
</tbody>
</table>

All parameters are in \((\mu g/m^3)\) unless otherwise noted.
N/A = not applicable;
### 2.7.2 Water Quality

#### 2.7.2.1 Regulations

<table>
<thead>
<tr>
<th>Issue</th>
<th>Requirements of Egyptian legislations</th>
<th>Requirements of WB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Article 51,</strong> The Executive Regulations of Law 48 for the year 1982 amended with Ministerial Decree 402 / 2009</td>
<td>Standards for Ambient water quality</td>
<td><strong>Reference</strong> Inflections</td>
</tr>
<tr>
<td><strong>Article 52,</strong> The Executive Regulations of Law 48 for the year 1982 amended with Ministerial Decree 402 / 2009</td>
<td>Maximum limits for discharging processed liquid industrial wastes into freshwater bodies and groundwater reservoirs</td>
<td><strong>Reference</strong> Inflections</td>
</tr>
<tr>
<td><strong>Ministerial Decree No. 44/2000 amending Law 93/1962</strong></td>
<td>Controlling the discharge of wastewater into the sewage system and public network,</td>
<td><strong>Reference</strong> Inflections</td>
</tr>
<tr>
<td><strong>Ministerial Decree No. 44/2000 amending Law</strong></td>
<td>It encompasses this statement: “Wastewater discharge licenses must be acquired from the</td>
<td><strong>Reference</strong> Inflections</td>
</tr>
</tbody>
</table>
Concerned authorities during the construction and operation phase”

**Law 38/1967** and its executive regulations (decree 134/1968) Concerning cleanliness and sanitation and also regulates the collection, transportation, storage and disposal of solid waste.
2.7.2.2 Standards and Limits for the reuse of treated wastewater in irrigation of tree forests (Decree 44 of Year 2000)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Secondary treatment for reuse in irrigation</th>
<th>Parameter</th>
<th>Secondary treatment for reuse in irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD (ppm)</td>
<td>40</td>
<td>Zinc (ppm)</td>
<td>2</td>
</tr>
<tr>
<td>COD (ppm)</td>
<td>80</td>
<td>Arsenic (ppm)</td>
<td>NI</td>
</tr>
<tr>
<td>TSS (ppm)</td>
<td>40</td>
<td>Chromium (ppm)</td>
<td>NI</td>
</tr>
<tr>
<td>O&amp;G (ppm)</td>
<td>10</td>
<td>Molid betrays (only green fodders) (ppm)</td>
<td>0.01</td>
</tr>
<tr>
<td>Nematodes (no. of cells or eggs/ Liter)</td>
<td>1</td>
<td>Manganese (ppm)</td>
<td>0.2</td>
</tr>
<tr>
<td>Fecal coliform (MPN/100 ml)</td>
<td>1,000&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Iron (ppm)</td>
<td>5</td>
</tr>
</tbody>
</table>

<sup>2</sup> WHO guidelines for Helminth eggs is 1 egg/liter and for fecal coliforms is 10<sup>5</sup> for restricted irrigation and 1000 for unrestricted irrigation
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Secondary treatment for reuse in irrigation</th>
<th>Parameter</th>
<th>Secondary treatment for reuse in irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS (ppm)</td>
<td>2,000</td>
<td>Cobalt (ppm)</td>
<td>0.05</td>
</tr>
<tr>
<td>Sodium Absorption Ratio (SAR) %</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorides (ppm)</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boron (ppm)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cadmium (ppm)</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead (ppm)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper (ppm)</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nickel (ppm)</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.7.2.3 Standards and Limits for the drains’ water quality prior to being transferred to fresh watercourses for agricultural purposes only

And this according to Article 51 of the ER of Law 48/1982 amended by Decree 402/2009

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standards &amp; Limits (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Totaldissolvedsolids) TSS (TSS)</strong></td>
<td>1000 ≤</td>
</tr>
<tr>
<td>Temperature</td>
<td>Maximum difference of 3°C as compared with the receiving watercourse</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>5 ≥</td>
</tr>
<tr>
<td>pH</td>
<td>min 6.5 and max 8.5</td>
</tr>
<tr>
<td>BOD</td>
<td>≤ 30</td>
</tr>
<tr>
<td>COD</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Total Nitrogen (TN)</td>
<td>15</td>
</tr>
<tr>
<td>Total P (TP)</td>
<td>3</td>
</tr>
<tr>
<td>Oil &amp; Grease</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Mercury</td>
<td>≤ 0.001</td>
</tr>
<tr>
<td>Fe</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Mn</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Cu</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Zn</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Phenol</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>As</td>
<td>≤ 0.01</td>
</tr>
<tr>
<td>Cd</td>
<td>≤ 0.03</td>
</tr>
<tr>
<td>Cr</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Free Cyanide</td>
<td>≤ 0.01</td>
</tr>
<tr>
<td>Pb</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Ni</td>
<td>0.1</td>
</tr>
<tr>
<td>Se</td>
<td>0.01</td>
</tr>
<tr>
<td>Coliform 100 cm³</td>
<td>5000</td>
</tr>
</tbody>
</table>
### 2.7.2.4 Standards and Limits for discharge of liquid industrial effluent into freshwater bodies

And this according to Article 52 of the ER for Law 48/1982 amended by Decree 402/2009

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standards and Limits (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Does not exceed the temperature of the receiving receptor by more than 3°C</td>
</tr>
<tr>
<td>pH</td>
<td>6.9</td>
</tr>
<tr>
<td>BOD</td>
<td>60</td>
</tr>
<tr>
<td>COD</td>
<td>80</td>
</tr>
<tr>
<td>Dissolved</td>
<td>≥4</td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
</tr>
<tr>
<td>Oil &amp; Grease</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>Does not exceed 2000</td>
</tr>
<tr>
<td>Dissolved Solids</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
</tr>
<tr>
<td>Suspended Solids</td>
<td></td>
</tr>
<tr>
<td>H2S</td>
<td>1</td>
</tr>
<tr>
<td>Free</td>
<td>0.1</td>
</tr>
<tr>
<td>Cianides</td>
<td></td>
</tr>
<tr>
<td>Total P</td>
<td></td>
</tr>
<tr>
<td>NH3</td>
<td></td>
</tr>
<tr>
<td>TN</td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>0.05</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.01</td>
</tr>
<tr>
<td>Pb</td>
<td>0.1</td>
</tr>
<tr>
<td>Cd</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>Se</td>
<td>0.1</td>
</tr>
<tr>
<td>Cr</td>
<td>0.1</td>
</tr>
<tr>
<td>Cu</td>
<td>0.5</td>
</tr>
<tr>
<td>Ni</td>
<td>0.5</td>
</tr>
<tr>
<td>Zn</td>
<td>2</td>
</tr>
<tr>
<td>Fe</td>
<td>3.5</td>
</tr>
<tr>
<td>Total</td>
<td>5000</td>
</tr>
<tr>
<td>Coliform (100cm³)</td>
<td></td>
</tr>
</tbody>
</table>
### 2.7.3 Noise

#### 2.7.3.1 Regulations

<table>
<thead>
<tr>
<th>Regulations</th>
<th>Inflections</th>
<th>Reference</th>
<th>Inflections</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Egyptian requirements)</td>
<td>Inflections</td>
<td>Reference</td>
<td>Inflections</td>
</tr>
<tr>
<td>Article 42 of Law 4/1994</td>
<td>Maximum allowable limits for ambient noise intensity</td>
<td>OP 4.01</td>
<td>Ensure the environmental sustainability of investment projects</td>
</tr>
<tr>
<td>amended by law 9/2009 and</td>
<td>Maximum exposure duration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Article 44 of ERs (amended by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decree 1095/2011 amended by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decree 710/2012)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(WB requirements)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egyptian Law 4 Requirements</td>
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<td>Requirements</td>
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<tr>
<td>WBGGENERAL. EHS GUIDELINES</td>
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<td></td>
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<tr>
<td>Table 1.7.1</td>
<td></td>
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<td>Table 2.3.1</td>
<td></td>
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<tr>
<td>Presents Noise Level Guidelines</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Identify maximum increase in background noise levels at the nearest receptor location off-site.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presents noise limits for different working environments</td>
<td></td>
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</tr>
</tbody>
</table>

#### 2.7.3.2 Standards and Limits for Ambient Noise

<table>
<thead>
<tr>
<th>Egyptian Law 4 Requirements</th>
<th>Permissible limit for noise intensity decibel</th>
<th>Requirements of WB (Table 1.7.1 of the IFC General EHS Guidelines)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible limit for noise intensity decibel</td>
<td></td>
<td>Receptor One hour $L_{\text{eq}}$ (dBA)</td>
</tr>
<tr>
<td>TYPE OF AREA</td>
<td>DAY 7 a.m. to 10 p.m.</td>
<td>NIGHT 10 p.m. to 7 a.m.</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Sensitive Areas (schools- hospitals- public parks- rural areas)</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Residential areas in with limited traffic and public services are available</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Residential areas in the city where commercial activities are available</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Residential areas located adjacent to roads which width is less than 12m, and workshops or commercial or entertainments activities are found</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>Areas located adjacent to roads which width is 12m or more, or light industrial areas.</td>
<td>70</td>
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</tr>
<tr>
<td>Industrial areas (heavy industries)</td>
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<td>70</td>
</tr>
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</table>
2.7.3.3 Standards and Limits for Noise Levels in the Work Environment

<table>
<thead>
<tr>
<th>TYPE OF PLACE AND ACTIVITY</th>
<th>MAXIMUM PERMISSIBLE NOISE [level equivalent to decibel (A)]</th>
<th>MAXIMUM PERMISSIBLE NOISE [level equivalent to decibel (A)] at the beginning of 2014</th>
<th>Location /activity</th>
<th>Equivalent level LAeq,8h</th>
<th>Maximum LAmax ,fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work place with up to 8 hour shifts and aiming to limit noise hazards on sense of hearing*</td>
<td>90</td>
<td>85</td>
<td>Heavy Industry (no demand for oral communication)</td>
<td>85 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td>Hospitals, clinics, public offices, etc</td>
<td>80</td>
<td>80</td>
<td>Light Industry (decreasing demand for oral communication)</td>
<td>50-65 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td>Administrative offices – control rooms</td>
<td>65</td>
<td>65</td>
<td>Open offices, control rooms, service counters or similar</td>
<td>45-50 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td>Work rooms for computers, typwriters or similar equipment</td>
<td>70</td>
<td>70</td>
<td>Individual offices (no disturbing noise)</td>
<td>40-45 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td>Work rooms for activities requiring routine mental concentration</td>
<td>60</td>
<td>60</td>
<td>Hospitals</td>
<td>30-35 dB(A)</td>
<td>40 dB(A)</td>
</tr>
</tbody>
</table>

*: If the measured noise at the workplace increased over the maximum allowable limit by 3 dBA, the exposure period shall be reduced to half of the exposure period. In addition, wearing proper ear muffs is a must.
Noise level at any time at the work place shall not exceed 135 dBA
Noise shall be measured inside working environment in LAeq unit in accordance with ISO 9612/ ISO 1996 or Egyptian standards
CHAPTER 3  PROJECT DESCRIPTION

3.1 INTRODUCTION
The main objectives and the need for the ISSIP II are presented in Chapter 1. In this Chapter, the location/routing, design specifications and construction activities and operational parameters for the different components of the ISSIP II project in Assiut governatorate will be addressed. The first phase of the ISSIP II Project in Assiut governatorate will involve providing sewerage collection and treatment services for a cluster of villages including; Al Nawawra, Al Etmania and Wadi Al Sheeh. Figure 3.1 shows the cluster covered under the first phase.

Sewage is collected in Al Etmania and Wadi Al Sheeh through a network of gravity sewers which ends at the main pump station (PS). The collected sewage is pumped through the force-mains (FMs) - pressurized pipeline - to Al Nawawra. The total sewage collected from both villages is then pumped to the main WWTP which is located in a desert area east of Al Nawawra.

The capacity of Al Nawawra WWTP is 6,000 m$^3$/day until 2030, and 12,000 m$^3$/day by 2050. Total population served is around 56,000 capita; 16,000 in Al Etmania and Wadi Al Sheeh and 40,000 in Al Nawawra.

The project will be operated by Assiut Water and Wastewater Company.

This chapter includes therefore a detailed description of the following:
1. Location/routing, design, construction and operational parameters of the gravity sewers and house connections in each of the covered villages; the gravity sewers is a shallow system placed under the roads.
2. Location/routing, design, construction and operational parameters of the PSs and FMs in each of the covered villages.
3. Location, design, construction and operational parameters of the central WWTP.
4. Canals’ and railways’ Pipeline crossings and design details of the crossing structures

The aim of the information included in this chapter is to serve as the basis for impact identification during construction, operation and decommissioning phases (as will be described in Chapter 5). It also serves as the basis (in addition to the baseline conditions described in Chapter 4) to the analysis of alternatives described in Chapter 6.

Please note: the project description presented in this chapter is primarily based on the Feasibility Studies (FS) as well as data and surveying maps provided and prepared by the Engineering House of Expertise (EGEC).

3.2 GRAVITY SEWERS AND HOUSE COLLECTION SYSTEM

3.2.1 Location/Routing and Design
The gravity sewers and house collection system represent the first component of the sewage collection and treatment network. This is a network of pipelines, which connects individual houses to transfer the raw sewage to the village’s PS. From there the FMs will transfer the collected amount to the next village and/or to the central WWTP.
3.2.2 Construction processes and resources used

The construction activities of the gravity sewers will involve digging, pipeline placement, pipeline connection welding, and then surfacing. The construction site will be mainly within the road network. Sensitive receptors along the route have been identified and will be presented in details in Chapter 4 (Baseline conditions) and Chapter 5 (Impact Assessment). It is expected that during construction, the following activities will take place:

- Spoil storage and transport/disposal of excess materials.
- Storage of the raw materials such as pipelines, Portland cement, sand, and gravel.
- Concrete mixing and pouring; water will be added to the cement sand gravel mix.
- Steel reinforcement storage, welding, and bending.
- Wood will be used to mold the concrete during the civic works.

3.2.3 Operational processes and resources used

The operation of the gravity sewers involves the movement of sewage by gravity under its own weight starting at the individual houses and ending at the PSs. Regular Maintenance activities are expected for the manholes in order to prevent blocking and in order to increase the efficiency of the gravity sewers.

3.3 PUMP STATIONS AND FORCE MAINS

3.3.1 Location/Routing and Design specifications

The project will involve the construction and operation of two PSs; the first will be located in Al Etmania (capacity 90 l/s by 2030 and 117 l/s by 2050); the second in Al Nawawra (capacity 270 l/s by 2030 and 400 l/s by 2050); The area of land needed for the different PS sites will be around 400 m²/each site in average. Figures 3.2 and 3.3 show the proposed site location for the PSs in the following villages, respectively:

- Al Etmania
- Al Nawawra

In general, the PS site comprises of the following components:
- The inlet pipeline, which introduces the collected wastewater from the villages’ houses.
- The wet well for the pump station where the inlet sewage is discharged and pumped into the PS. The wet well is equipped with three pumps (in addition to one standby) and a basket screen to protect the pumps and prevent solids and refuse flowing with sewage water to entering the pump sump.
- The FM’s line output, which heads to the following village within the cluster of concern.
- Flow measuring devices;
- The site also comprises of a generator unit supplied with a fuel storage tank, a guard room and a warehouse, and is surrounded with a fence of a height of around 2m above ground.
- The site comprises of a monorail crane to serve the pumps and a rotary crane for lifting the screen.
The FMs connect the different villages of the cluster to the central WWTP.

Figure 3.1 – Clusters covered during the first phase of the ISSIP II Project in Assiut governorate
Figure 3.2 – Proposed site location for Al Nawawra PS
3.3.2 Construction processes and resources used
The construction activities of the PSs will involve conventional activities related to the construction of reinforced concrete components. The activities will involve digging down to the foundation level, construction of needed isolated footings, construction of the main cesspit, guard room, warehouse and fence. The activities will also involve the installment of pipelines and pumps, special pieces and valves, connection welding, and completing all the electrical work needed. The construction activities will be located within the allocated site. Sensitive receptors around the PS site have been identified and will be presented in details in Chapters 4 and 5.
It is therefore expected that during the construction of the PS, the following activities will take place:

- Storage of the raw materials such as pipelines (maximum 6 layers high separated by timber blocks), pumps, masonry, Portland cement sacks, sand, and gravel, wood plates (to mold the concrete and for the windows and door frames), fuel and water.
- Concrete mixing and pouring; water will be added to the cement-sand-gravel mix
- Steel reinforcement storage, welding, and bending
- Spoil storage and transport/disposal of excess spoil.

3.3.3 Operational processes and resources used

The operation of the PS involves the operation of two pumps (in addition to one stand-by) in order to pump the collected wastewater. The pumps have the following specifications:

- Total head required will be 28m
- Maximum rpm of 1500
- Pump casing made of grey cast iron
- Pump motor will be squirrel cage, induction type with IP-68 enclosure
- Velocity at suction opening of the pump shall not exceed 4m/sec

3.4 WWTP

3.4.1 Overview

The collected wastewater will be pumped to the central WWTP in a desert area south east of Al Nawawra village with a total area of 493 Feddan (92 Feddan will be allocated for the WWTP and the rest for the timber forest which will be irrigated using the effluent from the WWTP). The proposed location for the WWTP serving Al Nawawra and Al Etmania and Wadi Al Sheeh villages is shown in Figure 3.6. The WWTP will comprise of the main components described below and shown in Figure 3.7.

3.4.2 Design specifications and operational processes

3.4.2.1 Technology and principal treatment stages

The WWTP will adopt the Oxidation pond system. The system will comprise of the following components:

Stage 1 until 2030:
- Anaerobic ponds; two ponds will be operating during the first stage (until 2030), each has a capacity of around 15,000 m³, 44m x 87m (dimensions at mid-height)
- The ponds will incorporate for two parallel lines to account for emergency and/or maintenance periods.
- For stage 2 (until 2050), the number of ponds will be doubled to become 4.
- Sludge storage ponds; Two ponds will serve during stage 1, to be doubled in stage 2. Each pond will be 100m x 30m x1m. The capacity is designed to accommodate to the generated sludge for a period of three years (which is estimated at 6257 m³)
- Facultative ponds; Two ponds will be operating each with an area of 23870 m² and depth of 1.5 m. The number of ponds will be doubled to become 4 during the second stage (until 2050).
- Maturation ponds; four ponds will be operating, each with an area of 9000 m² and a depth of 1 m

### 3.4.3 Fate of treated effluent and sludge

The treated effluent will be stored in tanks and used for the irrigation of the timber forest. As mentioned above, sludge will be stored on site. Sludge samples will be collected and analyzed. Based on the results of the analysis, as well as the approval of the Ministry of Agriculture, the sludge could be used as soil fertilizers. If the results show that the sludge possess hazardous characteristics, the sludge shall be sent for disposal in Nasreya Hazardous Waste Treatment and Disposal Centre in Alexandria. Other plausible alternatives include the use as Refuse Derived Fuel (RDF) in cement factories (i.e. Assiut Cement) as will be discussed in more details in Chapter 5.

### 3.4.4 Construction processes and resources used

The construction activities of the WWTP will involve conventional activities related to the construction of reinforced concrete components. The activities will involve digging down to the foundation level, construction of needed footings, and other needed civic works. The activities will also involve the installment of pipelines and pumps, special pieces and valves, connection welding, and completing all the electrical work needed. The construction activities will be located within the allocated site. It is expected that during the construction of the WWTP, the following activities will take place:

- Storage of the raw materials such as pipelines (maximum 6 layers high separated by timber blocks), pumps, masonry, Portland cement sacks, sand, and gravel, wood plates (to mold the concrete and for the windows and door frames), fuel and water.
- Concrete mixing and pouring; water will be added to the cement-sand-gravel mix
- Steel reinforcement storage, welding, and bending
- Spoil storage and transport/disposal of excess spoil.

### 3.5 TIMBER FOREST

In consideration of water resources deficiency in the country, taking advantage of irrigating woody plants and ornamental trees with wastewater is an ideal environmental solution for utilization of about 2.4 billion cubic meters annually rather than dumping in the Nile River, northern lakes or coastlines, all of which is threaten the environment.

The project proponent has allocated 400 acres of land surrounding the WWTP for afforestation as depicted in figure 3.4. The current area designated for the timber forest is barren desert land. The timber forest is designed to receive 6,000 m³/day in its first phase until the year 2030. The purpose of this afforestation is mainly to maintain the water balance and to improve the environmental conditions in the area, the project proponent shall be
responsible for planting and managing the timber forest, including placement and maintaining of the irrigation network.

Types of woody plants vary in terms of growth rapidness due to surrounding biological and environmental conditions. In addition, the growth rate of trees differ according to the density of surrounding trees; the higher the tree density the lower the growth rate.

Fast growing trees are a set of tree types characterized by fast length and diameter growth especially in good locations; in addition to the early maturity of these trees which results in achieving fast economic reward. The cutting cycle of these types ranges between 10-25 years for most cases and might be less in the Middle East depending on the type and the purpose of the planting.

The timber forest is intended for environmental purposes, such as maintaining the water balance, serving as a protective belt or to fix dunes, protection against erosion of soil or mountain slopes and improving the overall environmental conditions. Furthermore, these trees are planted to reduce air pollution.

Below are potential tree species under consideration:

A. Casuarina trees- one acre produces 130 tons of wood
B. Camphor trees- one acre produces 190 tons of wood.
C. Khaya trees -one acre produces 200-350 tons of wood.

Irrigation water intended for use in the proposed timber forest in El Nawawra is secondary treated wastewater from the wastewater treatment plant in El Nawawra. Secondary treated wastewater will strictly adhere to the Egyptian standards for wastewater use for irrigation purposes, as mentioned in chapter 2 of this study. Water consumption rate of one tree ranges between 60-80 liter/ day/ tree and water requirements for one acre ranges between 25-30 m³/ day.

Trees will be irrigated with unfiltered drops that provide the required quantity during suitable number of working hours. Also, water pressure of the irrigation network must not be less than 2 bars at every tree to ensure the efficient operation of the irrigation network.

Pipes used in irrigation network will be made of plastic (UPVC) with diameters ranging between 32 ml- 300ml and the irrigation equipment will be fixed to polyethylene hoses with 20 ml diameters and with lengths not more than 100 m to ensure the efficient distribution of water.

Sludge produced from the WWTP may be applied to the timber forest depending on its quality and approval from the Ministry of Agriculture.

Closing Valves will be installed at all intersections and the linking pipes that support each area. Operation hours are expected to be 12 hour/day.

The network will be designed by using the following equations

Flow equation

\[ Q = A \times V \]

Where \( V \geq 1.50 \) m/ second

Hazen Williams equation for calculating pressure loss

\[ H_f = 10.68 \left( \frac{Q}{C} \right)^{1.85} \times L / D^{4.87} \]

Where:

- \( Q \) = the rate of the water flow in the pipe (m³/ second)
- \( A \) = cross- sectional area of the pipe (m²)
- \( V \) = speed of water flow in the pipe (m/second)
- \( h_f \) = pressure loss in the pipe (m)
- \( D \) = the internal diameter of the pipe (m)
C= Hazen Williams factor  
L= length of the pipe (m)  
The speed of the design is 1.5 m/second with a maximum speed of 2m/second and a minimum speed of 0.6 m/second  
The trees will be distributed by a pore distance of 3×3 m, i.e. a tree every 9 m$^2$, thus about 467 trees for one acre.  
The available area for the timber forest is 400 acres according to the boards of the land  
A lifting station will be built for the tree forest. The forest will be divided into two phases with two main sewer lines that flow 6,000m$^3$/day with a 300 mm diameter. The sewer line and the irrigation network of the timber forest will be carried out for the first phase only.  
A suitable sized dry well will be built in a way where the bottom of the dry well is lower than the bottom of the sink by about 1 m and the wall of the dry well is higher than the sink by about 1 m. Also, a pressure disc filter will be fixed to the lifting station in a way that serves the flow of the pumped water in the network  
The water pumps will be as follows:  
Pumps expected to be commissioned include two pumps that discharge 70 liter/second +1 backup pump 70 liter/second during the first phase, and two pumps that discharge 70 liter/second +1 backup pump 70 liter/second in the second phase.  
Two sand media filters will be installed to the main sewer lines of the pumps. Discharge of the filters will equal 1.2 of the discharge of the pump set for each line. Each group of filters will be installed as a single unit or a group of filters with a filtering capacity not less than 80 micron. All filters will include a number of stopcocks necessary for the efficient operation, including butterfly valves, check valves and air valves. In addition, an automatic back wash self-cleaning system will be installed to all filters and will be controlled via an electric panel. It should be taken into consideration that the maximum pressure allowed in the filters is 8 bar. Moreover, electronic meters will be installed to measure the difference in pressure which can send a signal to the filter control board to start the back wash process in case the difference in the pressure of getting in and out signals the presence of partial blocking in the filter. In addition, the two water lines will be supplied with screen filters to be installed to line pipes.  

HCWW will consider and adopt cost-effective fire protection and response measures such as prohibiting smoking in or near the timber forest, prohibiting the burning of any yard or other waste, limiting vehicle access to dry areas, establishing a fire break area around the forest, establishing fire lookouts, having firefighting tools and equipment at various points, creating access points in the event that fire trucks will need to enter the timber forest to control/extinguish a fire, providing communication equipment to forest workers to be able to rapidly communicate the potential occurrence of a fire and providing firefighting training to forest workers. Fire protection and response plans will be developed by HCWW.  

HCWW will ensure at least one forest worker per shift is first aid certified. In addition, a first aid kit will be made available at a well communicated and designated area. HCWW will ensure all timber forest workers are properly trained and well informed of the various kinds of work stress, nutrition, hydration and identifying and managing hazards. No workers working in the timber forest will be permitted to perform any work that may be harmful to them or the environment. Workers will have the right to refuse to perform such work and make sure their working hours include regular rest breaks as well as a meal break. Timber forest workers shall make a concerted effort to identify any potential hazards in their place.
of work. HCWW shall provide all timber forest workers with the appropriate personal protective equipment (PPE), with a minimum of safety footwear, safety helmets, eye protection and gloves. In cases where workers are exposed to dust and/or chemicals, respiratory protective equipment shall be provided by HCWW. Where chemical or sludge handling is involved, HCWW will ensure workers wear personal protective clothing and follow handling procedures carefully.

To protect the timber forest from potential vertebrate pests, HCWW will establish physical barriers both around the timber forest site and also around seedlings in the initial planting stages. Physical site barriers may be constructed of wire and barriers for seedlings may be composed of wire mesh or plastic. HCWW shall consider controlling insect larvae populations by using emulsifiable concentrates of mosquito larvicides applied by continuous drip methods. Before applying pest control measures, HCWW will seek to correctly identify the pest(s) in question, assess the potential damage that may be caused by the pest, determine what control methods are available and outline their benefits and risks, identify the most cost-effective methods that will have the least harm on humans and the environment, and most importantly, ensure they are complying with all local laws and regulations.
Figure 3.4– Proposed site for Al Nawawra Timber Forest
Figure 3.5 – Proposed Site for Al Nawawra WWTP Timber Forest

3.6 PIPELINE CROSSINGS

The pipeline crosses the eastern section of Al Nawawra canal, the beginning of Wady Al Sheeh canal and EL Gaish canal
3.7 LAND ALLOCATED FOR THE PROJECT

Lands needed for the construction of the two PSs and Nawawra’s WWTP are described as follows;

- Nawawra’s WWTP: State owned lands, situated in the desert east of Nawawra’s village. The total area is 1794 Feddan, 9 Qirates and 19 Sahm (7,536,514 meter square). Among this total area, the ISSIP II phase 1 project will use 492 Feddan (92 Feddan for the WWTP and 400 Feddan for the tree forest). The remaining land will be allocated for future projects of NOPWASD.

- Al Etmania PS: 2500 m² of state owned lands

- Al Nawawra’s PS: State owned, previously used for a water station site.

The site visits paid to the project areas reflected no type of any illegal customary ownership of these plots of lands. As well, no tenants were located on the lands. The approvals associated with the lands listed above are included in Annex 2.

Detailed assessment and due diligence of land acquisition are presented in Chapter 5 – Section 5.6.8

Figure 3.6– Proposed site for Al Nawawra WWTP
Figure 3. Layout of Al Nawawra WWTP
Figure 3.8 – Layout of site location, new site in blue/original site in green
Figure 3.9 – Distance between new location & nearest formal village
Figure 3.10 – Distance between new location & nearest informal houses
The previous figures (3.9&3.10) show the locations of the closest formal village areas and informal houses to the new location of the WWTP. It must be noted that the new location is far from formal residential areas by at least 1 km. According to the Egyptian code for the design and implementation of sewage treatment plants, issued by Ministerial Decree No. 169 of 1997, the distance between the WWTP and the closest formal housing area should be at least 1 km. The current location is in compliance with the relevant Egyptian legal requirements.

3.8 LAND ISSUES AND VERIFICATION OF THE NEW WWTP LOCATION

The Consultant’s team has conducted a site visit on August 2016, with the aim of verifying the land issues related to the new location. The social team has also conducted several meetings with relevant stakeholders and with the affected persons.

Findings from the field work and interviews with the stakeholders show the following:
- The new location of the WWTP is clear of any socio-economic usage, as shown in figures 3.11 & 3.12.
Figure 3.11 – Pictures from the new location of the WWTP

Figure 3.12 – Pictures from the new location of the WWTP
Farming areas and expansion of cultivated areas
- The main socio-economic activity at the area is farming. Farming areas are located west of the main road and represent a natural extension of the existing villages and hamlets.

![Farming areas close to the new WWTP location](image)

It was indicated during the interviews that the usual practice of the farm owners is to extend their farming activities towards the desert areas and reclaim some of the land then later they start to settle the situation with the government and pay necessary usufruct fees. After the necessary procedures they become the owners of the land. The following photo series (photo 3.14 till photo 3.18) show the historical expansion of the cultivated areas.
Figure 3.14 Historical extension of Farming areas 1 (in 2009)

Figure 3.15 Historical extension of Farming areas 2 (in 2013)
Figure 3.16 Historical extension of Farming areas 3 (in 2014)

Figure 3.17 Historical extension of Farming areas 4 (in 2016)
- Existing structures
The following figures (Figures 3.19 till 3.21) discuss the closest existing structures close to the location of the new WWTP.

Figure 3.19 – Location of the surrounding closed structures to the new WWTP
The unused newly constructed room in Figure 3.18 appears in Google Earth imagery on 24 February 2016. Therefore, it is assumed the room was constructed after the cutoff date announcement on 17 November 2015. The announced cutoff date was 30 June 2016. The
room has no known historical or current purpose, and its owner, who the Consultant met on 24 August 2016, conveyed his support for the project and approved the room’s demolition without compensation for the sake of the project.
Figure 3.20 – Vacant house and barn
The closest sensitive receptors to the WWTP are Abdel Samad School and Abdel Samad Youth center. The closest distance between the WWTP and the youth center is 1.36 km.
History of the land use at the site

The following group of pictures show the history of the land use of the new WWTP site starting from the time of preparation of the original ESIA (during 2014) and at the time of the approval of EEAA (October 2014) then during 2015 as the cutoff date was declared during November 2015 (site delivered to the contractor). Then during 2016 as consultation activities were conducted with the local community.

The images show that the location of the WWTP is clear of any usage during that time. Only limited illegal vacant structures exist and they are at least 1 km away from the current location (compliant with Egyptian codes and regulations). No farming activities occurred at the location of the site.
Figure 3.23 – Land use of the WWTP site at the time of conducting the ESIA in 2014

Figure 3.24 – Land use of the WWTP site at the time of EEAA approval in 2014
Data collected during the interviews indicated that these new houses are illegally built (local public units has issued violations). The youth center is the only structure that has obtained a legal permit, however. All other structures are illegally built. The public land specialist at the local unit stated that until 2009 there were no cultivation or buildings west of the current WWTP location and that these houses were built starting in 2014.
Steps taken for land acquisition
After obtaining all necessary permits and issuing the land allocation decree, the Assiut Water Company ensured that the land is cleared by conducting a site visit. The site was delivered to the contractor on November 3, 2015. The cut-off date was announced at the local unit on November 18, 2015. Prior to delivering the site to the contractor the RSU had conducted an official record to ensure no encroachments on the site occurred on 30 November, 2015.
CHAPTER 4 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1 LOCATION
Assiut Governorate is located on the 2 banks of the Nile River, It extends to 160 km length from Badari and Sedfa South to Dayrout North. The width of the valley ranges from 10 to 20 km. 

As for the boundaries of Assiut, it is surrounded by Minia governorate from the north, the Red Sea Governorate from the east, the New Valley from the west and Sohag from the south. The governorate is located between the Red Sea and New Valley Governorates as shown in Figure 4-1. The distance between Assiut city and Cairo is about 375 km.

Figure 0-1 location of Assuit governorate

There are 11 administrative Districts (Markaz) in Assiut, each consisting of a capital city of the same name of the District.
It also includes 56 municipalities followed by 235 village and 844 affiliates and rural residential community as shown in Table 4-1. Figure 4-2 shows the administrative division for the governorate.
Table 4-1 district, Municipalities and villages in Assiut Governorate

<table>
<thead>
<tr>
<th>No.</th>
<th>district</th>
<th>No. of Cities</th>
<th>No. of municipalities</th>
<th>No. of mother villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assiut</td>
<td>1</td>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Dayrout</td>
<td>1</td>
<td>7</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>Al Qusiya</td>
<td>1</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>Manfalout</td>
<td>1</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>Abo Tceg</td>
<td>1</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Sidfa</td>
<td>1</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>7</td>
<td>Al Ghanyim</td>
<td>1</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Abnoub</td>
<td>1</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>Al Fath</td>
<td>1</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>10</td>
<td>Sahel Selim</td>
<td>1</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>11</td>
<td>Al Badari</td>
<td>1</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>56</td>
<td>235</td>
</tr>
</tbody>
</table>

Table 0-1 Administration distribution

The districts under the study according to this phase are illustrated in table 4-2

<table>
<thead>
<tr>
<th>Assiut Governorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
</tr>
<tr>
<td>Al Badari</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Table 0-2 the villages under the study
Markaz Dairut
Total area = 208 km²
No. of municipalities = 7
No. of mother villages = 41
No. Of affiliates = 21

Markaz Al Qusiya
Total area = 184 km²
No. of municipalities = 4
No. of mother villages = 31

Markaz Abnoub
Total area = 199 km²
No. of municipalities = 4
No. of mother villages = 16
No. Of affiliates = 70

Markaz Manfalout
Total area = 217 km²
No. of municipalities = 7
No. of mother villages = 24

Markaz Al Fath
Total area = 105 km²
No. of municipalities = 6
No. of mother villages = 23
No. Of affiliates = 70

Markaz Assiut
Total area = 236 km²
No. of municipalities = 8

Markaz Abo Teeg
Total area = 127 km²
No. of municipalities = 4
No. of mother villages = 12
No. Of affiliates = 106

Markaz Al Ghanayim
Total area = 47 km²
No. of municipalities = 7
No. Of mother villages = 19

Markaz Sahel Selim
Total area = 69 km²
No. of municipalities = 3
No. of mother villages = 16

Markaz Al Badary
Total area = 92 km²
No. of municipalities = 7
No. of mother villages = 19

Markaz Sidfa
Total area = 78 km²
No. of municipalities = 4
No. of mother villages = 17

Figure 4-2 The administrative division for Assiut Governorate
Source: feasibility study
4.1.1 EL ATMANIA VILLAGE

El Atmania village is a small village founded close to the eastern mountain and near to military farms, the main pump station will be installed in it. the nearest two building to the pump station are a house away not less than 25 meters and a small LPG cylinders storage building away about fifty meters from the pump station, the location are illustrated in figure 4-3.

Figure 4-3The location of El Atmania pump station
Most of the pipe line go through wide street enough as showed in figure4-5, but the important is when this pipe lines cross a sensitive area as canals or schools as shows in figure 4-4

The line goes parallel to a school

The line cross the eastern Al Nawawra canal

Figure 0-4 pipe lines cross an sensitive areas

Figure 0-5 the widens of the streets

4.1.2 EL NAWAWRA VILLAGE

EL Nawawra pump station will be installed inside an old water pump station as shown in figure 4-6. There is a house beside the outer wall of old station, it will be away to the new sewage pump station not more than 25 meters.
Figure 0-6 Al Nawawra pump station
The water treatment plant will be installed in desert area near to Al Nawawra and beside the military farms, the location shows in figure 4-7 and also in figure 4-8. It is important also to mention that the plant will be installed beside unplanned land reclamation area.
Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project Assiut - Final

Figure 0-7WWTP in Al Nawawra village
Figure 4-8  WWTP in desert area of El Nawawra village

Most of the pipe lines go through wide street enough, but the important is when this pipe lines cross a sensitive area as canals as shows in figure 4-9

The pipe lines goes parallel to Eastern Al

The pipe lines goes barrel to Wady Al Shih
4.2 HYDROLOGY

4.2.1 Surface water
Assiut Governorate depends mainly on the Nile water for irrigation and drinking. The estimated amount of discharged water to Assiut governorate is about 1599 million m$^3$ per year. The main canals at the governorate are: Ibrahimeya canal which serves to irrigate about 79407 feddans, Nag Hammadi West canal, which serves to irrigate about 141 thousand feddans and Nag Hammadi East canal which irrigates about 88 thousand feddans.

Badara district is one of the districts of Assiut, which includes Nawawra and Atamna villages. Farokeya canal passes in front of both villages. Figure 4-11 shows the distribution of canals at the district which passes through Nawawra and Atamna villages: Nawawra Sharkeya canal and Wadi el Sheih canal which branches to El Geish canal. These canals are used only for irrigation purposes and are not used for drinking.
Figure 4-10  distribution of canals and drains at the governorate
Figure 0-11 canals that pass through Nawawra and Atamna villages at Badara district
Figure 0-12 Nawawra canal passing through the residential area

Figure 4-13 Nawawra canal passing through the agricultural area
Figure 4-14 Nawawra Sharkeya canal at the entrance of Atamna village

Figure 0-15 Wadi Sheih canal branching of Nawawra Sharkeya canal
Figure 0-16: El Giesh canal at Wadi Sheih
During the field survey, the research team noted that canals passing through the residential area are loaded with domestic waste. Housewives are generally disposing of domestic waste at the canal. It was also noted that some houses directly discharge sanitation water to the canal, sometimes they discharge indirectly as evacuation cars get rid of the collected wastewater at the canal. As highlighted in figure 4-17 and figure 4-18.

Figure 0-17: Discharge of wastewater at an empty land close to the canal

Figure 0-18: Discharge of wastewater at the canal
The impact of the human activities is clear on the water quality at residential areas. The research team has conducted a water quality analysis for surface water. Water samples were collected and analyzed to identify water quality. Two samples were collected from Nawawra Sharkia canal; one at the entrance of Etmania village (26°53’ 43.71” N and 31°30’ 44.59” E) and the other one in front of the residential area in Etmania (26°51’ 9.14” N and 31°31’ 11.47” E). The results (shown in the below table and in Annex 3) have indicated that the total and fecal coliform bacteria level in canals are high but still within the allowable range according to the ER of Law 48/1982 amended by Decree 402/2009.

The sampling and analysing were performed by “measurements and calibration lab(MCL) faculty of engineering Cairo university”. Figure 4-20 shows the location at Etmaniya village where the sample was collected.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standards &amp; Limits (mg/l)</th>
<th>Sample 1 (Alatmania - Al Nawawra ElSharkia)</th>
<th>Sample 2 (Al Nawawra ElSharkia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dissolved solids (TSS)</td>
<td>≤ 1000</td>
<td>273</td>
<td>43</td>
</tr>
<tr>
<td>Temperature</td>
<td>Maximum difference of 3°C as compared with the receiving watercourse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>≤5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>Min 6.5 and max 8.5</td>
<td>7.32</td>
<td>7.22</td>
</tr>
<tr>
<td>BOD</td>
<td>≤30</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>COD</td>
<td>≤50</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Total Nitrogen (TN)</td>
<td>15</td>
<td>1.51</td>
<td>1.89</td>
</tr>
<tr>
<td>Total P (TP)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil &amp; Grease</td>
<td>≤3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>≤0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>≤3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>≤2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>≤1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zn</td>
<td>≤2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>≤0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As</td>
<td>≤0.01</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cd</td>
<td>≤0.03</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cr</td>
<td>≤0.05</td>
<td>0.003</td>
<td>0.002</td>
</tr>
<tr>
<td>Free Cyanide</td>
<td>≤0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>≤0.1</td>
<td>0.008</td>
<td>0.002</td>
</tr>
<tr>
<td>Ni</td>
<td>0.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Se</td>
<td>0.01</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T. Coliform 100 cm³</td>
<td>5000</td>
<td>1330</td>
<td>1500</td>
</tr>
</tbody>
</table>
Drains:
Available drains at the governorate are Assiouty, Zawya, El Siel, Ababnoub, El Bahary, Bani Mohamed, El Badara main drain, Abou Tieg, Beni Samie el Qebly, El Asaya and El Kom El Ahmar.

4.2.2 Groundwater
Groundwater represents the second source of water at the governorate after surface water. Water is extracted from the quaternary aquifer of the Nile valley and the surrounding desert area. Groundwater is used at towns and villages in the valley as a main source for potable water.

Figure 4-21 describes the groundwater aquifer at the governorate, Figure 4-22 shows the depth of the groundwater. Groundwater level at the villages of Nawawra and Atamna is more than 20 meters. The two villages previously depended on the groundwater for drinking purposes. Community members dug individual wells for supplying their needs. Water from these wells is characterized by an increased percentage of minerals. After the water network has been connected, the Ministry of Health and the Water Company have banned the inhabitants from using these wells. The research team was not able to collect samples to identify the quality of groundwater, since the wells were dry.

Six boreholes advanced to 15 m below ground surface in the oxidation ponds’ proposed site in April 2016 revealed that soil in the area is characterized as being mostly silty clay with small amounts of sandy gravel. No groundwater was encountered during the investigation. The full geotechnical report is presented in annex 3.
Figure 0-21  underground aquifers at the governorate
Figure 0-22 depth of groundwater
4.3 CLIMATE  
(the source: Previous EIA study prepared by EcoConServ 2009 and Assuit environmental profile 2005)

4.3.1 Temperature

The project is located at Badara district close to the Eastern desert. The wastewater treatment plant will be constructed at a desert area, characterised by continental climate. The annual minimum recorded temperature is 15, the annual maximum recorded temperature is 30. The following figure 4-23 highlights the average annual temperature recorded at Assuit meteorological station.

![Temperature Graph]

Figure 4-23  average monthly temperature at the area

4.3.2 Rain

Climate data point to the lack of rainfall in the area in general. The highest rate of rainfall is 3.5 mm/year, the average was 0.7 mm/year, which represents very limited amounts, causing no damage at all.

Although the amount of rainfall is very limited, but storm water is among the main threats to Assuit, which will be discussed later in more detail.

4.3.3 Humidity

The annual average humidity rate at Assuit governorate is 38%, the average annual evaporation rate is 14.2 mm. The following figure 4-24 highlights the annual relative humidity rates.
4.3.4 Wind
Based on the data recorded at the Egyptian Meteorological Authority, at Assuit station (station no 62393), the average wind speed at the area is 8.1 MPH. This speed varies between seasons. The maximum recorded wind speed is during Spring and Summer, the least speed occurs during Autumn and Winter. Figure 4-27 shows the average change in wind speed at the governorate, with regards to wind direction based on the recorded data at the station as shown in figures 4-25 and 4-26. The prevalent wind direction is towards the west or the south west.
Figure 0-25  average wind direction and speed all over the year

Figure 4-26  wind rose
4.3.5 Atmospheric Pressure
The average atmospheric pressure is 1012.8 mbar, which is a little lower than the average at sea level equivalent to 1013.2 mbar. This is due to the increase of ground level than the sea level by about 45 to 46 meter. Figure 4-28 shows the annual rates of atmospheric pressure at Assuit governorate.

4.3.6 Storm water
Assuit governorates suffered from the worst storm water disaster during 1994 at Doronka district. Thus the Egyptian governorate to restore the storm water drains. Several of these drains were maintained afterwards. Figure 4-30 shows a layout of storm...
water drains distribution at both sides of the Nile in Assuit governorate. The closest drains to the project area are as follows:

**Storm water drains at Wadi Sheih, Etmania and Hemamia:** Four extenuration barrages are used. Excess water from the barrages is discharged to Nawawra Sharkeya canal then to the Nile using the extenuation drains. Storm water collected at the Wadi Sheih and Atamna drains is discharged to Nawawra Sharkeya canal then to Nag Hamadi Sharkeya canal through pipeline near the end then finally to the Nile through the following drains:

- Khazendarya
- El Mamtar
- El Maana
- New El Maana drain to the Nile

These drains are very important since they are located at the villages of Wadi Sheih and Etmania, where the project will be constructed. It is planned to construct the pump station at an area away from the storm water drains.

The proposed site for the establishment of the WWTP has been evaluated based on the geological and geomorphological characteristics in order to determine the extent to which the site would be affected during heavy precipitation on the region.

The objectives of the assessment are listed below:

1 – To study the flood history that occurred around the WWTP site to determine if the area has been subjected to serious floods in the past.
2 – To study of geological and topographical maps, and aerial photographs, as well as digital elevation maps of the area, in order to describe the geological nature of the site and the types of rocks located and physical properties and their ability to absorb large amounts of water.
3- To study the geomorphology of the area and the general slope of the earth's surface
4- To Identify the relationship between the location of the proposed site for the WWTP and the potential flood pathways in the region.

The WWTP will be located in the south-western part of the valley Abu Al Sheih, as shown in the geological map (Figure 4.29a).
From the field visits, as shown in Figure 4.29b, the WWTP site is a flat near-horizontal area entirely free of traces of dry streams/valleys or any deep rises or falls.
Figure 4.29b: WWTP site. Note the limestone rock, located to the south of the site and Quaternary sediments across the site.

Longitudinal and lateral topographical sections have been studied around the WWTP site in order to determine the topography of the region and the overall slopes around the site. The slopes are shown in Figures 4.29c to 4.29f.
Figure 4.29c: Topographic Section of Google images extending from north to south. Note the horizontal level to the West of the site.

Figure 4.29d: Topographic section for Google images extending from north to south. Note the horizontal level of the site.

Figure 4.29e: Topographic section for Google images extending from north to south. Note the horizontal level East of the site.
Figure 4.29f: Topographic section for Google images extending from East to West, passing through the new WWTP site. Note the small difference in the ground level to the East and West of the Site, which would not exceed 6m

Aerial photographs show that there is a range of dry valleys draining into the valley Abu Al Sheih, most importantly Wadi Abu Tarifia and Wadi Abu Halifa from the Middle and small valley from the south (Valley Adabia), these are shown in Figure 4.30a.

Wadi Abu Tarifia and Wadi Abu Halifa were classified by previous studies as weak-to-moderate regarding their ability to collect rain water, and causing floods. As for the Valley of Adabia, it is very short and its ability to synthesize large amounts of rain is unlikely even in the event of a severe precipitation.

Given the location of the station, which is located to the far south west of Wadi El-Sheih, the location was found to be far from the exits of valleys mentioned above. In the event of a surface flow of any intensity, the paths of surface water will follow the natural existing slopes where the WWTP area is considered relatively high as compared to the surrounding areas and consequently will not fall in the flood pathways. (Figure 4.30b to d).

From the above assessment, the following were concluded:
1 - The surface of the land where the WWTP site is located is flat, characterised by a small slope to the north.

2 - There is no signs at the WWTP site of any old flood paths.

3 – The existing pathways of the larger valleys are far from the WWTP site.

The newly proposed site for the establishment of the WWTP is therefore suitable when considering the risks resulting from floods or sudden surface water runoff resulting from an unexpected heavy rainfall.
Figure 4.30a: Google image showing the location of the WWTP in relation to the spillways/drainage pathways of the valleys in the region.
Figure 4.30 c - 3D Model for the WWTP site showing the surface water runoff pathways for the valleys draining into Abu Al-Sheih valley. Note the pathways are distant from the WWTP location.
4.4 AIR QUALITY

A. National Monitoring Network Data:

The national network for monitoring air quality currently operates 87 air quality monitoring stations. Stations extend all over Egypt, only 15 stations exist in Upper Egypt, and two stations at Assuit.

The last state of the environment report for 2011, issued in 2012 indicates the following:

Sulpher dioxide:
The annual average of Sulpher dioxide concentrations decreased from 60 microgram/m³ in 1999 to 15 microgram/m³ in 2011. As highlighted in figure 4-30e.

Nitrogen Dioxide:

Air quality in Egypt suffers from the increase in Nitrogen Dioxide concentrations since 1999. Nitrogen dioxide concentrations have increased from 45 micrograms /m³ in 1999 to 60 micrograms /m³ in 2011 as indicated in Figure 4-30f.

Suspended Particle Matter:
PM concentration exceeds the permissible limits, although the annual average concentration had decreased from 190 micrograms/m³ in 1999 to 140 micrograms/m³ in 2011 as highlighted in Figure 4-31.

![Annual Average of inhaled particles PM10 in the Arab Republic of Egypt (1999-2011)](image)

**Figure 4-30** Particle Matter annual average all over Egypt

### B. Field study results:

Most of Assuit districts are characterised by rural atmosphere mostly clear of pollutants, though several areas in Assuit are industrial areas. Heavily polluting establishments exist in Assuit such as fertilizers, Petroleum refining, cement and power generation projects. These establishments mainly exist away from residential areas. Badara district is located far from air polluting projects in Assuit. It must be noted that Badara is the highest populated district in Nile East side in Assuit, therefore more human activities can be expected. The impact of desert environment can be noted on the air quality at Badara district since it is located close to the East desert where the ground level rises higher than the villages close to the valley and to the river Nile.

The research team has conducted air quality measurements at carefully selected locations. The measurement locations were selected to represent all districts depending on the analysis and also the available data before the field work. The most important negative factor noted was the foul odours at the streets resulting from the septic tanks especially during evacuation process. At some places septic tanks suffer from leakages which increase the impact of the odours, in addition to the impacts of the Nawawra Sharkeya canal passing through residential area and the emissions caused by burning domestic waste. These features are common of most of the villages that do not possess sanitation networks.

The project area can be classified as a desert area (the area designed for the wastewater treatment plant) and an agricultural rural area (Nawawra and Atamna villages). The research team used the maximum permissible limits indicated in annex 5 of the executive regulation of the law of environment as a guideline to indicate the level of pollution.
The measured elements include: SO2, NOx, NH3, TSP, PM1, PM7, PM 2.5 and PM 10. The results show that the air is free from the gaseous pollutants but the dust level is increase the ambient air quality standard limits as presented in tables 4-3.

The location of measurements of air and noise in the villages are shown in figure (34).

<table>
<thead>
<tr>
<th>Al Badary District</th>
<th>EL Etmaniya</th>
<th>Al Nawawra</th>
<th>Al Nawawra-WWTP</th>
<th>Permissible limits</th>
<th>Avaraging time</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CO)</td>
<td>1000</td>
<td>880</td>
<td>950</td>
<td>10000</td>
<td>8</td>
</tr>
<tr>
<td>(SO2)</td>
<td>38</td>
<td>45</td>
<td>33</td>
<td>125</td>
<td>8</td>
</tr>
<tr>
<td>(NOx)</td>
<td>54</td>
<td>60</td>
<td>64</td>
<td>150</td>
<td>8</td>
</tr>
<tr>
<td>(NH3)</td>
<td>Nd</td>
<td>Nd</td>
<td>Nd</td>
<td>120</td>
<td>8</td>
</tr>
<tr>
<td>(TSP)</td>
<td>.347</td>
<td>.257</td>
<td>.267</td>
<td>0,23</td>
<td>8</td>
</tr>
<tr>
<td>(PM 10)</td>
<td>.298</td>
<td>.218</td>
<td>.248</td>
<td>0,15</td>
<td>8</td>
</tr>
<tr>
<td>(PM 7)</td>
<td>.301</td>
<td>.221</td>
<td>.213</td>
<td>0,15</td>
<td>8</td>
</tr>
<tr>
<td>(PM 2.5)</td>
<td>.02</td>
<td>.02</td>
<td>.02</td>
<td>0,08</td>
<td>8</td>
</tr>
<tr>
<td>(PM 1)</td>
<td>.02</td>
<td>.02</td>
<td>.02</td>
<td>0,08</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 4-3: The air quality measurements results

The measurements was performed by “measurements and calibration lab(MCL) faculty of engineering Cairo university”. The report is attached in annex -3.
In Atmaniah village

In Nawawra village

Figure 4-31 the location of measurements of air and noise in the governorate

4.5 NOISE
Rural nature prevails in the project area where residential settlements represent islands between cultivated lands, lying close to the desert regions. Through monitoring and inspection of the sites where the pump stations and the pipeline network will be constructed, it was found that the main sources of noise in these areas are the movement of cars and operating water pumps. No other sources of noise were noted in the desert area where the wastewater treatment plant will be established. Environmental measurements show the high level of noise in two locations, as explained in the following table. The location of measurements of air and noise in the villages are shown in figure (34).

<table>
<thead>
<tr>
<th>Gerga District</th>
<th>EL Etmaniya</th>
<th>Al Nawawra</th>
<th>Al Nawawra- WWTP</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average value dB</td>
<td>60.5</td>
<td>64.4</td>
<td>45.5</td>
<td>7:00 am – 10:00 pm</td>
</tr>
<tr>
<td>Permissible limits</td>
<td></td>
<td></td>
<td>50 dB</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-4 The noise level measurements

The measurements were performed by “measurements and calibration lab (MCL) faculty of engineering Cairo university”. The report is attached in annex -3

4.6 FLORA
In Assuit governorate area includes a clay agriculture land with cultivated crops of the typical cash crops grown in the Egyptian agricultural areas. Cotton, maize, wheat, clover, corn and beans are the common crops grown at different seasons in the agricultural land. The land in Assuit is fertile characterized by high yields.
Three main groups of flora are found Assuit land according to their life span are perennials, biennials and annuals.

In what relate to commercial importance species no commercially important species are known within the project area. On the basis of plant longevity, the flora present at the Nile Valley is composed of 4 biennials, 99 perennials and 122 annuals.

The perennial species ranges from fruticose or sulfruticose to herbaceous. Four biennial species are Melilotus albus, Apium graveolens, Chenopodium ambrosoides and Spengularia salina. The perennials flora include Actheorhiza bulbosa, Alhagi graecorum, Asparagus stipulars, Aster squamatus, Astraglus fruticosus, Atractylis carduus and others.
The annuals flora include; Adonis dentate, Abutilon theophrasti, Amaranthus graecizans, Amaranthus hypochondriacus, Aumi majus, Anthemis borumuelleri and others.

In the desert extend of the governorate there are five common plant species were recorded in the sand flat formation habitat at the area of investigation which covers the surroundings of the Project areas. These species were; Chenopodium album, Anabasis articulate and Tamarix nilotica.

4.7 FAUNA

because thousands of years of intensive human activities, the modern Nile Valley and Delta have been converted to a man-made ecosystem. Animals now inhabiting the region are those that are able to tolerate human activities or those that can avoid contact with the human. The intensive cultivation and widespread use of agrochemicals have contaminated the region adversely affecting many of the native animals.

Birds

The characteristic birds in governorate include Egretta alba alba (common), Egretta ibis ibis (rare), Corvus corone saradonix (common), Streptopelia scneagalenis aegytiaca (common) and Fringilla montifringilla (common).

Mammals:

Forty mammalian species are known in the Nile Valley at the present time (Anon, 1993). Rodents are the most common in the project areas inhabiting the cultivated fields. The most common species are Rattus rattus, Rattus norvegicus, Mus musculus, Acomys cahirinus cahirinus, Arvicanthis niloticus, Gerbillus gerbillus gerbillus and Gerbillus andersoni andersoni. Insectivora were represented by Crocidura nana and Hemiechinus auritus aegytius. Rhinopoma hardwickei arabium, Taphozous perforatus, Taphozous nudiventris, Otonycteris hemprichi, Tadarida aegytiaca were the dominant Chiroptera (Bats) species. Carnivora were represented by Vulpes vulpes and Mustela nivalis. Perissodactyla was represented by Equussp.
Invertebrates
some insects such as locusts, beetles, butterfly and some spiders were observed.

Reptiles:
34 species of reptiles were recorded in the Nile Valley and Delta (Anon, 1993). Common reptiles at the project area include Trapelus mutabilis, Tarentola annularis annularis, Mesalina guttulata, canthodactylus boskianu Hemidactylus turcicus, Chalcides ocellatus, Coluber florulentus, Natrix tessellate, Psammophis sibilans, Telescopus shara, Varanus niloticus, Mabya quinquetaeniata and Naja haje. These reptiles live at both vegetation and desert environments within the governorate area.
Based on the investigation conducted by the Consultant, no endangered species have been identified within the project affected area.

**Aquatic flora:**
The dominant species of the aquatic canal banks in the Nile Valley includes: Phragmites australis, Cynodon dactylon, Imperata cylindrica, Typha domingensis, Arthrocnemum macrostachyum, Inula crithmoides, Juncus acutus, Zygophylum aegypticum, Frankenia hirsuta, Echinops spinosissimus and Alhagi maurorum.

Aquatic fauna:
Amphibians:
In the Nile Valley there are four species of amphibians are known.
Characteristic amphibians include Rana ridibunda, B. viridis, Ptychadena mascarenensis and Bufo regularis.
4.8 GEOLOGY

Assiut consists of some of sedimentary rocks and loose sediments, caused by Tertiary and Quaternary formations as follows:

1. **Tertiary Formations**: can be traced to Eocene and Pliocene eras.
   
   **A. Eocene formations:**
   
   Eocene is the second era during Tertiary formations. Most of its formations composed of limestone stroked out with layers of clay and flint.

   Limestone forms most of the flood plain, with overlooking steep edges. Rainfall has previously caused dramatic dissolving of these rocks and opening a number of valleys, with estuaries towards the end of the flood plain. These rocks were affected by mechanical and chemical erosion factors causing fragmentation and melting of most of its surface parts.
Source: Environmental Description

B. Pliocene Formations:
Pliocene represents the fifth and final era of the Tertiary age. Its formations appear in a narrow part of the western side of the Nile valley. Most of the formations are marine sediments, representing layers from limestone, sandstone, marble and clay.

2. Quaternary Formations:
It consists mainly of loose sediments from two types: dry valley sediments and floodplain sediments.

A. Floodplain sediments:

Floodplain sediments can be traced on both sides of the River Nile. They consist of modern loam sediments carried by the Nile River from its headwaters South in Ethiopia. River Nile was the main source carrying these segments each year during the flood season. Sediments used to cover both sides during high water level season thus covering the floodplain and adding to it a new layer of silt each year. This served the renewal of soil fertility which stopped after the construction of the High Dam.

Floodplain sediments increase in roughness as we get closer to the river, and become smoother away from the river. The coarse sediments carried by the flood waters first fell and deposited directly on both sides of the river. The soft sediments remained dissolving in the water and later deposited on the surface floodplain away from the river banks.
Floodplain soil:

The floodplain generally consists of four types of soil, based on classification and productivity: first, second, third and fourth class soil. The degree of salinity is not noticeable as most of the soil is of normal salinity arable lands. Most of the land of the governorate is originally formed of:

**Clay Soil**: Covers large areas of the floodplain, alluvial soil is sometimes interspersed with dark brown clay formations. The thickness of the clay soil in some places is only about 60 cm showing sandy soil or yellow sandy clay or yellow or gray clay loam or loam underneath.

**Sand Soil**: Carried by the wind at the west border of the cultivated valley.

**Surface Calcareous soil**: swept away from the western hills by flood water, can be cultivated.

Figure 4-36 shows distribution of spreading rock formations at different areas in Assuit. The figure includes rock distribution of different types, ages and formations, depending only on rock formation and chemical composition. Silt and clay sediments can be found in Nile Valley as well as the surrounding rocks, sandstones and gravel. It can also be found in limestone and dolomite formations. Areas covered in sand and gravel are most suitable for construction based on stability, withstanding pressures and inability to collapse.
Figure 4-33 rock formations spreading in different areas in Assuit governorate

Source: Assuit Environmental profile

The figure 4-34 highlights the geological elements of Assuit governorate. Rock formations appear and are classified according to their geological ages and their interconnectedness. It shows also locations of the most important geological formations such as faults, cracks and breaks which represent the most unsafe areas for construction. It shows also rock sequences and their extensions.
Figure 4-34  geological elements for Assuit governorate
Source: Feasibility study EGEC
Figure 4-35 shows the topographic map of Assuit governorate, showing the land slope in Badara district towards the valley. Figure 4-39 shows the contour lines of the mountain and desert area, neighbouring the project area. It is characterized by the valley of Abou Sheih where the treatment station will be constructed.

Figure 4-35  Topographic map of Assuit governorate

Source: Feasibility study EGEC
Figure 4.36  valleys and contour lines in the desert area near the project
The wastewater treatment plant will be constructed at a desert area in Nawawra village, Badara district. It will be constructed in a silt and sand soil, few kilometres away from the valley at the borders of Abou Sheih valley.

The field study has shown that the area is almost flat, there are some few small hills not exceeding 2-4 meters in height. Pictures in Figure 4-40 show the slight change in the land level and the type of land in the area.

![Type of surface soil and Typography of the wastewater treatment station construction area](image)

### 4.9 SEISMIC HAZARD

Figure 4-38 shows the seismic hazards. The area is located in the low impact area (five levels classification) which provides a good opportunity for development. Taking into consideration that construction of the stations and the pipelines will be conducted according to the civil engineering codes consider the level of impacts caused by earthquakes upon the station and the sanitation network. These measures will prevent any impacts caused by earth movements leading to leakage from the sanitation network and causing pollution to the groundwater aquifer.
Figure 4-38 Seismic hazard in Egypt including Assuit

Source: www.who-eatlas.org
Soil Quality:
It is planned to construct the pipeline network and the pump stations will be at EL Etmaniya and Al Nawawra villages which are all considered rural areas with limited soil pollution. No industrial activities exist in the area. one new treatment plant will be established at the desert area of Al Nawawra village. Soil pollutants are limited to the domestic waste scattering along the streets and on the banks of the canals or drains. A soil sample was collected at the area planned for construction of the treatment station to represent the baseline conditions prior to the occurrence of any potential pollution in cases of inadequate environmental management for generated sludge during the treatment process. The results show that the soil does not contain any pollutants. The report is attached in annex -3
The sampling and analysis was performed by“measurements and calibration lab (MCL) faculty of engineering- Cairo University”.
Six boreholes advanced to 15 m below ground surface in the oxidation ponds’ proposed site in April 2016 revealed that soil in the area is characterized as being mostly silty clay with small amounts of sandy gravel. No groundwater was encountered during the investigation. The full geotechnical report can be found in annex 3.

4.10 PROTECTORATES
El Wadi el Assuity is the protectorate located in Assuit governorate. It is located on the eastern side of the Nile. Figure 4-39 shows a map of the natural protectorates in Egypt. Figure 4-40 shows the location of the protectorate in Assuit.

El Wadi el Assuity protectorate:
Assuit governorate is characterized by a wide variety of habitats that contribute to the enrichment of biodiversity. About 188 species are monitored at El Wadi el Assuity protectorate, including 78 species of insects, 59 species of birds, 30 species of plants, 13 species of reptiles, 8 species mammals, along with many species of insects, amphibians and fish at the River Nile.

El Wadi el Assuity was declared as a breeding and multipurpose protectorate. It was declared protected in 1989, by the decree of the Prime Minister No. 942 of 1989, as amended by Resolution No. 710 of 1997. It has an area of 35 km² and is located 400 kilometres south of Cairo.

It was noted during the field visit and from the maps that the project location is far from any protected areas. Al Wadi el Assuity protectorate lays more than 25 kms from the area.

4.11 ARCHAEOLOGICAL SITES
Assuit governorate includes historical sites from all eras: Pharaonic, Coptic and Islamic. Badara district includes Pharaonic monuments from pre and dynastic eras. Hemameya area is the main Pharaonic site close to project. The closest historic sites to the project location are Ezbet Youssef Tombs and Hemameya monuments.
**Ezbet Youssef Tombs in Atamna:**

It is the closest to the project site. These tombs are located in a desert area away from the residential area in Atamna village, at least 2 kms towards the north. Figure 4-41 shows a photo of the tombs, and figure 4-43 shows its location to the project location.

![Ezbet Youssef Tombs](image-1)

**Hemameya monuments:**

It is located near the project site, but not within the construction site. The villages of Atamna or Nawawra do not include any historic areas. These monuments are located at least 5 kms towards the north from the project area. Figure 4-42 shows part of these monuments, and figure 4-44 shows its location to the project location.

![Hemameya Monuments](image-2)
Figure (4-43) the location of Azpet Yousef to boundary of the project
4.12 SENSITIVE AREAS
These represent the most sensitive receptors to the project activities, where a higher likelihood may occur for negative environmental impacts, or an interaction between the project activities and the surrounding environment:

1. The storm water drains close to the project area
2. The wastewater treatment station that will be constructed at the borders of Wadi el Sheih, as shown in Figure 4-45
3. The increasing levels of Pollution at Nawawra canal, as shown from the lab analysis and field survey.
4. The sewage network will pass through some narrow streets with weak buildings.
5. Bubulcus ibis lives in the agriculture areas close to Nawawra canal
6. The sewage line will pass by the internal agricultural roads located beside Nawawra Sharkeya canal, which may have impacts on the quality of water during construction activities. Impacts on the quality of water may also occur in case of the sewage line passing through the Nawawra sharkeya canal and Wadi el Sheih in case of any malfunction as shown from the figure 4-46.
7. The sewage network passing in front of schools as a sensitive receptor

Figure 4-47 sewage network in front of a school
8. Closeness from historic and monuments area especially at Ezbet Youssef tombs in Atamna (2 km away), which is established at a mountain’s area as highlighted in the Figure 4-51.

Figure 4-48 Ezbet Youssef Tombs

Figure 4-49 Residential house close to Nawawra and Atamna pump stations

4.13 SOCIO-ECONOMIC CONDITIONS

This chapter aims at describing the social, economic and health environment of the areas of the project. This description will help the consultant in having an integrated Photo of the project area. This is done through using the spatial and time boundaries of the project. The study team based their study on clear analysis of the secondary and primary data, observation and picture documentation of all the activities done during the data collection process.
4.13.1 Description of the project area
This project will be implemented in Assiut Governorate. It is located in the Middle Upper Egypt Region that encompasses Assiut and New Valley governorates. Assiut lies between two mountains, thus it is characterized by an extreme continental climate. It is also considered the trade capital of Upper Egypt. Assiut's area covers 13720 km². It includes 11 Marakz, 11 cities, 2 districts, 55 rural local units annexed by 235 villages, 1083 hamlets.

According to the results of the 2006 census, population is about 3.4 million people; 26.4% of them live in urban areas, and 73.6% in rural areas. The population natural growth rate is 22 per thousand. The governorate contributes to the industrial activities through major industries including: fertilizers, medicines, cement, petroleum, as well as small industries such as kleem, rugs, woods embellished with shells, and ivory products. Seven industrial zones in the governorate's marakz were also established.

As mentioned before the project targets El Badary District where two villages were targeted: El Etmania, Wadi El Sheih and El Nawawra.

The information center provided data on the District and mother villages level. However, there was lack of data on affiliated villages.

The information center at El Nawawra Village reported that the area of the village is 2069 feddans, 1035 of which are cultivated, and only 292 feddans are construction lands. Whereas the area of El Etmania village reached 2000 feddans (1582 feddans cultivate and 200 feddans for construction).

<table>
<thead>
<tr>
<th>Basic information</th>
<th>Nawawra village</th>
<th>El Etmania village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>2069 Feddan</td>
<td>2000 Feddan</td>
</tr>
<tr>
<td>Area of agricultural land</td>
<td>1035 Feddan</td>
<td>1582 Feddan</td>
</tr>
<tr>
<td>Total area of built land</td>
<td>292 Feddan</td>
<td>200 Feddan</td>
</tr>
<tr>
<td>Total area of land with utilities</td>
<td>132 Feddan</td>
<td>70 Feddan</td>
</tr>
</tbody>
</table>

The study team visited the different areas of the project, which were mostly agricultural areas. At El Etmania mother village the prevailing construction pattern used red brick. In Nagaa Hassan Abdel Rehim other types of building using mud bricks were observed. Another area that has a group of buildings similar to villas was observed.

The heights of the buildings were between 2 to 3 floors at most. There was an economic disparity between the dwellers of these buildings and those living in more luxurious ones. As well as the economic disparity between Nagaa Hassan Abdel Rehim Village and the two other mother villages.
As for the roads it has varied in area between 3 meters to more than 30 meters especially in El Etmania Village, in which the area of the streets was very wide in particular the areas close to the desert boarder. Looking closely at the type of roads in these areas, it is noticed that the most common type is sandy roads, which is a characteristic of semi urban areas. It is also noticed that most of the streets are adapted for the sanitation network, on the contrary the streets in the three villages are very narrow to the extent that the pumping trucks have to maneuver to reach them.
4.13.2 Description of the location of the WWTP and the Timber Forest

The current location of the WWTP and the timber forest according to the allocation Cabinet decree number 1666 can be described as desert area. Based upon the findings of the field visits and as shown in the previous figures, the location is vacant of any socio-economic activities.

The only socio-economic activity surrounding the project location is agriculture. Cultivated areas are newly reclaimed areas. The normal practice for the local inhabitants is to start reclaiming the land illegally then later they pay necessary fines. During the field work the discussions with the Local Government units has indicated that the unit has issued official violations for land users. During discussion with some of those farmers they should support of the project and they were willing even to give parts of the land (although they are located outside of the allocated site). They had no objection to the construction of the WWTP with regards their farming activities. No objections of the new location were recorded expect for the grievance submitted previously.
4.13.3 Demographic profile of the project areas

4.13.3.1 Description of population
This section describes the population in terms of population number, age, education, and working nature of heads of households. It is based on the secondary data, especially statistics and some primary data available for this area.

4.13.3.2 Number of Population
Statistics of population number in these areas varied, but most of it were estimations based on 2006 statistics. It was clear from the statistics provided by the Information Center that the number of population in project area was estimated by 56 thousand persons. They are distributed as follows; 71.2% at El Nawawra Village, 28.7% at El Etmania Village and Nagaa El Shikh. The estimated number of population in the three villages reached 3000 persons approximately. The number of households at El Etmania Village is 3273 households and 7521 at El Nawara Village. The total number of households in the three villages does not exceed 600 households.

According to the statistics of 2006, the percentage of population in the age category 15 to 45 years is 44%. The category of infants (less than 6 years) is about 19%. The age category exceeding 60 years does not exceed 5%. The different age categories data shows that it is a growing community. This fact requires a clear plan for future expansions of the project in a way that serve the growing number of population.

Table 2: Number of population and households in project areas

<table>
<thead>
<tr>
<th>Markaz</th>
<th>El Etmania</th>
<th>El Nawawra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>3273</td>
<td>7521</td>
</tr>
<tr>
<td>Males</td>
<td>8555</td>
<td>20685</td>
</tr>
<tr>
<td>Females</td>
<td>7728</td>
<td>19643</td>
</tr>
<tr>
<td>Population number</td>
<td>16283</td>
<td>40328</td>
</tr>
</tbody>
</table>

Source: Information Center at El Badary
4.13.3.3 Education
Different educational services are available in the project areas, that provide the inhabitants with learning opportunities. The following table shows the educational services available at El BadaryMarkaz.

Table 4-5: The educational services available at El BadaryMarkaz

<table>
<thead>
<tr>
<th>Services</th>
<th>El BadaryMarkaz</th>
<th>El Etmania village</th>
<th>El Nawawra Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational features 2010/2009 unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre university education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of schools</td>
<td>school</td>
<td>183</td>
<td>8</td>
</tr>
<tr>
<td>No. of classrooms</td>
<td>classroom</td>
<td>1516</td>
<td>81</td>
</tr>
<tr>
<td>No. of students</td>
<td>1000 student</td>
<td>57.37</td>
<td>4,860</td>
</tr>
<tr>
<td>Percentage of females to the total number of students</td>
<td>%</td>
<td>47.7</td>
<td>47.4</td>
</tr>
<tr>
<td>No. of teachers</td>
<td>1000 teacher</td>
<td>1.64</td>
<td>0.072</td>
</tr>
<tr>
<td>Technical schools</td>
<td>school</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Private schools</td>
<td>school</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Azhar education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of institutes</td>
<td>institute</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>No. of classrooms</td>
<td>classroom</td>
<td>136</td>
<td>12</td>
</tr>
<tr>
<td>No. of students</td>
<td>1000 student</td>
<td>3.55</td>
<td>.720</td>
</tr>
<tr>
<td>Percentage of females to the total number of students</td>
<td>%</td>
<td>41.66</td>
<td></td>
</tr>
<tr>
<td>No. of teachers</td>
<td>1000 teachers</td>
<td>288.0</td>
<td>60</td>
</tr>
<tr>
<td>No. of students /teacher</td>
<td>Student/teacher</td>
<td>12.33</td>
<td>12.3</td>
</tr>
</tbody>
</table>

Source: description of the Egyptian governorates through information 2010 – IDSC
Village related information Source: The Information Center at El Badary (2013)
The Information Center at El Etmania provided detailed information about the educational services available at El Etmania and El Nawawra villages. They are represented in 14 primary, 7 preparatory, 2 secondary and 2 vocational schools. Moreover, there are 3 Azhar institutes, a primary school in each village and a one classroom school.
Class density in the project areas reaches about 50 students, while in El Badary district the students density is 37.5 Student/ class

Table 4-6: Educational services available at El Etmania and El Nawawra villages

<table>
<thead>
<tr>
<th>Education services</th>
<th>El Etmania</th>
<th>El Nawawra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiteracy classroom</td>
<td>There are 60 classrooms stopped for shortage in funds</td>
<td>5</td>
</tr>
<tr>
<td>Education Level</td>
<td>Village 1</td>
<td>Village 2</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Primary school</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Preparatory school</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Secondary school</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Technical school (commercial, industrial, agricultural)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Azhar institute</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

*Source: The Information Center at El Badary (2013)*

Education is one of the important indicators for the quality of life. The more the educational level increases the more well being indicator increases and vice versa. Due to the low level of education in Assuit Governorate in general, it occupied an advanced rank in evaluation of the status of poverty in Egypt. Assuit is ranked the second after Sohag in terms of poverty.

Studying the educational status of the inhabitants, the only data available are those provided by CAPMAS in 2006. The illiteracy rate in the project villages is about 44% at El Nawawra and 38.5% at El Etmania. The category who received basic education does not exceed 20%, however, those who received commercial or vocational intermediate education is 20% at El Nawawra and 3% at El Etmania villages. The percentage of those who finalized university education is 2.1% at El Nawara, and 3% at El Etmania villages.

![Bar chart showing educational status distribution in El Etmania and El Nawawra](chart.png)

*Figure 4-53: Distribution of population according to educational status and the area*

*Source: CAPMAS (2006 census)*

**4.13.3.4 Employment**

Agriculture is one of the most important working activities that the majority of the population in the project areas work in. It is followed by services and commercial activities. Because of the agricultural work nature, it is noticed that the rate of permanent labors reaches 77.5% at El Nawawra, whereas it does not exceed 58.5% at El Etmania. The irregular employment is about 14.8% at El Nawawra and 27% at El Etmania.
The unemployment rate in Assuit Governorate is about 8.3% according to Human Development Report 2010. It reaches 20.7% among females, and decreases in the rural areas to 6.1% only. The unemployment rate increases to 71% among intermediate education graduates and does not exceed 2% among basic education holders or less.

It is noticed that most of the population depend on working abroad but it is an irregular. This stresses the credibility of the data presented.

![Chart showing the distribution of population according to employment and area.](chart)

**Figure 4-54: Distribution of population according to employment and area**

Source: CAPMAS (2006 census)

### 4.13.4 Housing and living conditions

Describing housing is an important element to be met in the study because housing and walls are deeply affected by the project. Lack of sanitation services resulted in distressing the housing conditions in all the project’s areas.

Reviewing the data provided by CAPMAS, it is found that around 84% of the housing units at El Etmania village are under the “rural housing” pattern. The percentage of separate houses reached 12.7%. At El Nawawra village the percentage of rural housing reached 36.9% and the “house” pattern 34.8%. It is remarkable that El Nawawra village has housing buildings that represent 20% of the buildings there.

Regarding the study sample, the study team could not differentiate between the rural house and the separate house because quality of construction was very similar, red bricks was used in most buildings. That is why the results were 70% living in a separate house.
The number of rooms in each housing unit varied between 2 to 12 rooms with an average of 4. That is why the overcrowding rate is 0.05 person/room. Most of the study sample mentioned that there is a separate bathroom and kitchen. This was made certain during field visits. They also mentioned that the house was built from red bricks.
Mentioning the floors at the housing unit, it is clear that 41.2% have cement floors. There is a difference between the two villages as it is 75% at El Etmania and does not exceed 30.8% at El Nawawra. The percentage of the housing units that has sandy floors at El Nawawravillage is 23.1%, whereas the percentage of tiled floors increased to 46% and 25% for ceramic floors.

It is worth mentioning that the type of floors varied even at the same unit. The type of floors used in the first floors were either sandy or cement to avoid sanitation leaking.

Regarding aeration in the housing units, windows and balconies are noticed in all the villages. Most of the windows were opened which indicates a good aeration pattern for the houses. However, interior rooms, especially those close to the sewage cesspits, have poor aeration and mal sanitation odor. It is also noticed that most of the balconies and windows have jalousie which aerates and refresh the flats naturally.

As for water sources, the study sample mentioned that they have access to pure potable water from the Nile through the national grid. This was asserted by the secondary data as 99% have water connections in all project areas.

It should be noted that some water pumps were observed, and they are used only during water failures.
There were discrepancies among the study sample in their view of the water quality. At El Etmania village all the study sample mentioned that there is a change in the water’s taste, but it is 66.7% only at El Nawawra. There is a change also in the water’s odor as mentioned by most of the study sample at El Etmania, whereas it does not exceed 43% at El Nawawra village. Concerning the change in water color, it is 20% at El Nawawra and 23.8% at El Etmania. 50% of the study sample at El Etmania mentioned that the water is mixed with sanitation, however it does not exceed 16.7% at El Nawawra.

Table 4-7: Distribution of the study sample according to view of the water quality in each area

<table>
<thead>
<tr>
<th>People point view in water</th>
<th>El Nawawra</th>
<th>El Etmania</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in water taste</td>
<td>66.70%</td>
<td>100.00%</td>
<td>80.40%</td>
</tr>
<tr>
<td>Change in water odor</td>
<td>43.30%</td>
<td>90.50%</td>
<td>62.70%</td>
</tr>
<tr>
<td>Change in water color</td>
<td>20.00%</td>
<td>23.80%</td>
<td>21.60%</td>
</tr>
<tr>
<td>Water mixed with wastewater</td>
<td>16.70%</td>
<td>50.00%</td>
<td>28.60%</td>
</tr>
</tbody>
</table>

The question here is how to handle water when there is a change in taste, color and odor; 65% of the study sample at El Nawawra village stated that they use the water as it is, whereas 71.4% at El Etmania do not use it and 29% wait until it improves then they use it. 5% of the sample at El Nawawra said that they buy water. It is clear that these are not the only solutions they resort to as there are some water pumps at the ground surface. In many cases these pumps are used as an alternative by the people. Moreover, it was observed that some people drinks directly from the pumps which assures that it is used as an alternative in case of bad water quality.

Most of the sample store water in plastic containers or tins for bathroom usages. In this sense Assuit Governorate is similar to other governorates. Water is stored in the bathroom and is used by holding a plastic or a tin cup. For cooking and drinking usages water is stored in aluminum containers and plastic bottles. These containers are also used for washing and washing vegetables and meat. Harvest washing processes were observed in the public way in Hassan Abdel Rehim village.
It was noticed through field visits that most of the respondents use bathrooms for bathing and most of the bathrooms have doors that are locked from inside. This gives a sense of privacy for the users. Water is heater either on stoves or using electric or gas heaters. In few houses there are some kerosene stoves, and that some of the bathrooms’ roofs are not covered properly.

The people in different areas try to avoid using sewage cesspits and they dispose the water outside the house. They do the same with laundry wastewater. There were some observations of laundry washing in the streets using clean water, this will be presented in details in Chapter four: effluent used. 45% of the sample stated that they dispose dish washing water in and 37.3% dispose laundry wastewater there. There is a variation between different villages: as the percentage of those who dispose dish washing wastewater in the street reached 65% at El Etmania and does not exceed 26% at El Nawawra village.

Water disposal in front most of the houses was witnessed which indicates water disposal practices, especially in Summer. Disposing water in this way has a double benefit represented in getting rid of wastewater and lowering the costs of pumping the sewage cesspits.
4.13.5 Economic indicators and poverty

Reference to the Human Development Report 2010, Assuit Governorate is ranked the second in terms of poverty rates all over Egypt. Moreover, it is ranked in an advanced level among the five poorest governorates. The national income per capita is 8019.6 LE/year, whereas the expenditure rate is 2220 LE/year. The percentage of the poor compared to the total number of population reached 61%, 31.4% of which are in abject poverty.

First: Income and expenditure

Income index is the least credibility indicators, and its validity and reliability is very weak in the Egyptian society as the respondents do not care to mention their income accurately and most of them provide misleading information due to their fear against the researcher. Thus, we monitored the expenditure rate as it is mostly based on a more accurate base. The study team investigated the income also to measure the accuracy of the expenditure data.

The average of the working persons in the household reached 1.82 persons/household, in other words each household has one head or two at most. The monthly expenditure size of the study sample varied between 200 to 5000 LE with an average of 1761.54 LE/household and a predominant value of 1000 LE. This income is very close and corresponds to the expenditure size, as the average income is 1373 and the predominant value 1000 LE. When the study team asked about the inconsistency of the expenditure with the income value, it revealed unforeseen aids that the household receives.

The percentage of those who spend less than 1000 LE reached 19% of the sample. Quarter of the sample were among the category from 1000 to less than 1500 LE. 30% were among the category 1500 to less than
2000 LE. The income categories were in consistency with the expenditure ones. A huge discrepancy between the study villages was revealed.

Regarding providing material or cash aids to the household, most of the sample mentioned that they do not receive any aids from any authority or organization. However, as mentioned above they receive some material aids from their families.

Studying the change in income over the past year, it is noticed that 6.7% at El Nawawra stated that their income had decrease during the past year, whereas it was 25% at El Etmania. Nevertheless, 33% of the study sample said that their income increased because of the increase in agricultural crops prices and the dollar exchange rate as some of them works in exporting pomegranate.

Figure 4-58: Distribution of the study sample according to monthly income and expenditure categories

Regarding providing material or cash aids to the household, most of the sample mentioned that they do not receive any aids from any authority or organization. However, as mentioned above they receive some material aids from their families.

Studying the change in income over the past year, it is noticed that 6.7% at El Nawawra stated that their income had decrease during the past year, whereas it was 25% at El Etmania. Nevertheless, 33% of the study sample said that their income increased because of the increase in agricultural crops prices and the dollar exchange rate as some of them works in exporting pomegranate.
Second: Work of the head of the household

The Education and work of the head of the household is one of the most important indicators indicating poverty or wellbeing of the household. The working fields of the head of the household varied. The percentage of legislation men and managers reached 7.4% at El Nawawra, but this category totally disappeared at El Etmania in which clerk and admin work prevailed reaching 42.9%. The percentage of farmers was 25.9% at El Nawawra and does not exceed 14.3% at El Etmania.
4.13.6 Role of woman and man in the current sanitation system

Discussing the woman and child status with regard to the sanitation system, there is a great similarity to what was mentioned with Sohag and Menoufia governorates. Woman carry the larger burden, disregarding her age, she is responsible for disposing dish and laundry wastewater. She suffers the malodors of the sewage, especially that arising from the internal sewage cesspits. The researchers observed water disposal activities in the streets, they found that it is carried by women and girls aged 15 to 50 years.

Children suffer the current sanitation system, because they are exposed to the harms of insects resulting from sewage disposal areas. They also suffer from lack of sanitation, as there are water puddles in which they are often vulnerable to accidents of falling in. In addition they are also vulnerable to falling in canals and sewers where wastewater is disposed.

As for men they carry the responsibility of finding pumping trucks, especially when there is shortage in the trucks. In case they did not find, they do the pumping by themselves and dispose the waste in the streets or in nearby agricultural lands. During the pumping process they exert effort to facilitate it, accordingly they carry the pumping hoses and assist the worker, especially in narrow areas (streets of Naga Hassan Abdel Rehim).

4.13.7 Status of vulnerable groups

Vulnerable groups are identified as those groups that might be the highest affected by the project due to poverty and social exclusion. For example, they include, women heads of households, disabled, people living in poverty and abject poverty and currently marginalized youth are categorized among them.

The analysis of vulnerability that might occur due to the project implementation, it might be summarized as follow:

1. **Vulnerability due to deprivation of the project**: In general any poor person who cannot have access to the sanitation network due to defects inside the house or streets or lack of financial resources will be considered as vulnerable group as they will not benefit from the project.

2. **Vulnerability due to accidents**: Those poor marginalized groups that will suffer due to accidents are considered as vulnerable, particularly, in case of not being able to get proper treatment.
4.14 HEALTH CONDITION OF THE POPULATION

Profiling the health conditions in the project future area is one of the most important elements of the environmental impact assessment study. With regard to the sanitation projects, the study paid special attention to observing the health conditions of the population through identifying the prevailing diseases, the degree of health awareness and the type of sanitation and solid waste collection pattern used.

The study relied on primary data from the community in addition to other relevant data of the available health services in the areas that were provided by the information centers. The study observed the health conditions through the registers of some health units and school, but these registers were either not available or not include realistic registration for the health units and household medical services. Accordingly, these registers were excluded.

Reviewing the data provided by the information center, it is perceived that there are lots of health services distributed on the village level, though these services suffer shortage in labor force and medicines. The following table shows the pattern of the health services available in the marakz, as there are none on the village level.

Concerning Health services located in the two villages, they are as follow
1. In El Etmania village: a) 1 Health Center, 2 health units, 2 health offices and one family planning office. b) the private services are represented by only one private doctor and four pharmacies
2. In El Nawawra village: a) 2 health units, 1 health office and one family planning office. b) the private services are widely spread due to the absence of Governmental services

The two villages suffer due to the lack of:
1. A hospital near to the villages
2. Far distance to reach Assuit the Capital
3. The doctors working in the health unit are not enough
4. Lack of specialized doctors
5. Lack of medication

<table>
<thead>
<tr>
<th>Health features 2010</th>
<th>Type of service</th>
<th>El Badary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitals affiliated to the Ministry of Health</td>
<td>Hospital</td>
<td>0</td>
</tr>
<tr>
<td>Public and central hospital</td>
<td>Hospital</td>
<td>1</td>
</tr>
<tr>
<td>Specialized hospitals</td>
<td>Hospital</td>
<td>0</td>
</tr>
<tr>
<td>Educational hospitals</td>
<td>Hospital</td>
<td>0</td>
</tr>
<tr>
<td>Health Insurance Authority Hospitals</td>
<td>Hospital</td>
<td>0</td>
</tr>
<tr>
<td>University hospitals</td>
<td>Hospital</td>
<td>0</td>
</tr>
<tr>
<td>others</td>
<td>Hospital</td>
<td>0</td>
</tr>
<tr>
<td>Private sector hospitals</td>
<td>Hospital</td>
<td>1</td>
</tr>
<tr>
<td>No. of doctors</td>
<td>Doctor</td>
<td>102</td>
</tr>
</tbody>
</table>

Table 4-8: Distribution of the different health services in each area

Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project – Assiut - Final
<table>
<thead>
<tr>
<th>No. of dentists</th>
<th>dentist</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of pharmacist</td>
<td>pharmacist</td>
<td>26</td>
</tr>
<tr>
<td>No. of nurses</td>
<td>nurse</td>
<td>1087</td>
</tr>
</tbody>
</table>

4.14.1 Current sanitation pattern used

Because sanitation is the core of this study, the study team observed the current sanitation patterns and concluded that 60% of the sample have sewage cesspits that are pumped. Whereas, 40% have septic tanks. The community’s definition for a cesspit is that it has a solid bottom and it is pumped. The septic tank needs pumping after a long period.

The location of the cesspits varies, some are located inside the house near to the kitchen and the bathroom and some are located in the street. The situation is similar at schools and governmental units, as most of the cesspits are located in the street or inside the school. The Photo below shows some of the cesspits located inside a school and in the street.
Studying wastewater disposal pattern, most of the sample noted that the pumping truck of the Local Council and the trucks owned by the people do the pumping process. There are some other trucks of the NGOs. The sample also mentioned that it is very difficult to get the Local Council truck as you have to submit a request and pay for the service in advance. It takes one to two weeks to have the truck. Of course this is not the case with private owned trucks as you get it as soon as you call the driver.

There is a governmental pumping truck allocated for each village unit at least. This means that around 4000 housing units are served by one pumping truck. On the other hand, there are about 6 private owned trucks for each village or group of small villages. Private owned trucks are catastrophic for environment. It is prohibited in Assuit Governorate according to a decision by the former Governor. The trucks dispose their load in canals and sewers close to population areas.

Monitoring the labors working in sewage pumping, it is noticed that they do not use any protective clothes, accordingly they are in contact with sewage water one way or another. It is also remarkable that their hands have some suppurations. In this regard this are not different from the labors affiliated to the potable water and sanitation companies and NGOs.
The question now is about the disposal locations which might have negative health impacts on the community and raw fruits and vegetables consumers. The trucks are disposed anywhere: a canal, agricultural land, a drain or in the street. Hence, problems and fights arouse between the drivers and the inhabitants which results in community tension.

This sewage disposal pattern rings a bell for the negative health impacts resulting from eating uncooked fruits and vegetables watered by untreated wastewater. Many studies showed that there is a relation between the high percentage of diseases and irrigation using untreated wastewater. A place for dish and laundry washing by the canal was monitored, using public pumps and tap, it is disposed directly to the canal. For woman to have privacy, a wall is constructed so they can sit behind, as shown in the Photo below.

Regarding cesspits pumping at schools and governmental organization, the students said that the cesspits inside the schools are rarely pumped. Children are exposed to sewage water and cesspits overflow which deprive them from the playground.

Looking at the population point of view about the sanitation pattern used, it shows that the current sanitation system causes lots of problems for three quarter of the sample. 87% mentioned that they suffer from sanitation, their suffering represented in health problems, and exposing their children to dangers. 69.6% mentioned malodors arising from sanitation. Half of the sample pointed to ponds formed around the house and financial problems caused by pumping.

The local community tried to deal with the different problems they face with the current sanitation pattern through pumping the cesspits, pest control by spraying and submitting complains to officials (Local units, water and wastewater companies).
Table 4-9: Distribution of sample according to the problems faced with the current sanitation system

<table>
<thead>
<tr>
<th>Sanitation problems</th>
<th>sample</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazards</td>
<td>63</td>
<td>87.00%</td>
</tr>
<tr>
<td>Malodors</td>
<td>16</td>
<td>69.60%</td>
</tr>
<tr>
<td>Puddles around the house</td>
<td>11</td>
<td>47.80%</td>
</tr>
<tr>
<td>Cost of pumping</td>
<td>10</td>
<td>43.50%</td>
</tr>
<tr>
<td>Affects the house</td>
<td>2</td>
<td>8.70%</td>
</tr>
</tbody>
</table>

**A question with various answers**

It was important to monitor the authority that the community resorts to solve the problems faced with the current sanitation system. The answers of the sample corresponded with what the water company and the local unit stated. They agreed that the Local Unit is the place that people head to with their complain (45%). It is followed by natural leaders and parliament members (8.4%). It is worth mentioning that 37.5% do not know whom to contact to solve their problems. Therefore, it is required to have a clear machinery to raise the people’s awareness about the authority assigned to solve these problems. It should be noted that the potable water companies were not among the different bodies that people resort to.

Regarding the cost that the people pay, the sample pointed out that they pump the cesspits around 22 times annually at least. Each time they might need more than one load because the capacity of the pumping truck does not exceed 3m³ or even less.

In average pumping each time takes 2 to 3 loads. The cost/load is about 15 to 20 LE using the Local Unit trucks. Whereas the cost using the private trucks reached 25 to 30 LE. Making a simple calculation it is clear that each pumping time costs between 45 to 90 LE. As mentioned before private trucks are easily accessed and better performance. Most of the pumping trucks do not fill their whole tank however, they fill half their capacity to increase the number of loads and hence the cost can be doubled. The data collected did not reflect any variation according to the economical status, as high priority is given to tank evacuation regardless of the economical status.

The different responds of the people show that they are not much satisfied about the pumping process for some reasons:
1. Difficulty to have the governmental pumping truck in convenient time and cost, as the available private trucks costs highly.
2. The pumping process is not carried honestly as the worker fills half the tank capacity only to burden the beneficiary with more costs.

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3. There are problems that accompany the pumping process such as malodors, insects and fear about young children.
4. During pumping and loading water litters which pollutes the surrounding environment.

The pumping trucks cost 20 LE/load, by the end of the month we pay 200 LE…in addition to diseases and children infections caused by mosquitoes, malodors and overflow.

4.14.2 Toilet types
In any study it is important to know the toilet types used as it affects the people’s health. Toilets in different areas including houses, schools, mosques and governmental offices were monitored.

The sample of the quantitative study revealed that the prevailing toilets used are closed toilets with doors, mostly they have a window as a sort of aeration. As for the toilet unit used they are mostly pit latrines without flush (85.3%). Few percentage have toilet seats with flush. Hose is a common component in all toilets, it is used for washing up. Hose is one of the most important factors that cause diseases, especially because there is no soap in the toilet. In case of water failure, a cup is used as an alternative and water is taken from the containers in the toilets. The study sample mentioned that they do not share the toilet, this helped in decreasing the sanitation problems.

Field visits showed that the toilets are clean and covered with ceramics, but this is a false indicator. Some toilets were not clean and contaminated. The researchers pointed out that at El Etmania 28.6% of the toilets

![Figure 4-63: Distribution of the study according to the type of toilet used and the area](image-url)
have remnants of feces, and it does not exceed 11% at El Nawawra. Regarding odors, 40% of the toilets at El Nawawra have malodors and 32% at El Etmania.

In some luxury houses the toilet conditions were different, as toilet seats were dominant, in addition to soap and liquid soap too.

Governmental offices were similar to house toilets, however they are equipped with flush and urinals and they are in better condition. The main contamination causes: hoses and water containers are common in all areas.

Regarding disposal of pumping trucks’ load, canals have a high rank at El Etmania (60%), followed by a location allocated for the Council. At El Nawawra wastewater was disposed at the mountain area.
School toilets were on a very deteriorating level in terms of hygiene and privacy, as the number of users increases in some schools to more than 1000 students. The female students said that the sanitation at schools is equal to severe pollution. Discussions with little girls revealed that sewage at school is pumped rarely, the parents interfered to pump the cesspits and this carry its cost.

The mosques’ toilets varied in status, some were old and others were new, yet it was generally clean. Most of the toilets were pit latrines with flush and had a hose, some water containers. One of the mosques at Nagaa Hassan Abdel Rehim had water pump. There was no soap in all the visited mosques, which indicates the pollution level there.

Field researches pointed out that 38.8% of the sample have a place to wash their hands in next to the toilets, with variations between the two villages. 22.5% do not have a this place. 95% of the first group used either ordinary soap or liquid soap. 6.5% do not have soap. This issue should be included in an awareness program targeting local communities.

Table 4-10: Distribution og the sample according to having a place for hand wash.

<table>
<thead>
<tr>
<th>Place used for hand wash</th>
<th>area</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>El Nawawra</td>
<td></td>
</tr>
<tr>
<td>In the toilet or a place next to it</td>
<td>37.70%</td>
<td>38.80%</td>
</tr>
<tr>
<td>Far from the toilet</td>
<td>32.10%</td>
<td>33.80%</td>
</tr>
<tr>
<td>Couldn’t identify or no toilet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couldn’t observe the hands washing place</td>
<td>1.90%</td>
<td>3.80%</td>
</tr>
<tr>
<td>No place for hands washing</td>
<td>28.30%</td>
<td>22.50%</td>
</tr>
</tbody>
</table>

| Availability of soap bar/ liquid soap    |                 |        |
| soap                                    | 97.40%          | 90.30% |
| Liquid soap                             | 8.70%           | 3.20%  |
| No soap                                 | 2.60%           | 6.50%  |
4.14.3 Sources of pollution

Looking at the sources of pollution in the project areas, it is find that it is limited to garbage and contamination of canals and sewers. Garbage will be dealt with thoroughly in the second part. Contamination of sewers and canals is the most obvious, as there are some areas that are highly contaminated while it is used in agriculture, in addition to the spread of insects, reptiles (snakes and mice) in some areas.

It is worth mentioning that some youth were monitored sorting wastes inside one of the canals in Assuit. They go into the canal, sort the disposed wastes and scavenge for plastic and tin materials.

No air pollution is monitored except for random burning processes of agricultural wastes. The number of workshops and factories is not high to result in air pollution.

![Photo 22: scavenging for waste in the canal](image1)
![Photo 22: contaminated wastewater in El Nawawra Canal](image2)

Most of the interviewees mentioned that sanitation is the main cause of pollution due to children playing in the streets where urination, defecation and wastewater disposal take place. Children get infected with gastroenteritis and diarrhea. Some urination and defecation processes in canals were observed which causes bilharzias.

The tractor used for transferring the load of the pumping trucks is one of the most polluting factors and is considered a main cause for diseases. Not only does it cause pollution for the areas that it passes by, but also to the workers dealing with it as it not subject to any form of censorship.

4.14.4 Solid wastes

Solid wastes is the most dangerous problems, it distorts the sights and contains reptiles, snakes and pests that have a negative impact on environment. The study team did not observe the spread of wastes around the houses, however there were huge accumulations in canals and sewers.
Researchers mentioned that 39% of the interviewees’ houses have small amounts of wastes spreading around it. 17.1% of the houses have a large amount, whereas, 4.9% of the houses have no waste around. Cattle dung was observed around 35% of the sample houses at El Etmania village, but it did not exceed 1% at El Nawawra.

4.14.5 Behaviors related to hygiene
Regarding the behaviors related to hygiene, it includes:
- Urination and defecation in the streets
- Washing foods
- Toilets using practices
- Washing hands before and after eating
Because it is very difficult to know the health practices through filling the questionnaire form, it was based on observation and asking some questions included in the different research tools.

No traces of urination or defecation were observed in main streets, but it was observed near canals and sewers, especially in areas far from mosques in which toilets were used.

It was observed that women wash vegetables in aluminum and plastic containers and wastewater was disposed in the street. Inside the house foods were washed in the kitchen sink or using a tap located next to the pit latrine unit.

As for bathroom usage behaviors it varied among males, females, adults and children. Females adhered more to using proper behaviors including washing up and washing their hands after using the toilet. At school they avoided using the toilets.

Adults cared about using the toilet appropriately, but mostly they did not wash their hands after using the bathroom. In most cases they washed their hands using the hose inside the bathroom. It was difficult to monitor this through their responds.

Regarding washing their hands before and after eating, most of the sample gave model answers. However, it was difficult to verify this information among different houses.

### 4.14.6 Cattle and poultry breeding

Cattle are main cause of infections such as avian and swine flu. 82.4% of the sample mentioned that they breed poultry and 1/3 breed sheep. 17.6% at El Nawara have riding animals. 58.8% breed cattle at El Etmania.

<table>
<thead>
<tr>
<th>Type of animal</th>
<th>El Nawawra</th>
<th>El Etmania &amp; Nagaa El Shikh</th>
<th>El Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep &amp; goats</td>
<td>38.50%</td>
<td>25.00%</td>
<td>35.30%</td>
</tr>
<tr>
<td>Poultry</td>
<td>84.60%</td>
<td>75.00%</td>
<td>82.40%</td>
</tr>
<tr>
<td>Riding animals</td>
<td>23.10%</td>
<td></td>
<td>17.60%</td>
</tr>
<tr>
<td>Livestock</td>
<td>53.80%</td>
<td>75.00%</td>
<td>58.80%</td>
</tr>
</tbody>
</table>

Hygiene wise the study was concerned with the places where livestock was kept. 64.7% of the sample mentioned that they had a barn, (75%) at El Etmania, and 61.5% at El Nawawra.

87.5% of the sample at El Nawawra village said that they have a barn outside the house, whereas this percentage decrease at El Etmania (33.3%). Those who have a barn inside the house represented 66.7% at El Etmania and did not exceed 12.5% at El Nawawra.

### 4.14.7 Common diseases (hygiene practices)
Common diseases in project areas were discussed with the community, health departments and representative of EEAA. Based on the sample surveyed views, most of the common diseases were caused by lack of a safe sanitation. The health departments’ officials mentioned that flu, diarrhea and typhoid fever are the most spreading diseases due to shortage in sanitation.

The people were aware that there is pollution caused by lack of sanitation. However, this awareness was not translated into hygiene practices. Though most of the sample are aware of the main cause of the problem, yet they did not guide their children to follow proper practices or encourage them to wash their hands. 37% of the sample said that they are aware of the diseases caused by lack of sanitation. This percentage varied between the two villages as it was 20% at El Nawawra and 58.3% at El Etmania. The following Table shows that a large percentage of the sample (60.6%) are aware of the diseases caused by water contamination.

Table 4-12: Distribution of the sample according to their awareness of the diseases caused by lack of sanitation

<table>
<thead>
<tr>
<th>Diseases awareness</th>
<th>El Nawawra</th>
<th>El Etmania &amp; Naga El Sheih</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diseases caused by lack of sanitation</td>
<td>20.00%</td>
<td>58.30%</td>
<td>37.00%</td>
</tr>
<tr>
<td>Diseases caused by lack of running water</td>
<td>26.70%</td>
<td>8.30%</td>
<td>18.50%</td>
</tr>
<tr>
<td>Disease caused by contaminated water</td>
<td>66.70%</td>
<td>55.60%</td>
<td>60.60%</td>
</tr>
<tr>
<td>Diseases caused by spread of wastes</td>
<td>31.30%</td>
<td>36.80%</td>
<td>34.30%</td>
</tr>
</tbody>
</table>

The study results revealed that around 23.1% believe that worms are caused by lack of sanitation, followed by bilharzias, kidney failure, dermatological diseases and diarrhea.
relatives and neighbors have a greater effect compared to media and doctors. This can be seen in the individual practices to cure diseases or to avoid being infected. Doctors and environmental departments confirmed the importance of following a proper approach to raise the community awareness. It is also important to pass clear health messages through potable water and sanitation companies in cooperation of health units and NGOs.

The study sample pointed out that dermatological or skin diseases are the most common due to shortage in running water. This is followed by kidney failure, bilharzias and stones. Regarding the diseases caused by solid waste, 66.7% of the sample mentioned chest diseases followed by digestive system and intestinal diseases and skin diseases.

Table 4-13: Distribution of sample according to their awareness of water contamination related diseases (with shortage in running water and waste)

<table>
<thead>
<tr>
<th>Diseases caused by lack of running water</th>
<th>%</th>
<th>Diseases caused by water contamination</th>
<th>%</th>
<th>Diseases caused by wastes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin diseases</td>
<td>60.00%</td>
<td>Kidney failure</td>
<td>45.50%</td>
<td>Chest diseases/ chest allergy (asthma)</td>
<td>66.70%</td>
</tr>
<tr>
<td>Kidney failure</td>
<td>20.00%</td>
<td>salts</td>
<td>36.40%</td>
<td>Digestive system/ intestinal diseases</td>
<td>16.70%</td>
</tr>
<tr>
<td>Bilharzias</td>
<td>20.00%</td>
<td>Liver diseases</td>
<td>18.20%</td>
<td>Skin diseases</td>
<td>16.70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bilharzias</td>
<td>18.20%</td>
<td>Opthmologic disease (irritation/ weak eyesight)</td>
<td>8.30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stones</td>
<td>9.10%</td>
<td>Microbe/ virus</td>
<td>8.30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diarrhea</td>
<td>4.50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>poisoning</td>
<td>4.50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microbes/ virus</td>
<td>4.50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Multiple responses

Moving to actual practices with infected people, the sample were asked if at least one family member got infected by a disease during the previous month. Follows here a briefing about infection with different diseases among the study sample:

**Diarrhea:** the percentage of those who has one infected person at least reached 39%. These percentage varies between the two village 27.0% in Nawawra and 59.1% in El Etmania and the infection among males and females. It reached 44.4% among males at El Nawawra village and 54.5% at El Etmania. The population at El Nawawra checked either the doctor or the public hospital, whereas at El Etmania they depend on the health units. Contaminated water and microbes were the main causes of diarrhea infection.

Table 4-13: diarrhea infection among household's members

<table>
<thead>
<tr>
<th>Diarrhea infection among household members</th>
<th>area</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nawawra</td>
<td>4.50%</td>
</tr>
<tr>
<td></td>
<td>Etmania</td>
<td>4.50%</td>
</tr>
<tr>
<td></td>
<td>and</td>
<td>4.50%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4.50%</td>
</tr>
</tbody>
</table>
Intestinal worm infection: Quarter the sample suffered intestinal worm infection, it is mostly caused by improper personal hygiene, not washing the hands before and after eating and after using the bathroom. The total infected persons in El Emania reached 28.0% while it was only 20.0% in El Nawawra. The percentage of male infection was 55%, whereas it did not exceed 45.5% among females. Two third of the sample checked a private doctor and one third visited the public hospital and the health unit. The main causes of worm infection as mentioned by the sample was contamination especial from the canals.

Table 4-15: intestinal worm infection among household members

<table>
<thead>
<tr>
<th>Worm infection among household members</th>
<th>El Nawawra</th>
<th>El Etmania&amp;Nagaa ElSheih</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of infection</td>
<td>20.00%</td>
<td>28.00%</td>
<td>23.10%</td>
</tr>
<tr>
<td>Gender of infected person</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>71.40%</td>
<td>25.00%</td>
<td>54.50%</td>
</tr>
<tr>
<td>female</td>
<td>28.60%</td>
<td>75.00%</td>
<td>45.50%</td>
</tr>
<tr>
<td>Place checked for treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health unit</td>
<td>20.00%</td>
<td>7.70%</td>
<td>4.80%</td>
</tr>
<tr>
<td>Public hospital</td>
<td>25.00%</td>
<td>40.00%</td>
<td>30.80%</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Private clinic</td>
<td>75.00%</td>
<td>40.00%</td>
<td>61.50%</td>
</tr>
</tbody>
</table>

Other diseases: small percentage mentioned that they suffered bilharzias, kidney failure and scabies. This percentage varied between one to five households, they checked the health units and private clinics.
CHAPTER 5 ENVIRONMENTAL IMPACT ASSESSMENT

5.1 INTRODUCTION

The current chapter includes the assessment of the environmental impacts of the different components of the ISSIP II project in Assiut governorate during the construction, operation and decommissioning phases. The project’s components covered in the EIA assessment include:

1. House connections and gravity sewers;
2. PSs including all sub-components;
3. FM; and
4. Central WWTP including all sub-components (i.e. timber forest).

It is worth noting that after site revisits and reassessment of potential impacts, the consultant has concluded that there will be no further, unforeseen adverse impacts resulting from the shift of the site location.

The construction and operation of some/all of the components of the project listed above will also create additional activities/processes such as:

1. Solid hazardous and non-hazardous waste generation.
2. Liquid waste generation
3. Development of on-site workers/staff workshops, offices and housing units

The consultant has assessed the impacts due to the construction, operation and decommissioning of the main four components listed above , in addition to those resulting from the aforementioned additional three activities/processes.

The key receptors which the consultant has considered include 1) air (air quality and ambient noise); 2) Soil (soil quality, erosion, landscape); 3) water (water quality and resource consumption); 4) Biological environment (Flora and Fauna); 5) Human environment (Occupational health & safety, Community safety, Visual impacts, Cultural heritage and Archaeology impacts, traffic impacts and the Socio-economic and Health impacts).

The environmental impact assessment methodology that the consultant has adopted is presented in details in Chapter 1. This encompasses of a semi-quantitative assessment that considers the following:

- Probability of the impacts
- Spatial and temporal scale
- Intensity of the impacts (which encompasses the sensitivity of receptors, pathway of influence and the reversibility nature of the impact)
5.2 ENVIRONMENTAL IMPACTS DURING CONSTRUCTION AND DECOMMISSIONING PHASES

5.2.1 Noise Impacts

Overview of construction activities related to noise generation

As described in Chapter 3, the construction/installation of the different components of the project (WWTP, FMs, PSs, gravity sewers and house connections) will include the activities listed below:

- Preparation and leveling of the land.
- Excavation works to the required depth for the trenches needed to install the gravity sewers and FMs and also for some of the components of the central WWTP and PSs such as the sumps and reactors. It should be noted that most of the upper soil layer of the selected roads are composed of compacted silt-clay or sand and that the gravity sewers are a shallow system and will be installed in the middle of the roads.
- Trench preparation following excavation including leveling, constructing the pipe foundation, and welding/connecting the pipes.
- Installation of manholes and catch basins for rainwater collection.
- Construction of Reinforced concrete elements and other civil works.
- Installation of cranes, steel bridges, pumps and other electrical equipment.

5.2.1.2 Point sources of noise emissions

Various mechanical/electrical equipment, will be needed during the construction activities described in the previous section. These include bulldozers, trucks, pavers, and other equipment. The operation of this equipment is the main potential source of noise emissions during the construction and decommissioning phases.

The vulnerable groups who are susceptible to the construction noise are the following:
- Onsite Workers; who are the most exposed to the highest noise levels generated from different construction activities due to their proximity to the noise sources.
- Neighboring communities and other sensitive receptors (such as students at schools and other educational institutes, patients at hospitals, etc.).

There are no sensitive receptors close to Nawawra’s WWTP (closest residential cluster is located more than 2000m west of the plant site), nor close to the two PSs in El Nawawra and El Etmania respectively. Reference should be made to Figures 3.2 to 3.4
5.2.1.4 Noise Impact Significance

Construction of the WWTP

The noise emitted during the construction of the WWTP will decrease from 95 dB at source down to 50dB at around 50 m away from source. The source is a moving point, the location of which depends on where the main construction activities are taking place. It was clear that no residential units or other receptors are located around El Nawawra’s WWTP. The potential generated noise will mainly affect the workers on site. The impact should be therefore considered of Minor significance. It should be fully controlled by applying proper health and safety procedures as detailed in Section 5.2.6.

Construction of the PSs

It was clear from the site visits that no residential units or other receptors are located around both Al Nawawra’s and Al Etmania’s PS's proposed sites. The potential generated noise will mainly affect the workers on site. The impact should be therefore considered of Minor significance. Similar to the noise impacts related to the construction of the WWTP, this impact should be fully controlled by applying proper health and safety procedures as detailed in Section 5.2.6.

Construction of gravity sewers and FMs

It is expected that the noise generated during the construction of gravity sewers would exceed the allowable 50dB because the construction activities are actually being performed in the middle of the roads opposing the houses (around 10m distance). However, the construction activities for the gravity sewers are expected to last for a short period of time in front of each house and/or school. This impact should be considered of Moderate significance due to the potential high noise levels.

The activities involved in the installation of the FMs are similar to those of the gravity sewers and should also be considered of Moderate significance.

The Table below shows the results of the evaluation of the construction noise impacts of the main project’s components (WWTP, PS, Gravity sewers and FMs)

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C)</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Impacts due to the construction of</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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5.2.1.5 Mitigation and monitoring measures

Mitigation measures

On site Construction noise shall be mitigated to ensure a safe work environment by implementing an on-site occupational health and safety plan, which considers national and international requirements.

The plan shall include the following measures:

- Ear muffs/protective hearing equipment shall be made available to all workers in noise critical areas
- Training on how and when to use protective hearing equipment shall be conducted as part of the workers’ induction sessions.
- Place visually clear instructions in areas where noise emissions are significant.

Other mitigation measures to reduce the noise impacts off-site - at the nearest sensitive receptors – include the following:

- Optimize the use of noisy construction equipment and turn off any equipment if not in use.
- Regular maintenance of all equipment and vehicles
- Stop all construction activities during the night
- Communicate the construction schedule with neighboring communities and sensitive receptors
- Implement a complaints handling system

Monitoring measures

- Measuring the ambient noise level in noise critical areas (on site), using a portable noise meter
- Investigate noise complaints from workers and neighboring communities in the affected locations.

5.2.2 Air Quality Impacts

5.2.2.1 Overview

Besides the noise generated during the construction of the different components of the project as described in Section 5.2.1. Air quality at both the construction site and at the nearest receptors could be affected due to the following:

- dust emissions
- Exhaust of power generators and vehicles transferring the raw materials and/or those disposing the excavated soil and construction waste.
- Exhaust of construction equipment

The following air pollutants are foreseeable for most of the construction activities:

- Fugitive dust emissions (PM$_{10}$, PM$_{2.5}$)
- NOx and SOx
- CO in case of old motors
5.2.2.2 Air Quality Impact Significance

**During the construction of gravity sewers and FMs**, dust emissions will negatively impact ambient air quality. This is particularly significant during the excavation activities required for installing the gravity sewers and FMs. These activities will be in close proximity to the houses as indicated before (around 10m away). The impact will be therefore disturbing, however, it is of a temporary nature—digging activities are expected to last from one to two days in front of each house. The problem of dust emissions might arise from the storage of spoil until being lifted and transferred to the designated disposal sites.

Exhaust of trucks or equipment will have negligible or very low impact, since using those trucks and equipment will be intermittent and expected to be only during the day.

The air quality impacts due to the construction of gravity sewers and FMs should be considered of Minor significance

**During the construction of the central WWTP and PSs**, excavation activities will be mainly limited to the site, which will have a lower impact as compared to the excavation required during the construction of gravity sewers and FMs.

The construction of the WWTP will last around 16 months. During this period, trucks bringing raw materials and those transferring spoil and construction waste will be moving to and out of the site on a regular basis, thus affecting the receptors exposed to the roads leading to the WWTP site. However, this impact will be of temporary and intermittent nature.

The air quality impacts due to the construction of the WWTP and PSs should be also considered of Minor significance

The Table below shows the evaluation of the air quality impacts.

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality Impacts due to the construction of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravity sewers and FM</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>WWTP and PSs</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

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5.2.2.3 Mitigation and monitoring measures

**Mitigation measures**

Implement a construction site management plan including the following measures:
- Store construction materials in pre-identified storage areas.
- Cover friable materials during storage.
- Wet the network of unpaved roads on site. The use of water should be restricted to extremely active areas.
- Regulation of speed to a suitable speed (20 kmh) for all vehicles entering the village’s boundaries.
- Implement preventive maintenance program for vehicles and equipment working on site and promptly repair vehicles with visible exhaust fume.

**Monitoring Measures**
- Investigate dust complaints from workers and residents of affected villages
- Measure HC, CO and opacity for construction machinery using a gas analyzer
- Visual inspection of vehicles and equipment operating along the gravity sewer and FM route or entering the site of the WWTP and PS

5.2.3 Soil and groundwater Impacts

**Overview**

Typical construction activities may result in soil and groundwater contamination due to the following:
- Uncontrolled disposal of hazardous liquids such as spent oils, paints, or any other chemicals/additives used in concrete making and finishing works.
- Leaching of solid wastes which are randomly disposed of.

Poor irrigation management of the timber forest Potential impacts on soil other than contamination include:
- Soil erosion
- Soil compaction due to heavy machinery use
- Loss of resources if the excavated soil is not segregated and reused as an alternative to transport and use of additional materials from outside the site.

5.2.3.2 Soil and groundwater Impact significance

**During the construction of gravity sewers and FMs**
The top soil layers will be excavated. Groundwater might be encountered but the probability is very low because the depth to groundwater is around 20m. Normally the excavated soil will be filled back in the trench thus minimizing the level of disturbance and/or the loss of some soil amounts as waste. The quality of the soil and groundwater will also be affected considering the large spatial context of the gravity sewers and FMs network, if special controls related to waste management were not taken into accounts. In general, the soil and groundwater impacts during the construction of the gravity sewers and FMs should be considered of minor significance and will be controlled by applying the mitigation measures related to waste management and by maximizing the reuse of the excavated soil.

**During the construction of the WWTPs and PSs**

Similar to the construction of the gravity sewers and FMs but only limited to the PS and WWTP sites, the impacts related to the soil and groundwater quality and loss of resources will take place during the excavation works needed for the construction of some components of the PSs and WWTP. Impacts associated with the preparation of the timber forest include flooding due to poor irrigation management practices which may attract insects, flies and mosquitoes and cause soil salinization, as well as the accumulation of potentially toxic elements and nutrients. However, this is unlikely to occur given that the allocated land (400 acres) for the timber forest is large enough to sustain large amounts of irrigation water, giving the WWTP’s management enough time to shut down and regulate the flow of irrigation water. Other impacts may include the improper handling, storage and disposal of non-hazardous waste generated as a result of domestic waste by site workers. In general, the soil impacts during the construction of the timber forest should be considered of minor significance and will be controlled by applying the mitigation measures related to irrigation.

Impacts to groundwater associated with the preparation of the timber forest include flooding due to poor irrigation management practices, which may cause soil salinization, as well as the accumulation of potentially toxic elements and nutrients. Excess leaching of potassium and sodium may occur in the event that treated wastewater does not meet Egyptian standards, thereby leading to groundwater contamination. However, this is unlikely to occur given that 1) groundwater in the area is expected be at depths greater than 15 m; 2) soil is characterized as being silty clay, thus having low permeability; and 3) the allocated land (400 acres) for the timber forest is large enough to sustain large amounts of irrigation water, giving the WWTP’s management enough time to shut down and regulate the flow of irrigation water. Further

In general, the groundwater impacts during the construction of the timber forest should be considered of minor significance and will be controlled by applying the mitigation measures related to irrigation.

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Impact</th>
<th>Probability of</th>
<th>Temporal Scale</th>
<th>Spatial Scale</th>
<th>Intensity</th>
<th>( P^<em>(A)^</em>(B)^*(C) ) Overall Score</th>
</tr>
</thead>
</table>

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Table 5.2.3 Soil and Groundwater Impacts due to the Construction of Gravity Sewers and FM and WWTP and PS

<table>
<thead>
<tr>
<th>Occurrence (P)</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil and groundwater Impacts due to the construction of Gravity sewers and FM</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>WWTP and PS</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### 5.2.3.3 Mitigation and Monitoring Measures

**Mitigation Measures**
- Design and construct an impermeable protective base layer underlying areas with potential hazardous liquids storage or use
- Implement a site **construction management plan** including segregation and reuse options of excavated soil.
- Use appropriate procedures for handling chemicals and petroleum products during facility operation. This includes proper storage, use, and cleanup of these materials.
- Adjust the proper quantities of water applied in the timber forest, clean drainage canals and consider planting flood tolerant species
- Apply contour plowing, conservation tillage and other soil erosion prevention techniques
- Ensure waste management plans are developed for the site, including important elements such as waste segregation practices and proper disposal
- Rip or scarify and level compacted soil

**Monitoring Measures**
- Document the amount of soil disposed of, and the amount of soil brought to the site.
- Document foul odors in timber forest and increased number of insects, mosquitoes and flies
- Collect groundwater samples from existing groundwater wells for reassurance to ensure wastewater from timber forest has not caused groundwater contamination
- Analyze wastewater effluent to ensure it is compliant with Egyptian Code 501/2005 for reuse of treated wastewater in agriculture.
- Keep records of waste accumulation

### 5.2.4 Water Quality Impacts

#### 5.2.4.1 Impact Significance
**During the construction of gravity sewers and FMs**

The planned routing for the gravity sewers and FMs will involve several crossings under some canals and drains such as Nawawra sharkeya canal and Wadi el Sheih. The sewage line will also pass parallel to Nawawra Sharkeya canal. Dumping any of the excavated soil and/or construction wastes in the water stream will have a negative impact on the flow as well as the quality of the water. The Water Quality impacts during the construction of the gravity sewers and FMs should be considered of Moderate significance and will be controlled by applying the mitigation measures related to waste management.

**During the construction of the WWTPs and PSs**

No impacts are foreseen during the construction of the WWTP and PSs. The water Quality impact during the construction of the WWTP and PSs should therefore be considered of Minor significance.

No impacts are foreseen during the construction of the timber forest given the absence of surface water bodies in proximity to the site (at least 1 km radius).

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>( P^<em>(A)</em>(B)^*(C) ) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil and groundwater Impacts due to the construction of Gravity sewers and FM</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>WWTP and PSs</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

### 5.2.5 Flora and Fauna Impacts

#### 5.2.5.1 Overview

The Consultant has conducted baseline surveys in order to assess the presence and distribution of ecologically sensitive species and habitats along the proposed project’s sites. Consequently, it was concluded that no endangered faunal or floral species have been recorded at the project’s areas. All recorded species are under the “Least Concern” category.

#### 5.2.5.2 Flora and Fauna Impact significance
**Fauna related impacts**

Although some faunal species of mammals, birds, reptiles and insects exist at the project’s area, faunal impacts are not likely to be significant given the small scale of the development relative to the extent of similar intact habitats in the area. The evaluation of the impacts on fauna is illustrated in the Table below, and should be considered negative with Minor significance yet this impact can be reduced/eliminated if appropriate mitigation measures are implemented.

**Flora related Impacts**

The flora existing in the proposed sites for the WWTP and PS, as mentioned above, do not belong to the endangered species category. So the impact of the project’s construction on the floral species should be considered on Minor significance.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flora and Fauna impacts</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

5.2.5.3 Mitigation and monitoring measures

*No specific mitigation and monitoring measures are needed, they are included under other impacts*

5.2.6 Occupational health and safety impacts

5.2.6.1 Overview

Construction sites are considered the most potentially hazardous and accident-prone parts of any working environment. Excessive exposure to these construction site hazards exposes workers to injury and possible death. To prevent this, contractors should be aware of all possible dangers that can be encountered during normal business operations. According to the safety and health standards every employee shall have sound knowledge of their susceptibility to harm or injury in the workplace.

5.2.6.2 Occupational health and safety impact significance
Listed below are the main six construction site hazards identified by the Occupational Safety and Health Administration (OSHA), all of which will be encountered during the construction of the different components of the ISSIP II project.

1- **Excavation and Trenching** – OSHA has recognized excavation and trenching as the most hazardous construction site operation.

2- **Falls** – Falling from scaffolding over six feet or a fixed ladder over twenty feet is the most dangerous and common construction site hazard. The usual cause of this incident is slipping, tripping and using unstable ladders. There are many reasons for fall hazards and to eliminate such risks, employers must have a fall protection program as part of any overall workplace safety and health program.

3- **Stairways and Ladder** – According to OSHA’s construction safety and health standards, stairways and ladders are important sources of injuries and fatalities among construction workers.

4- **Scaffolding** – The most potential risk of scaffolding is due to moving scaffold components; scaffold failure related to damage to its components; loss of the load; being struck by suspended materials; electrical shock; and improper set-up. Construction workers who assemble and dismantle scaffolding and work platforms at construction sites face the risk of serious injuries due to falls.

5- **Use of Heavy Construction Equipment** – The main causes of such accidents include: ground workers struck when a vehicle is backing up or changing direction; equipment rollovers that injure the operator; mechanics run over when brakes are not properly set; and ground workers crushed by falling equipment from backhoes, buckets, and other moving construction vehicles.

6- **Electrical Hazards** - Electricity is one of the greatest hazards to workers on site. Power line workers, electricians and electrical engineers work continuously work with electricity can face exposure to this hazard on a daily basis.

Due to the high probability of occurrence and the high risk involved, the occupational safety and health impacts during the construction of the WWTP should be considered of MAJOR significance and it should be considered of Moderate significance during the construction of PSs, gravity sewers and FMs due to the relatively lower risks involved. The impacts will be controlled to a large extent by applying the mitigation measures listed below.

5.2.6.3 Mitigation and monitoring measures

**Mitigation measures**

The Contractor shall adopt an Occupational Health and safety plan during the construction phase. According to OSHA standards the main mitigations measures to prevent common construction hazards are:

- Workers must follow safety standards and use protective equipment to minimize hazards while trenching and excavating

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• Workers should be trained to identify and evaluate fall hazards and be fully aware of how to control exposure to such risks as well as know how to use fall protection equipment properly.
• Workers must comply with OSHA’s general rule for the safe use of ladders and stairways
• The scaffolding hazard shall be addressed as stated by OSHA standards. They give specific requirements for the maximum load, when to use scaffolding, bracing systems and the use of guardrails.
• To prevent Heavy Construction Equipment risk, workers should follow all construction safety guidelines necessary to eliminate the exposure to such injuries and accidents
• The best way to prevent the Electrical hazard is for the workers to be at a safe working distance away from the power lines. Other precautionary measures include guarding and insulating of the vehicle from which they might work. This would help prevent electrical hazards from injuring them while working.

The Occupational Health and safety plan shall also include the Egyptian Labor law No. 12 for 2003 and the international construction standards requirements, including, but not limited to, the following measures:

- Identification of hazard sources to workers
- Eliminating the sources of hazards
- Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to how to use the Personal Protective Equipment (PPE).
- Inspection and testing of all equipment and machines
- Appointing an Accident Prevention Officer at the site, to take protective measures to prevent accidents
- Designation of restricted areas, such as construction sites
- Preparation of an emergency response plan
- Provision of necessary rescue equipment
- Elaboration and management of a safety guarantee plan
- Provision of appropriate and sufficient first aid equipment

**Monitoring measures**

- Regular reporting of any accidents, as well as records and reports on health, safety and welfare of workers
- Continuous monitoring of all hazardous events.
- Regular inspection of workers against pathogenic agents and provision of immunization when needed

**5.2.7 Community Safety**
5.2.7.1 Potential impacts

- **Excavation and Trenching** – this is recognized as the most hazardous operation during the construction phase for the surrounding community, because most of the excavation will be performed in narrow streets which increase the probability of members of community falling into the trenches. The slurry/mud waste generated from the excavation would slip the passengers, the solid wastes generated would trip them. All these events increase the probability of falling and increase the danger of excavations operations. The risks of excavation and trenching operation increase when they occur;
  - Besides the railway line and or
  - On both sides of a covered canal.

Excavation and trenching could also affect the structural integrity of the village’s houses, since many are old and weak,

- **Electrical shock**- Electricity is one of the greatest hazards to people passing by the construction site. Power cords will be used which may cause electrical shock if not well maintained and/or they were left hang out freely.

**Mitigation measures**

- To prevent Excavation and Trenching accidents and injuries, both the contractors and workers must follow safety standards and use protective equipment to minimize hazards while trenching and excavating. The sides of the trenches should be strengthened by wood or aluminum reinforcement sheets installed on both sides of the excavated trench, in critical areas (adjacent to existing houses and near canals and drains).
- Using fences and warning signs during the construction phase
- Using protective barriers and safe walkways
- Appointing of an officer on site, to take protective measures to prevent accidents and/or to respond to accidents.
- Provision of appropriate and sufficient of first aid equipment on site

5.2.8 Visual impacts

5.2.8.1 Visual Impact Significance

**During the construction of gravity sewers and FM**

Only temporary visual impacts will be caused during the construction of the gravity sewers and force mains, resulting mainly form the over ground storage of excavated spoil and raw materials (i.e. pipes, pipe connections, cement sacks, concrete mixers, construction wastes, etc.). However, due to the short period of exposure and reversibility nature of this impact, it should be considered of Minor significance.

**During the construction of the central WWTP and PSs**
During the construction of the central WWTP and PSs, the project would gradually change the aesthetics and landscape of the areas where the PSs and WWTP will be constructed. However, with regards to the WWTP it is located in a desert area so no visual impacts are foreseen. With regards to the PSs, The visual impact is low as the expected height of the different components of the PS is comparable with adjacent buildings. The visual impacts due to the construction of the WWTP and PSs should be considered of Minor significance. No mitigation measures are foreseen, expect constructing a temporary fence around the site until the construction of the concrete fence has been achieved.

5.2.9 Traffic Impacts and Difficulty of Access

5.2.9.1 Impact Overview and significance

During the construction of gravity sewers and FMns

The main impact on roads traffic will be during the installation of FMns/gravity sewers along, or crossing main and secondary roads. Longitudinal excavation will cause narrowing of the excavated road for relatively long period, while the lateral crossing of roads may cause blocking of the road, but for relatively short period, possibly few hours. The significance of the impact will be relatively higher with regards to main roads as compared with secondary ones. However, although the traffic density is relatively low, mainly used for pedestrian and field animals, the smaller width of the secondary roads will increase the significance of the impact. The blockage of villages' roads through excavation will cause access problems to pedestrians, and possibly to riders of animals and agriculture tractors. This access difficulty will have more impacts on elderly people, handicapped and children, who may make tedious long cycles before they reach their targeted locations.

The traffic impacts during the construction of the gravity sewers and FMns should be considered of Moderate significance. The EMP includes mitigation measures to be taken during construction to minimize such effects.

During the construction of the central WWTP and PSs

The construction activities will be mainly limited to the site. The traffic impacts might arise from the increase flow of traffic due to the transport of raw materials and/or the disposal the construction wastes. However, this impact is of temporary nature and the timing of said trips could be adjusted to avoid peak hours. The impact should be therefore considered of Minor significance.

5.2.9.2 Mitigation and monitoring measures

Mitigation Measures

1. All mitigation measures for safeguarding long delays of vehicles and trains traffic will be undertaken by the Local Traffic Department and the Railway Authority. Respectively.
2. During the excavation of roads in villages, there should be a wood or metal bridge for pedestrians’ access over each opened trench. Pedestrian paths beside or across trenches should be as flat as
possible, and clearly marked with warning signs that are visible at night. In all cases the maximum length of an open trench in certain roads should not exceed 500 meters.  

3. There should be at least a guard(s), on duty at the construction site (24h), to help people access the paths and bridges and to respond to any falls or accidents.  

4. Alternate access routes should be identified and communicated with the residents before starting construction.

**Monitoring Measures**

1. The monitoring of traffic flow on roads and railways shall be undertaken by the Traffic Department and the Railway Authority. The monitoring activities that should be undertaken by project include recording and documenting the contractor’s access facilitation adequacy and possible complaints from residents and falling accidents.

5.2.10 Impacts related to Archaeology and cultural heritage

5.2.10.1 Impact Overview and significance

There are a few number antiquity sites close to the project’s area such as Ezbet Youssef Tombs and Hemameya monuments, which are unlikely to be affected by the project. However, the large area covered by the project raises possibilities for chance-finds of antiquity objects during excavation works. Finding such objects may, if not properly managed, risk their loss or damage during handling/storage in construction site.

Furthermore, the identification of antiquity sites by the Supreme Council for Antiquities is an ongoing procedure. Accordingly, there is a possibility that some structures in the project areas could be regarded as antiquity sites during the construction phase. In such case, there is a risk on the integrity of such structures.

Law 117/1983 for the Protection of antiquities has set certain standards that should be followed during excavation works near a registered antiquity site. The Supreme Council for Antiquities emphasizes that collaboration should be established between the Council and the infrastructure developer during construction near an antiquity. These standards and requirements were adhered in the EMP which has defined procedures for chance-finds of antiquity objects, and measures for protection of antiquity sites during construction activities, as listed below.

The impacts on archaeology and culturally valuable sites should be considered of Minor significance and will be fully controlled by the application of the mitigation measures listed below.

5.2.10.2 Mitigation, procedures for chance finds and monitoring measures

**Mitigation measures and procedures of chance finds**

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3 This condition has been recommended by the HCWW

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1. Prior to construction works the project's construction plan should be presented to the Supreme Council for Antiquities, who shall identify project locations (including PSs, WWTPs, sewer lines and FMs) that require providing protection against possible damage to near antiquities.

2. Chance find procedures will be employed, in case an antiquity is found during excavation. The process includes immediate cessation of excavation works, leaving the antiquity object exactly on its found location, taking photographs to document time and status of the object, assigning guards to watch the found antiquity and contacting the Supreme Council of Antiquities to handle the site within 48 hours.

**Monitoring measures**

1. Chance find objects will be documented by the CSC. The documentation should include date, time and exact location of the found object, in addition to the followed procedures until the object has been handled by the Supreme Council for Antiquities.

**5.3 IMPACTS DUE TO ADDITIONAL ACTIVITIES/PROCESSES DURING THE CONSTRUCTION PHASE**

**5.3.1 Impacts due to hazardous (H) and non-hazardous (NH) waste generation and handling of hazardous chemicals**

**5.3.1.1 Impact overview**

This section presents an evaluation of the environmental impacts due to H and NH waste generation during the construction phase. The evaluation presented in this section also covers the storage and handling of hazardous chemicals on site – such as chlorine needed for the water treatment processes as previously described in Chapter 3.

The following are the types of wastes expected to be generated on site during the construction of WWTP and PSs and also during excavation and installation activities for the gravity sewers and FMs.

**Non Hazardous wastes**

- Food residuals
- Paper, plastics, and glass
- Concrete, bricks
- Steel, metals
- Wood
- Excavated soil
- Water collected during dewatering activities (potentially contaminated with sewage)
- Old cesspit content
- Sewage and waste resulting from on-site workers’
- Empty Sacks
**Hazardous wastes**
- Waste electrical and electronic equipment (WEEE)
- Empty chemical containers
- Spent chemicals and oils

5.3.1.2 Impact Significance of NH waste generation

The NH wastes generated on site during the construction phase normally have a high recycling potential. If not recycled they would be sent to landfills or randomly dumped and burned, which would be a loss of natural resources.

Random dumping and accumulation of wastes on or around the site would cause a negative visual impact to workers as well as users of the surrounding areas. It could also block the roads, increase the rate of accidents. Accumulated wastes may be burned, a practice commonly found in Egypt, which could emit toxic emissions especially if plastic substances were among the waste streams.

Accumulation and/or uncontrolled disposal of organic wastes (food residuals) would also result in potential impacts on the health and hygiene of both general public and on-site workers by attracting vermin to the site such as birds, rodents or insects which can act as disease vectors. This will result in spread of disease, and disruption of the natural ecosystem. Odor may also be generated following long periods of accumulation due to the decomposition of some organic wastes, which will be an annoyance to both general public and on-site workers.

Leaching to soil may occur in areas where accumulated waste is in direct contact with the soil. This would lead to a direct impact on the groundwater quality.

Liquid wastes may be encountered during the evacuation of existing cesspits, also construction site sewage will need to be evacuated. This waste will be of non-hazardous nature but will have to be properly disposed of in order to prevent potential contamination to soil, groundwater and surface water.

The evaluation of impacts due to non-hazardous waste generation during the construction phase is illustrated in the Table below. Some impacts are considered of MODERATE significance, mainly due to the proximity of receptors. The impact of NH waste generation is expected to be fully controlled by implementing the mitigation and monitoring measures listed in the following section.

**Evaluation of impacts due to non-hazardous waste generation**

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-hazardous Waste generation</td>
<td>Loss of natural resources</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

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Hazardous wastes may also be generated during the construction phase as listed in Section 5.3.1.1. The storage and disposal of these waste streams have to be carefully performed as to abide by the existing legal framework (Chapter 2). In addition to that, these hazardous wastes if not handled, stored and disposed of according to engineering best practice would have major and irreversible effect as follows:

- Mishandling and uncontrolled disposal of hazardous liquid and solid wastes would have major health impacts for on-site workers, inhabitants in the project’s area of influence, people who get in contact with waste during transportation and disposal, and flora and fauna exposed to such wastes.
- Uncontrolled disposal of hazardous wastes, in particular in liquid form, would cause soil contamination through direct contact or leaching.
- Air quality could also be affected since uncontrolled dumping of hazardous and non-hazardous materials would result in most of the cases to open burning and potential release of toxic emissions.

The impacts listed above are evaluated as presented in the Table below. Most of the impacts should be considered of Moderate significance and will be fully controlled by implementing the mitigation and monitoring measures listed in the following section.

### Evaluation of impacts due to hazardous waste generation

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C)</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous Waste generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of natural resources</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Health impacts</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Soil and groundwater</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Surface water</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>
• Prior estimation of dewatering liquid volume and arranging disposal of by tankers in nearest sewers, PSs, existing WWTP or pre-determined drain locations.

5.3.1.4 Mitigation and monitoring measures

A waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of construction waste (hazardous and non-hazardous) shall be developed and implemented by the construction contractors and made applicable to all sub-contractors. This plan shall define exact procedures and locations for waste management and disposal. The waste management plans should also refer to health and safety procedures, and emergency procedures for containing and managing accidental spillages.

Mitigation measures for non-hazardous wastes
• Implement a segregation system based on compatibility of different waste streams during each phase of project implementation
• Specify an area/containers for non-hazardous wastes which accommodate for the generated segregated streams
• Dispose of non-recycled wastes in the nearest landfill; the location of which needs to be confirmed at the beginning of the construction phase.
• Register the amounts of disposed of wastes and keep waste disposal and transportation receipts/manifests, to be ready for review by the PMU/HCWW.

For liquid wastes (dewatered liquid during excavation);
• Evacuation of closed/demolished household cesspits and construction site sewage to the nearest existing WWTP in consultation with and after getting approval of the CSC and RSU/PIU
• Prior estimation of dewatered liquid volume during the digging works
• Collect and analyze samples of the dewatered liquid
• Arrange for disposal by tankers in the nearest existing WWTP in consultation with and after getting approval of the CSC and RSU/PIU

The measures listed above represent the minimum measures to be included in the waste management plan which will be prepared and implemented by the contractor, and supervised by the PMU/HCWW. They should part of the contracting tender documents.

Monitoring measures for non-hazardous wastes
• Regular inspection of the waste storage area (for PS’s and WWTP’s sites)
• Regular inspection of the site(s) in general to identify random disposal of waste materials, specifically during the installation of gravity sewers and FM's.
• Regular inspection of the waste disposal manifests.

Mitigation measures for hazardous wastes

The measures listed below represent the minimum measures to be included/adopted in the waste management plan which will be prepared and implemented by the contractor, and supervised by the PMU/HCWW. They should be part of the contracting tender documents.

a) General measures

• All types of hazardous waste can only be transported by licensed hazardous waste service providers and disposed of in licensed landfill. Both, the service providers and disposal sites have to be identified at the beginning of construction works. At the time of producing this study, the nearest (only) hazardous waste disposal site is the Nasreya Centre in Alexandria.
• The different types of hazardous wastes should not be mixed.
• Spent mineral oils shall be collected, stored in sealed containers and recycled using a licensed company which also has to be identified by the contractor.

b) Adopting an Identification system for hazardous wastes generated on site

The Contractor shall be able to identify the different potential hazardous wastes. Identification shall be performed according to the Egyptian hazardous waste classification system by the contractor's in-house staff or with the aid of an independent waste management consultant appointed by the contractor.

c) Storage and Management of the waste accumulation area

The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light.

• It is recommended that the maximum period for storing hazardous waste is 270 days from the start date of accumulation of waste.
• The storage area must have a water supply
• A hazardous waste label that has a “Hazardous Waste” mark on it must be placed on the container while still at the generation point.

d) Emergency Response

For the purpose of first response, when a hazardous substance release is first discovered or witnessed, the individual of concern who had to be previously trained would initiate an emergency response sequence by notifying the proper authorities of the release. The individual will take no further action beyond self-evacuation and notification. The aim of the response at this level is limited to protect nearby persons, property, or the environment from the effects of the release. No trials are performed at this stage to actually stop the release. This level of response includes;

• actions to contain the release from a safe distance
- prevent its spreading
- evacuation

**Monitoring measures for hazardous wastes generated**

- Regular inspection of the hazardous waste storage area
- The spent oil containers are inspected monthly for leaks or any other form of damage and are kept in good condition.
- Regular inspection of the site to identify randomly dumped hazardous waste materials.
- Inspection of HW disposal receipts and manifests.

### 5.3.2 Impacts related to the creation of on-site workers and staff office camps

The majority of the workforce will be sourced from local communities and will live locally. No on-site camps will be therefore required except individual accommodation for the guards at the different project’s sites.

The management offices will be mainly located at the WWTP site and other interim sewage and potable facilities will be constructed at the PS sites.

Potential impacts include soil, groundwater and health impacts due to unsuitable waste and sewage management, which should be considered of **MINOR significance** due to the expected low amounts. Waste management mitigation measures identified under Section 5.3.1 should be sufficient to fully control this impact.

### 5.3.3 Summary of impact assessment during the construction phase

The Table below shows a summary of the impact assessment during the construction phase.
<table>
<thead>
<tr>
<th>Activities causing the impact</th>
<th>Ambient noise</th>
<th>Air Quality</th>
<th>Soil &amp; groundwater Quality</th>
<th>Surface Water Quality</th>
<th>Flora and Fauna</th>
<th>Occupational Health &amp; Safety</th>
<th>Community Safety</th>
<th>8-Virtual Impacts</th>
<th>9-Traffic Impacts</th>
<th>Cultural Heritage and Archaeological impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts due to the creation of onsite workers and staff camps</td>
<td>N/A</td>
<td>N/A</td>
<td>Minor</td>
<td>N/A</td>
<td>N/A</td>
<td>Minor</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
5.4 ENVIRONMENTAL IMPACT ASSESSMENT DURING THE OPERATION OF THE WWTP, PS, FM and GRAVITY SEWERS

5.4.1 Noise Impacts

5.4.1.1 Overview of operation activities related to noise generation

With regards to the expected noise generated during operation two motors will be operating in each PS, submersible in wet well. Their specifications are as follows:
- Speed (r.p.m) will not exceed 1500rpm
- The pump motor shall be of squirrel cage induction type with IP-68 enclosure
- Required head (28m) and working range (22-31m)
- Expected discharge is 30 L/s

Based on the specifications listed above, the expected noise level could be estimated at 75dB at source. With regards to the WWTP, the site will include several pumps each could be assumed to emit each around 75dB also.

The noise propagation from source has been modeled according to ISO 9613-2 and the significance of the noise impacts, when considering the sensitivity and proximity of the different receptors is described in the following section.

5.4.1.2 Evaluation and Significance of Noise Impacts

**Operation of WWTP**

The noise emitted during the operation of the WWTP may reach 75 dB, close to the operating pumps. From the site visit, and as previously presented, it was clear that no residential units or other receptors are located around the WWTP. The potential generated noise will therefore mainly affect the workers on site and with the implementation of the mitigation measures listed below, the impact could be fully controlled. The impact should be therefore considered of Moderate significance.

The proposed timber forest is not anticipated to emit noise and therefore will have no impact.

**Operation of the PSs**

It was clear from the site visits that no residential units or other receptors are located around both PSs. The potential generated noise during operation will mainly affect the workers on site. The impact should be therefore considered of Minor significance. Similar to the noise impacts related to the operation of the WWTP, this impact should be fully controlled by applying proper health and safety procedures.

**Operation of gravity sewers and FMs**

No foreseen impacts during normal operation.
The Table below shows the results of the evaluation of the operation noise impacts of the main project’s components (WWTP, and PSs)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Impacts due to the operation of Gravity sewers and FM</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>PSs</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>WWTP</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

5.4.1.3 Mitigation and monitoring measures

**Mitigation measures**

**Off site:**
- Cultivate and maintain a tree belt around the site
- Implement a complaints system to investigate any noise complaints from neighboring communities.

**On site** noise emissions control during operation shall be achieved by implementing an occupational health and safety plan, which considers national and international requirements. This to ensure a safe work environment and to ensure that on-site noise levels stay within the allowable limits. The plan shall include the following measures:

- Ear muffs/protective hearing equipment shall be made available to all workers in noise critical areas
- Training on how and when to use protective hearing equipment shall be conducted as part of the workers’ induction sessions.
- Place visually clear instructions in areas where noise emissions are significant.
- Regular maintenance of all equipment and vehicles

**Monitoring measures**

- Measuring the ambient noise level in noise critical areas, using a portable noise meter.
• Investigate noise complaints from workers and neighboring communities in the affected locations

5.4.2 Air emissions and Odor impacts

5.4.2.1 Overview and Impact significance

The only source of air emissions within the PS and WWTP sites will be the stand-by diesel generators. The impacts of such emissions are considered to be of Minor Significance as the generators will be only turned on during power cut-offs. The compliance of generators emissions with Law 4/1994 standards will be sufficient to safeguard against unacceptable air emissions impacts to the surrounding areas. It should be noted that noise generated during the operation of standby generators have been neglected because it will of an interim nature and the dominant sound level will be that of the pumping sets – please refer to Section 5.4.1 for the operational noise impact assessment.

Within the WWTP, odors are expected to be generated near the inlet open channels and screens; oxidation ponds, and sludge storage areas.

It was found that odor generated from WWTPs could be one of the main problems facing the operation of the WWTPs as identified by neighboring communities and populations. Odors are the products of decomposition of organic matter. The main constituent of these odors is hydrogen sulphide (H₂S) due to its relatively high concentration in wastewater. Table 5.2 indicates the concentration of different chemicals found in wastewater and sludge and their detection threshold by people.

Table 5.2 Thresholds for odor detection and recognition associated with wastewater

<table>
<thead>
<tr>
<th>Odorous compound</th>
<th>Detection threshold (ppm volume)</th>
<th>Recognition threshold (ppm volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>17</td>
<td>37</td>
</tr>
<tr>
<td>Chlorine</td>
<td>0.08</td>
<td>0.314</td>
</tr>
<tr>
<td>Dimethyl Sulphide</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Diphenyl Sulphide</td>
<td>0.0001</td>
<td>0.0021</td>
</tr>
<tr>
<td>Ethyl Mercaptan</td>
<td>0.0003</td>
<td>0.001</td>
</tr>
<tr>
<td>Hydrogen Sulphide</td>
<td>&lt;0.00021</td>
<td>0.00047</td>
</tr>
<tr>
<td>Indole</td>
<td>0.0001</td>
<td>-</td>
</tr>
<tr>
<td>Methyl Amine</td>
<td>4.7</td>
<td>-</td>
</tr>
<tr>
<td>Methyl Mercaptan</td>
<td>0.0005</td>
<td>0.001</td>
</tr>
<tr>
<td>Skatole</td>
<td>0.001</td>
<td>0.019</td>
</tr>
</tbody>
</table>

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3 The WHO guidelines for detection of H₂S is 0.2-2 ug/m³ (about 0.0002 to 0.002 ppm), for recognition is 0.6-6 ug/m³ (about 0.0006-0.006 ppm) while the guideline value to protect against substantial annoyance is 7 ug/m³ (about 0.007 ppm)
It has been established that such odors are a cause of direct irritation and can also be a health threat through toxicological routes. Irritation could evolve into psychological stress after prolonged exposure which could lead to loss of appetite, reduced water consumption, impaired respiration, nausea and vomiting. Socioeconomic impacts, which will be discussed in more detail, associated with places of offensive odors have the ability to lower the living standards of the communities, affecting people’s dignity and value of life. However, we should not neglect the fact that there is a biological difference from one person to another which allows each person to react to such odors differently. This is why impacts associated with odors are sometimes subjective. Not to mention the level of tolerance that some people develop over time. This is of particular interest to workers at the pump stations and WWTP which will naturally acquire high odor tolerance.

In case of Al Nawawra’s WWTP, the site is located in a desert area. There are no nearby sensitive receptors (closest residential cluster is located more than 900m west of the plant). It is not therefore expected that the nearest villagers (considering the current situation) will be affected by odor generated from the WWTP. The impact on such receptors should be considered of Minor significance.

Impacts due to unpleasant odors within the site have a high probability of occurring. It is a permanent impact of any WWTP as long as it is in operation. Odors will be limited to the areas near their generation/storage/disposal areas; hence the spatial impact is low. The intensity will also be moderate since any changes due to odor emissions are reversible and the affected receptors will be self-recoverable.

A visit to an operational WWTP in Al Quseya village in Assiut was carried out on 7 and 8 August 2016 to get a more factual understanding of the potential impact of odors. The WWTP in Al Quseya is located 5 km away from the nearest residential area, and 500 m away from an ambulance unit. Based on observation, the WWTP does not have a timber forest to discharge its treated wastewater into; instead, treated wastewater is discharged into ponds and left to evaporate naturally. Based on interviews conducted by the Consultant during the site visit, the WWTP is operated poorly and no staff members were observed at the WWTP. The operators of the WWTP at Al Quseya are expected to be those operating the newly proposed WWTP in Al Nawawra. Based on interviews conducted with residents of Al Quseya and members of the ambulance unit (500 m away) from the operating WWTP, odors were not an issue. However, two pond breaches in the past have caused odor emissions, raising concerns of future breaches. It is important to note that, as explained in more detail in section 4.3.4 of this ESIA study, prevalent winds blow from the NW. Therefore, odors emitted are likely to travel away from the Nawawra village, located NW of the proposed site, and move SE. As an extra precautionary measure, HCWW will plant trees (as part of the timber forest) west/north west of the WWTP where they will act as a barrier from wind blowing from the E-SE direction.

Based on an environmental impact assessment conducted for a wastewater treatment plant in Rashaya, Rashaya Caza, Lebanon, financed by the USAID, no smell from the WWTP was anticipated to go further than 50 m from the site. In another environmental impact assessment, carried out for a wastewater treatment plant in Rashaya, Rashaya Caza, Lebanon.

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Wastewater Treatment Plant in Rashaya Rashaya Caza, Lebanon
treatment plant in Spain\(^8\), a buffer of 100 m (as per Spain’s National Environment and Planning Agency) was provided on all boundaries, whereas the nearest residential area to the newly proposed location of the WWTP is over 1,000 m away.

The overall impact assessment indicates that the newly proposed WWTP would not have any additional odor impacts and that the intensity of odors within the newly proposed WWTP site (and in close proximity), taking into account all conditions, will be of Moderate significance.

The proposed timber forest is not anticipated to emit air pollutants and therefore will have no impact on air quality.

Odor generated form the operation of the PSs is expected to be minimal and the impact should be considered of Minor Significance.

During the operation of gravity sewers and force mains, no odor impacts are expected except in the case of any leakage. This should be temporary and immediate repair shall be implemented. The impact should therefore be considered of Minor significance.

5.4.2.2 Mitigation and monitoring measures

**Mitigation measures**

1. Maintain efficient performance of biological treatment efficiency
2. Establish close communication with the neighboring areas, establish a complaints handling system and assign a staff member in the WWTP to receive odor complaints. This could be done through posters and the distribution of brochures that illustrate the right to complain, and the contacts information of the responsible staff, and the RSU officer assigned to supervise the plant.
3. Supplied standby generators to PSs and WWTPs should be checked with suppliers for their emission standards.
4. Regular checks and maintenance of the drainage system to ensure no significant ponding of leachate.
5. Handle and store waste in a manner which ensures that it is held securely without loss or leakage, thereby minimizing the potential for pollution.
6. Remove waste in a timely manner.
7. Maintain and clean waste storage areas regularly.
8. Sludge containers should be flushed with water regularly.
9. Sludge should be transferred to and in closed containers to minimize odor escape.
10. Frequent sludge withdrawal from tanks is necessary to prevent the production of gases.

**Monitoring measures**

\(^8\)C.L. Environmental. 2004. Draft Environmental Impact Assessment of The Proposed Western Spanish Town Wastewater Treatment Plant

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1. Record odor complaints received from neighboring areas. The record should include name of the person who has made the complaint, time of complaint, GPS location of the affected area, time and duration of unacceptable odor. Complaints records should be reported in monthly reports. The RSU should analyze odor complaints on monthly basis and document how each complaint was confronted.

2. Measure CO, SO2, total hydrocarbons (HC) and NOx annually using onsite gas analyzer.

3. Monitor the air quality on site down wind of the WWTP (SE direction) at the closest location possible.

4. Monitor air quality downwind at the closest sensitive receptor.

5.4.3 Soil and groundwater Impacts

5.4.3.1 Overview and Impact significance

*Operation of gravity sewers and FM*s
Potential impacts on soil and groundwater during the operation phase may arise from any leak developing in the system. The impact should be considered of *Moderate significance* with respect to gravity sewers and Force mains (the impact is more critical with respect to FM*s due to the higher pressure and the higher rate of contaminant migration to the surrounding soil and groundwater). The contact with the surrounding soil in all cases will be direct. The probability of the impact occurrence will depend on the quality assurance during the construction works and the impact’s duration will depend on the response time to the leak until the repair works start.

*Operation of the WWTP and PS*s
Potential impacts on soil and groundwater during the operation of the WWTP and PS*s will also arise from potential leaks and breaches of oxidation ponds. However, these should be considered of *Minor Significance* because of the following:

- All the units of the WWTP and PS*s are constructed over an impermeable concrete base layer which prevents direct contact with the underneath soil and allow for repair time.
- The leaks will be mostly visible as compared with potential leaks in the gravity sewers and force mains which will be hidden underground.
- Groundwater in the WWTP area has been reported to be at depths greater than 15 m below ground surface. Furthermore, soil in the area has been characterized as being silty clay, which has slow permeability rates.

Impacts from the timber forest are primarily positive and include:

- Improving the microclimate of the region and alleviating the influences of extreme temperatures
- Enhancing and enriching the area’s soil quality
- Alleviation of detrimental effects of pollutants, smokes, dusts and direct UV rays
- Adsorption or absorption of foul odor and gases
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Pest numbers and odors may increase in the case of flooding caused by improper irrigation in the timber forest. Increased levels of toxic elements and salinization of soil are potential impacts of flooding in the timber forest. Other potential impacts on soil are due to soil erosion and improper waste and sludge management. However, if sludge is sufficiently dried and treated/stabilized, prior to being reused (i.e. applied to land), there are no foreseen environmental and health impacts upon condition that sample analysis proves that sludge does not possess hazardous characteristics. Impacts are considered of minor significance because of the following:

- Based on the area allocated for the timber forest, and its relatively flat topography, the leaching and washing of salts is not likely to occur.
- Groundwater in the timber forest area has been reported to be at depths greater than 15 m below ground surface.
- Soil in the area has been characterized as being silty clay, which has slow permeability rates.
- The newly proposed location of WWTP is not predicted to have any additional impacts.

### 5.4.3.2 Mitigation and monitoring measures

**Mitigation measures**

- A leak detection plan shall be developed and implemented for the oxidation ponds. When the leakage rate exceeds a threshold limit defined by the contractor, the WWTP operator shall cease discharge to the identified leaking oxidation pond, and shall implement all necessary corrective action measures to mitigate the liner leakage.
- Leak-detection monitoring wells may be required to assess impacts to environment.
- Adopt best practices for irrigation, ensuring water quality and water quantity are maintained to standard.
- The flow connection between the different oxidation ponds should be regularly maintained and cleaned from precipitated sludge.
- Ensure that a layer of water with a depth around 20 cm is maintained in any non-operating oxidation pond in order to protect the sealing system and surface material from cracking.
- Maintain and operate oxidation ponds to meet permitted discharge requirements, including proper functioning of the outfall.
- A method for recording the wastewater levels in each oxidation pond shall be provided. This may include staff gages, sidewall depth markings, or pressure-depth sensors.
- Adjust the proper quantities of water applied in the timber forest, clean drainage canals and consider planting flood tolerant species.
- Create runoff collection ponds to prevent surface run off from potential breaches from seeping into soil or groundwater.
- Sloping and contouring to prevent sliding or collapsing of the oxidation ponds.
- Adjust water quantities for irrigation of the timber forest and ensure flood irrigation practices are completely prohibited.
- Apply contour plowing, conservation tillage and other soil erosion prevention techniques.
Monitoring measures

- Monitor the WWTP for physical stability features, such as tension cracks, surface erosion, piping failures and other features
- Regular inspection of all components of PSs and WWTP for any potential leaks
- Document foul odors in timber forest and increased number of insects, mosquitoes and flies
- Analyze soil samples to ensure wastewater from the timber forest has not caused elevations in heavy metals and other toxic elements
- Analyze groundwater samples from existing groundwater wells (or leak-detecting wells, if installed) to ensure wastewater from the timber forest has not caused groundwater contamination
- Analyze wastewater effluent to ensure it is compliant with Law 93/1962 for reuse of treated wastewater in agriculture
- Take representative sludge samples and analyze it according to requirements of Law 93/1962

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C)</th>
<th>Overall Score</th>
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<td>3</td>
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<tr>
<td></td>
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<td>4</td>
<td>3</td>
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<td></td>
<td>WWTP and PS</td>
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<td>1</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
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</table>

5.4.4 Water Quality Impacts

5.4.4.1 Overview and Impact significance

During the operation of gravity sewers and FM斯

Impacts on water quality might arise from potential leaks in the canal/drain crossing areas. Examples include the crossings on Nawawra sharkeya canal and Wadi el Sheih. The sewage line will also pass parallel to Nawawra Sharkeya canal. This will directly affect the surface water quality. The impact should be
temporary until repair action are implemented and will have low probability of occurrence. The impact should be considered of **Moderate significance**.

**During the operation of the central WWTP and PSs**

The key impact on the surface water during the operation of the WWTP will result from the disposal of the sludge which will be covered under the sludge management section. There are no impacts due to the discharge of the treated effluent since it will be used to irrigate a timber forest adjacent to the plant. Other than these, no impacts on the surface water quality would be expected during the operation of the WWTP. Also, no impacts are expected during the operation of the PSs. The impact should therefore be considered of **Minor significance**. The impact will be fully controlled if mitigation measures related to waste and sludge management are being implemented.

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
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<tr>
<td>Soil and groundwater Impacts due to the construction of</td>
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<td>3</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Gravity sewers and FM</td>
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<td>3</td>
<td>6</td>
</tr>
<tr>
<td>PS</td>
<td>0.5</td>
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<td>WWTP</td>
<td>0.5</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

5.4.5 Flora and Fauna Impacts

5.4.5.1 Overview and Impact significance

The Consultant has conducted baseline surveys in order to assess the presence and distribution of ecologically sensitive species and habitats along the proposed project’s sites. Consequently, it was concluded that no endangered faunal or floral species have been recorded at the project’s areas. All recorded species are under the “Least Concern” category.

**Fauna Impact significance**

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Although some faunal species of mammals, birds, reptiles and insects exist at the project’s area, faunal impacts are not likely to be significant given the small scale of the development relative to the extent of similar intact habitats in the area. The evaluation of the impacts on fauna is illustrated in the Table below, and should be considered negative with Minor significance yet this impact can be reduced/eliminated if appropriate mitigation measures are implemented.

**Flora Impact significance**

The flora existing in the proposed sites for the WWTP and PS, as mentioned above, do not belong to the endangered species category. So the impact of the project’s operation on the floral species should be considered on Minor significance. The timber forest is not expected to cause the spread of invasive species as the proponent is anticipated to identify tree species best suited for the site based on soil characteristics and water quality. The proponent will also outline the advantages and disadvantages of using these species. It should be noted that significant potential impacts would occur due to sludge management as will be discussed in the following sections.

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flora and Fauna impacts</td>
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<td>4</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

5.4.5.2 Mitigation and monitoring measures

No specific mitigation and monitoring measures are required

5.4.6 Occupational Health and Safety

5.4.6.1 Overview and Impact significance

Workers are often exposed to dangerous conditions during tank opening and venting; manual pumping and stripping; breaking or dismantling components and piping; and pressure washing, mucking, and scaling.

A dangerous atmosphere may expose workers to the risk of death, incapacitation, injury, chronic or acute illness, or impaired ability to escape unaided from a confined or enclosed space. When working on the
maintenance of sewage systems, special attention should be given to good hygiene practices, proper use of personal protective equipment and safe confined space entry procedures.

The workers may be exposed to the known and unknown dangers of handling treated or untreated sewage and gray water tanks during pipelines, equipment and tank opening, entry, cleaning and related operations. Related components/operations include: piping, aeration, vacuuming, settling, treatment tanks and apparatus, sewage-contaminated water tanks or waste oil tanks, bilges, or sumps, and valves, pumps, grinders, macerators and other contaminated equipment.

**Hazard identification attributed to the operation and maintenance of gravity sewers and force mains network**

**Atmospheric hazards**
Atmospheric hazards include oxygen-deficiency and flammable or toxic gases such as methane and hydrogen sulfide. Methane gas is colorless, odorless and tasteless, but is highly flammable and is considered an asphyxiate. Hydrogen sulfide (H₂S) is also colorless and flammable, but it is highly odorous and extremely toxic to humans. At approximately 100–150 ppm of H₂S, the olfactory nerve is paralyzed after a few breaths. Within a very short time, the sense of smell disappears, giving a false sense that the harmful gas has gone away. These gases are detectable only using proper instruments.

**Physical hazards**
Physical hazards include slips, trips, and falls on slippery and sloping surfaces; limited access and egress; corroded ladder rungs; and obstructions by piping and other structures. There is also the risk of receiving punctures and cuts from sharp edges and/or may wall collapses.

**Biological hazards**
Biological hazards include pathogens (e.g., viruses, bacteria, protozoa, parasitic worms, fungi) and other infectious microorganisms that can cause illnesses such as hepatitis, typhoid fever, dysentery and cholera. Inhaling or ingesting contaminated mists may result in serious illnesses.

**Hazard identification attributed to the operation and maintenance of WWTPs, tree forest and PSs**

**Mechanical hazards**
Mechanical hazards include energized equipment; rotating machinery; and waste stream leaks. Before any servicing is performed where energization or startup is adopted, all energy sources must be identified and isolated, and the machinery, equipment, or system rendered inoperative.

**Chemical hazards**
Chemical hazards include exposure to ammonium compounds, formaldehyde, chlorine products, sodium hydroxide, odorous compounds, sodium hydroxide, odor-control and sewage-biodegrading enzymes, sanitizers, biocides, cleaning agents, pharmaceutical drugs, hormones and heavy metals.

**Physical hazards**
Physical hazards include slips, trips, and falls on slippery and sloping surfaces; limited access and egress; corroded ladder rungs; and obstructions by piping and other structures. There is also the risk of receiving punctures and cuts from sharp edges and/or may wall collapses. There is also the fire and injury risks at the tree forest.

Due to the potential severity of the occupational health and safety accidents, the impacts should be considered of Major significance. They should be controlled to a large extent by the implementation of the mitigation measures listed below.

5.4.6.2 Mitigation and monitoring measures

**Mitigation measures**

The project’s operator shall implement an occupational health and safety plan, which shall include, but not be limited to, the following measures;

1. **Immunization**
   Ensure routine vaccinations for workers for influenza, tetanus, and Hepatitis “A” (according to Consultations with the institute’s physicians).

2. **Safe Practices and Personal Protective Equipment (PPE)**
   It is recommended to avoid liquid contact with exposed skin, by using a full-body impervious suits in addition with using rubber boots, gloves, hard hats and eye protection.
   Using the Respirator instrument is based on an evaluation of respiratory hazards in the workplace and other relevant workplace and user factors.
   During cleaning operations performed outside a tank or and pipelines, where the atmosphere is not immediately dangerous to life or health, the worker(s) shall wear supplied-air or air-purifying respirator with organic vapor HEPA (High-Efficiency Particulate Arresting cartridge).
   When working in confined spaces, the team (inside and outside) must have extra flashlights and two-way radios readied for communication.
   A first-aid kit must be readily available; an eyewash and flushing station, neutralizing solutions, cleaning equipment, and emergency medical services.

3. **Training**
   Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate Personal Protective Equipment (PPE).

4. **Control Measures Prior to entering and/or maintenance**
   - Assess and review sewage systems, components and piping.
• Perform jobsite safety and health analyses and be aware of all associated risks and hazards. Inform all workers involved of the risks and hazards determined by the jobsite safety and health analyses.
• Post warning signs and labels.
• Secure all toilets, urinals, drains, pumps, and sewage treatment systems.
• Isolate, close, secure, divert, de-energize, lockout and apply tags-plus applications to all valves, piping and associated equipment.
• When confined space entries are performed, have a trained rescue team with the proper rescue equipment available at the job site, or notifying the outside designated rescue team in advance that employees are working in a confined space on the sewage system so they can prepare to respond in the event of an emergency.
• Follow confined space entry testing and permitting procedures. If feasible, use sample ports to test for atmospheric contaminants inside the tank or / and pipeline manholes.
• Cautiously and deliberately remove bolts and nuts off manholes and piping, while staying alert to any immediate change of conditions, and be prepared to take necessary action.
• Use appropriate tools and operating procedures.
• Install and use adequate exhaust ventilation devices, ducting, lighting, and tank-cleaning equipment. Immediately following the piping being broken or the tank opened, apply or insert ducting to begin exhaust ventilation. Pipe all exhausts downwind, overboard, or away from people.
• Cover and isolate all work areas with disposable plastic sheeting to prevent possible contamination.
• pumping and drain all residual products flush tanks and piping systems
• Check for residual pressure or vacuum effects in tanks and piping.
• While remaining outside the tank, continue to test the atmosphere inside the tank remotely for safe conditions.
• Before beginning tank cleaning operations, while wearing the appropriate PPE, clothing and respiratory protection, cautiously enter the tank for an internal inspection.
• Chlorinate or sanitize the tanks and piping systems when necessary.

5-Post-Work Cleanup

• Remove contaminated clothing and bag for proper disposal or decontamination.
• Shower or wash face, arms, hands and legs with soap, using a substantial amount of water.
• Disinfect equipment (e.g., using iodine compounds, bromine, chlorine, ozone, or their equivalent) and wash contaminated spaces, decks and bulkheads with detergent, sanitizer, or bleach.
• Dispose of or re-wash rubber boots, gloves, eye goggles, face shields and respirators with a disinfectant solution.
• Wash contaminated clothing separately.
• Do not enter other spaces while still wearing contaminated clothing.

6-Measures at the tree forest

• HCWW will consider and adopt cost-effective fire protection and response measures such as prohibiting smoking in or near the timber forest, prohibiting the burning of any yard or other waste, limiting vehicle access to dry areas, establishing a fire break area around the forest, establishing fire lookouts, having firefighting tools and equipment at various points, creating access points in the event
that fire trucks will need to enter the timber forest to control/extinguish a fire, providing communication equipment to forest workers to be able to rapidly communicate the potential occurrence of a fire and providing firefighting training to forest workers. Fire protection and response plans will be developed by HCWW.

- HCWW will ensure at least one forest worker per shift is first aid certified. In addition, a first aid kit will be made available at a well communicated and designated area. HCWW will ensure all timber forest workers are properly trained and well informed of the various kinds of work stress, nutrition, hydration and identifying and managing hazards. No workers working in the timber forest will be permitted to perform any work that may be harmful to them or the environment. Workers will have the right to refuse to perform such work and make sure their working hours include regular rest breaks as well as a meal break. Timber forest workers shall make a concerted effort to identify any potential hazards in their place of work. HCWW shall provide all timber forest workers with the appropriate personal protective equipment (PPE), with a minimum of safety footwear, safety helmets, eye protection and gloves. In cases where workers are exposed to dust and/or chemicals, respiratory protective equipment shall be provided by HCWW. Where chemical or sludge handling is involved, HCWW will ensure workers wear personal protective clothing and follow handling procedures carefully.

- To protect the timber forest from potential vertebrate pests, HCWW will establish physical barriers both around the timber forest site and also around seedlings in the initial planting stages. Physical site barriers may be constructed of wire and barriers for seedlings may be composed of wire mesh or plastic. HCWW shall consider controlling insect larvae populations by using emulsifiable concentrates of mosquito larvicides applied by continuous drip methods. Before applying pest control measures, HCWW will seek to correctly identify the pest(s) in question, assess the potential damage that may be caused by the pest, determine what control methods are available and outline their benefits and risks, identify the most cost-effective methods that will have the least harm on humans and the environment, and most importantly, ensure they are complying with all local laws and regulations.

5.4.7 Community Safety

Potential impacts during the operation phase:

- **Falling in open manholes:**
The hazard start when the manholes’ cover is; a) left opened; b) Not properly fixed; and/or Brocken

- **Engulfment:**
This hazard has two scenarios, the first occurs when the sewage water flows out the pipeline network; the second is the risk of falling in the hidden manholes or deep pits under the waste water.

**Mitigation measures**
- Using fences and warning signs during maintenance periods and/or close the roads
- Regular inspection for all the components of the sewage system especially the manholes cover and take instantaneous measurements for correction.
- Preventive maintenance program
- Adjust the maintenance schedules away from the rush hour

5.4.8 Visual impacts

5.4.8.1 Overview and Impact significance

_During the operation of gravity sewers and FMs_

No foreseen impacts

_During the operation of the central WWTP and PSs_

During the operation of the central WWTP and PSs, the project would change the aesthetics and landscape of the areas where the PSs and WWTP will be constructed. However, with regards to the WWTP, it is located in a desert area so no visual impacts are foreseen. With regards to the PSs, the visual impact is low as the expected height of the different components of the PS is comparable with adjacent buildings. The visual impacts due to the operation of the WWTP and PSs should be considered of _Minor significance_. No mitigation measures are foreseen, expect maintaining a suitable landscape around the site.

5.4.9 Impacts Related to Archaeology and Cultural Heritage

There are no foreseen impacts on culturally valuable sites during the operation phase of the project

5.5 IMPACTS DUE TO ADDITIONAL ACTIVITIES/PROCESSES DURING THE OPERATION PHASE

5.5.1 Risks associated with disposal and/or reuse of final treated effluent

5.5.1.1 Risk of soil pollution as a result of irrigation using noncompliant effluent

In the **ISSIP II project in Assiut governorate**, the treated effluent from the Nawawra’s new WWTP will be reused for the irrigation of an adjacent timber forest. For such purpose, it has to comply, as a first step with the limits outlined in Table 5.2, according to the Egyptian legislation. Compliance with the treated wastewater standards is the first phase of getting approval to use the effluent for irrigation. However, the effluent for any reason may become not compliant with the standards, hence containing harmful amounts of compounds. This could have then a direct impact on the irrigated soil. The risk would depend on the area of land irrigated and the degree of unconformity of the treated effluent.
Table 5.2: Treated effluent standards outlined in Law 93/1962 for reuse in irrigation (Decree 44 /2000)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Secondary treatment for reuse in irrigation</th>
<th>Parameter</th>
<th>Secondary treatment for reuse in irrigation</th>
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<tbody>
<tr>
<td>BOD (ppm)</td>
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<td>Zinc (ppm)</td>
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<tr>
<td>COD (ppm)</td>
<td>80</td>
<td>Arsenic (ppm)</td>
<td>NI</td>
</tr>
<tr>
<td>TSS (ppm)</td>
<td>40</td>
<td>Chromium (ppm)</td>
<td>NI</td>
</tr>
<tr>
<td>O&amp;G (ppm)</td>
<td>10</td>
<td>Molid betrays (only green fodders) (ppm)</td>
<td>0.01</td>
</tr>
<tr>
<td>Nematodes (no. of cells or eggs/Liter)</td>
<td>1</td>
<td>Manganese (ppm)</td>
<td>0.2</td>
</tr>
<tr>
<td>Fecal coliform (MPN/100 ml)</td>
<td>1,000</td>
<td>Iron (ppm)</td>
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</tr>
<tr>
<td>TDS (ppm)</td>
<td>2,000</td>
<td>Cobalt (ppm)</td>
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<tr>
<td>Sodium Absorption Ratio (SAR) %</td>
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</tr>
<tr>
<td>Nickel (ppm)</td>
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</tr>
</tbody>
</table>

Notes:
NI: Not identified

One of the reasons for producing a non-compliant effluent is the use of the bypass line, in case of emergencies in the WWTP units. The existence of this bypass line is considered a necessity for the hydraulic protection of the WWTP, therefore it is an engineering requirement in the Engineering Code of Practice in Decree 169/1997. Accordingly, the risks of using this line will be an environmental issue. Although the possibilities may be low, the environmental consequences will be acute and could lead to soil contamination.

The hydraulic risks should be considered of Minor significance because of the large area allocated for the tree forest, which enables the establishment of an irrigation network of the required capacity to accommodate for the expected flow.

Due to the potential soil contamination, this impact should be considered of Moderate significance. The mitigation measures in the EMP have concentrated on reducing these possibilities to the minimum. The
Table below illustrates the evaluation of impacts associated with the disposal and/or reuse of final treated effluent in irrigating the timber forest.

### Impact assessment of final effluent production and disposal

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Impact</th>
<th>Probability of occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>(P)<em>(A)</em>(B)*(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks associated With disposal and/or reuse of final treated effluent</td>
<td>Risk of soil pollution due to non-conformity with normal operating procedures</td>
<td>0.50</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

5.5.1.2 Mitigation and monitoring measures

**Mitigation measures**

1. Implement preventive maintenance program to all structures and electromechanical equipment in PSs and WWTPs. The supplier of each equipment should provide a preventive maintenance schedule for supplied equipment. Implementing this schedule should be part of the WWTP and PS operational manual.

2. In case the influent is totally bypassed to the receiving tree forest, the PIU-EM should be immediately be notified with the reasons, durations and applied control measures for such event. The PIU-EM should directly notify the PSC and EEAA with the incidents. After returning to normal operation mode, reasons for using the bypass line should be analyzed to prevent repeating these incidents in future. This should be considered during the analysis of the results of the regular monitoring program. In addition to the measures listed above, assessment of soil and groundwater contamination should be undertaken.

**Monitoring measures**

1. Continuous monitoring of PS and WWTPs incoming and outgoing discharges. Daily averages should be calculated and documented.
2. Twice-a-week monitoring of influent and effluent water quality at WWTPs should be undertaken. Monitoring should include analysis of COD, TSS, TKN and total P.
4. An annual audit of the WWTP to review performance efficiency shall be undertaken by an environmental consultant. The audit should include reviewing all monitoring data throughout the year and recommendations to improve efficiency as appropriate.

5.5.2 Environmental impacts due to Sludge management

5.5.2.1 Overview

The design of Al Nawawra WWTP (working with oxidation ponds technology), results in the generation of sludge at a lower rate as compared with other treatment technologies (i.e. SBR), and pause relatively lower environmental and health impacts. No recommendations regarding suitable sludge applications have been identified. Following discussions with Assiut’s RSU, potential management options include the following:
- Disposal in landfills/dumpsites
- Use in agricultural lands/timber forest as soil fertilizers
- Use as Refuse Derived Fuel for the cement industry

Using one or more of the options listed above would depend on the quality of the sludge and the approval of Ministry of Agriculture for using the sludge for agricultural land applications, which could not be identified/Performed at the time of producing the study. All potential options have been therefore assessed for their potential environmental impacts.

Sludge contains nitrogen and phosphorus, which are beneficial constituents to soil. Law 93/1962, as well as Sewage Sludge Directive 86/278/EEC both encourage the use of sewage sludge in agriculture. However, they regulate its use in such a way as to prevent harmful effects on water, air, soil, vegetation, animals and humans. However, the sludge could also include high amount of heavy metals, pathogens and bacteria which could have negative impacts and health hazards and render it a hazardous waste.

Identification of potential impacts
1. Impacts associated with sludge handling, drying and treatment within the WWTP premises
2. Impacts due to sludge transport
3. Impacts associated with sludge disposal
4. Impacts associated with sludge applications on agricultural lands

5.5.2.2 Impact Significance and evaluation

Impacts associated with sludge handling, drying and treatment within the WWTP premises
In accordance with the proposed WWTP design, sludge handling is expected to generate odor, mostly near sludge storage areas. The significance of this impact is reduced since the plant is located in the desert more than 2000m east of the closest village.

Air quality and odor impacts due to the WWTP processes (including sludge management) have been covered in details in previous sections. Based on the quality of the sludge generated, which will be confirmed through chemical analysis of collected samples, sludge may possess hazardous characteristics (i.e. be classified as a hazardous waste). Handling should therefore in all cases be performed with care, as the sludge represents a high negative health risk due to its pathogens content.

Incomplete/inefficient drying followed by incomplete stabilization would increase the pathogenic and odor impacts presented above. Treatment/stabilization should be performed on site as will be detailed in the mitigation measures presented below.

**Impacts due to sludge transport**

Transportation of sludge from the WWTP to the nearest landfill or transporting it to nearby agricultural lands will require the use of trucks to accommodate the amount of sludge generated. These vehicles are a source of emissions that would affect the air quality. Motor vehicle emissions were found to contain NOx, volatile organic compounds, carbon monoxide, and carbon dioxide. These compounds contribute to air pollution and the creation of smog.

There is a potential soil contamination and odor emissions risk if vehicles were not completely sealed during transport.

Upon assessing the impacts of emissions from the transportation vehicles, it was found that the impact would be intermittent. The spatial impacts would be limited to hundred meters around the WWTP. In terms of the impact intensity on the environment, the air emissions could cause environmental changes that result in damage to the separate environmental components, however, the natural environment remains self-recoverable. Overall, air emissions due to sludge transport should be considered of MINOR significance. Noise impacts are also expected to take place due to the transportation of sludge. However, due to the intermittent nature and average noise level expected, the noise impacts due to sludge transport should be considered of MINOR significance.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability of occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>(P)<em>(A)</em>(B)*(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air quality and odor</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

---

9 Adapted from [http://en.wikipedia.org/wiki/Motor_vehicle_emissions](http://en.wikipedia.org/wiki/Motor_vehicle_emissions)

Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project – Assiut - Final
**Impacts associated with sludge disposal**

Based on the sludge analysis, the landfill category, either hazardous or non-hazardous, will be identified. If found non-hazardous, it will be sent to the nearest dumpsite/landfill. If hazardous, it will have to be sent to the Nasreya Centre in Alexandria. Landfill disposal of sludge shall be practiced by licensed waste contractors; the process could be easily monitored by the RSU/PMU. However, the landfill disposal of sludge has the following risks/negative environmental impacts:

- Loss of resources
- Waste directives in many parts of the world prohibit the disposal of organic wastes (or place an upper limit of around 5% of total organic carbon in the waste for it to be accepted for disposal). The potential of applying similar laws in Egypt during the life cycle of the project exit and this puts a risk on the sustainability of the landfill disposal option.
- Although the waste contractor could be monitored, random/illegal dumping of the sludge on agricultural lands or water streams still remains possible. Impacts of sludge on water include eutrophication, potentially leading to hypoxia which causes reduction in specific fish and aquatic animals’ populations. Also, sludge leakage back to canals and drains will offset positive environmental impacts of the WWTP.

The overall assessment indicates that the impacts due to landfill disposal of sludge should be considered negative of minor significance due to the relatively low amount expected to be generated and hence a low probability of contaminating soil and surface water. An alternative and preferred disposal method such as the reuse as RDF in cement industry and have fewer environmental risks as compared with the application on agricultural lands (which is discussed below).

**Impacts associated with sludge application on agricultural lands**

If sludge is sufficiently dried and treated/stabilized, prior to being reused (i.e. applied to land), there is no foreseen environmental and health impacts upon condition that sample analysis proves that sludge does not possess hazardous characteristics.

The main environmental and health risks arise from incomplete/absence of sludge stabilization. In such case, there is an increased risk that the sludge might contain a high pathogen content. Potential health hazards to human and animal health could arise from the application of sludge to agricultural crops because dumping raw sludge on agricultural lands could lead to the production of contaminated crops, especially if applied directly to plants. The consumption of these crops, their handling by vendors, and any contact with soil by farmers may also have biological and health impacts. These are also considered some of the main form of human exposure to agricultural sludge contaminants.\(^\text{10}\)

\(^{10}\) Smith, S. R. (2000): Are controls on organic contaminants necessary to protect the environment when sewage sludge is used in agriculture. - Prog. In Environ., 2, 129-146.
Studies have shown that fluid bio solids found in sludge, treated or untreated, adhere to forage crops\textsuperscript{11}. The effects of such compounds and pollutants on humans are dependent on the amount of soil and crops ingested by livestock. Due to the high health risks involved and the direct contact with soil which could occur, the impacts associated with sludge application on agricultural lands should be considered of Moderate to high significance with respect to both soil and health, as illustrated in the Table below.

<table>
<thead>
<tr>
<th>Impact parameters</th>
<th>Impact</th>
<th>Probability of occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>(P)<em>(A)</em>(B)*(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge application to agricultural lands</td>
<td>Soil and agricultural land contamination due to application of untreated sludge</td>
<td>0.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13.5</td>
</tr>
<tr>
<td>Human health issues and diseases</td>
<td>0.5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

5.5.2.4 Mitigation and monitoring measures

**Mitigation measures**

**Sludge handling and treatment**

- Following the drying process, the stabilization and hygienisation of sludge using quicklime should be implemented on site.
- The sludge and lime should be thoroughly mixed. A pH not less than 12 and a temperature not less than 55°C should be maintained for at least 2 hours after mixing.
- A manual for sludge treatment shall be developed and should be annually revised based on the actual sludge quality, actual quantity, new laws and regulations.
- A de-sludging plan shall be developed which should include the following measures:
  - Maintenance of service roads around the ponds
  - A plan for solids removal from the oxidation ponds shall be developed which will be protective of the liner system
  - A plan for measuring the depth of solids (sludge) accumulated in the oxidation ponds shall be developed using suitable equipment

o Ensure that collected sludge is transferred to a sludge dewatering facility (or a sludge drying area) and then to an adjacent sludge storage area with minimal spills.
o Ensure that discharge of water effluent from the sludge dewatering facility is collected back to the evaporation pond
o The sludge shall be stored and transported in closed drums to minimize environmental impacts.

• Workers handling sludge, or working near sludge tanks in the WWTP should wear suitable gloves and boots. Hygiene instructions should be disseminated to workers, before they start working. These instructions should be clearly illustrated in posters placed in the offices and rest rooms of workers.

Sludge application on land (if proven feasible by PIU):

It is very important to ensure that sludge is of adequate quality for reuse. The quality of the sludge has to fulfill the quality standards for heavy metals as indicated in Table 5.3 according to the Executive Regulations of Law 93/1962, and the US EPA threshold concentrations of heavy metals of sludge to be applied on agricultural land (whichever is lower). The monitoring activities for assessing the sludge quality and the effectiveness of the treatment are included in the sludge management monitoring activities in Table 7.4.

• Sludge must not be applied to soil in which fruit and vegetable crops are being grown, or less than ten months before fruit and vegetable crops are to be harvested.
• Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge.
• Treated Sludge shall not be used as fertilizer unless it has been tested and approved by (i) the competent administrative authority within the Ministry of Housing, (ii) the Ministry of Health and (iii) EEAA after preparing an EIA for the production, distribution, utilization and disposal process, if necessary.
• Health precautions and buffer zones should be respected and indicate that the application of sludge should be within the following ranges according to soil type (law 93/1962): 8-14 m³/feddan/year for thick soil, 10-16m³/feddan/year for medium soil and 12-20m³/feddan/year for light soil

Sludge Use as RDF (if proven feasible by PIU):

• Dried sludge could be sent to cement factories as RDF according to a contractual agreement between HCWW and the Cement Company. In that case the need for lime treatment should be reconsidered if it will affect the calorific value/properties of the sludge.
• If the sludge was found hazardous (based on the sludge sampling results), it shall be handled by workers wearing PPE and transported by a licensed contractor to a cement factory licensed to incinerate hazardous wastes.

Sludge disposal in landfill:
• If sludge cannot be reused, the right landfill category must be determined. Based on the chemical analysis of the sludge, it should be sent to the respective landfill (HW landfill or non HW landfill).
**Table 5.3: Egyptian and USEPA standards for land application of sludge**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentration limit (Law 93/1962)</th>
<th>Concentration limit (USEPA Part 503.13)</th>
<th>Cumulative Pollutant Loading Rate (USEPA Part 503.13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>2,800 mg/kg</td>
<td>2,800 mg/kg</td>
<td>2,800 kg/ha</td>
</tr>
<tr>
<td>Copper</td>
<td>1,500 mg/kg</td>
<td>1,500 mg/kg</td>
<td>1,500 kg/ha</td>
</tr>
<tr>
<td>Nickel</td>
<td>420 mg/kg</td>
<td>420 mg/kg</td>
<td>420 kg/ha</td>
</tr>
<tr>
<td>Cadmium</td>
<td>39 mg/kg</td>
<td>39 mg/kg</td>
<td>39 kg/ha</td>
</tr>
<tr>
<td>Lead</td>
<td>300 mg/kg</td>
<td>300 mg/kg</td>
<td>300 kg/ha</td>
</tr>
<tr>
<td>Mercury</td>
<td>17 mg/kg</td>
<td>17 mg/kg</td>
<td>17 kg/ha</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>18 mg/kg</td>
<td>Deleted in 1994</td>
<td>Deleted in 1994</td>
</tr>
<tr>
<td>Selenium</td>
<td>36 mg/kg</td>
<td>100 mg/kg</td>
<td>100 kg/ha</td>
</tr>
<tr>
<td>Arsenic</td>
<td>41 mg/kg</td>
<td>41 mg/kg</td>
<td>41 kg/ha</td>
</tr>
</tbody>
</table>

**Monitoring measures**

- The project operator should undertake continuous monitoring of pH of immature sludge drying beds. Logs of pH values should be used for controlling the lime dosing.
- Taking representative sludge samples (every 3 months or whenever sludge is being sold) and analyze it according to requirements of Law 93/1962.
- Periodical medical examination for the workers and lab analysis.

**5.5.3 Impacts due to handling and disposal of non-hazardous wastes**

**5.5.3.1 Impact significance and evaluation**

Non-hazardous wastes are expected to be generated during the operation of the PS and WWTP. These will result from the cleaning and scrubbing of inlet filters (contaminated solid particles), as well as from the daily activities of workers. The latter will comprise of a mix of food residual, plastic and paper packages. The first potential impact would be the contamination of soil, groundwater and/or surface water due to the uncontrolled disposal of contaminated solid wastes. Another potential impact would be the loss of natural resources (for recyclables) if recycling has not been implemented. Other impacts would include negative visual impacts if waste is accumulated in front or around the PSs and the WWTP. Burning of the accumulated wastes would impact the air quality around the PS and the WWTP sites, and could emit toxic emissions especially if plastic substances were among the waste streams.

Accumulation and/or uncontrolled disposal of organic wastes (food residuals) would also result in potential impacts on the health and hygiene of both general public and on-site workers by attracting vermin to the site such as birds, rodents or insects which can act as disease vectors. This will result in spread of disease, and disruption of the natural ecosystem. Odor may also be generated following long periods of accumulation due to the decomposition of some organic wastes, which will be an annoyance to both general public and on-site workers.
The evaluation of impacts due to non-hazardous waste generation during the operation phase is illustrated in the Table below. Most of the impacts should be considered of Moderate significance, which is mainly due to the proximity of receptors (with respect to the PSs). The negative impact of non-hazardous waste generation is expected to be fully controlled by implementing the mitigation and monitoring measures listed in the following section.

### Evaluation of impacts due to non-hazardous waste generation

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact parameters</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Probability of Occurrence (P)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temporal Scale (A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spatial Scale (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intensity (C)</td>
<td></td>
</tr>
<tr>
<td>P*(A)<em>(B)</em>(C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of natural resources</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Health impacts</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Soil and groundwater</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Surface water</td>
<td>0.5</td>
<td>4</td>
</tr>
<tr>
<td>Air quality due to open burn</td>
<td>0.5</td>
<td>4</td>
</tr>
<tr>
<td>Visual Impacts</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

#### 5.5.3.2 Mitigation and monitoring measures

A waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of potential non-hazardous wastes shall be developed and implemented by the project’s operator. This plan shall define exact procedures and locations for waste management and disposal.

**Mitigation measures for non-hazardous wastes**

- Implement a segregation system based on compatibility of different waste streams
- Specify an area/containers for non-hazardous wastes which accommodate for the generated segregated streams
- Dispose of non-recycled wastes in the nearest landfill.
- Register the amounts of disposed of wastes and keep waste disposal and transportation receipts/manifests, to be ready for review by EEAA.
- Prepare schedule for solids and oils removal from household separation unit. Sludge from household interceptors and septic tanks should be discharged to the WWTP.
- Remove oil from oil separators in restaurants and bakeries and dispose it in domestic solid waste disposal sites.\(^{12}\)
- Daily removal of PS screens waste to domestic solid waste disposal sites
- Stabilizing separated grit with lime, dry it in separate drying beds and dispose dry grit in domestic solid waste disposal sites

**HCWW/PIU should adopt the measures listed above and ensure that all waste relevant information (types, amounts, disposal methods, etc.) are included in the environmental register of the plant.**

**Monitoring measures for non-hazardous wastes**

- Regular inspection of the waste storage area (for PS's and WWTP's sites)
- Regular inspection of the waste disposal manifests.

### 5.5.4 Impacts due to handling and disposal of hazardous substances and hazardous wastes

#### 5.5.4.1 Impact evaluation due to handling of hazardous substances

As mentioned in the project description chapter some of the hazardous substances required for operation processes include diesel for standby generators, lubricating oils and laboratory chemicals.

Diesel and lubricating oils will be used and usually have some hazardous and toxic properties. However, the workers handling them are expected to have high awareness regarding their risks. The higher risk in this regard will be that associated with the necessary disposal of empty containers. Impacts on soil (and groundwater) quality could result from fuel storage tank leakage. Secondary containment shall be therefore incorporated in the design as to ensure a minimum of 110% external volume.

Laboratory chemicals comprise of many hazardous substances and liquids. The health risks due to the handling of hazardous substances should be considered of **Major Significance**. However, implementing safety induction classes, operational health and safety procedures in addition to implementing the normal laboratory operating procedures including the preparation of COSSH forms and wearing PPE ensure that the impact’s significance is reduced.

#### 5.5.4.2 Impact evaluation due to handling of hazardous wastes

Hazardous wastes may also be generated during the operation phase such as spent oils and empty chemical containers. The storage and disposal of these waste streams have to be carefully performed as to abide by the national legal framework (Chapter 2). In addition to that, these hazardous wastes if not handled, stored and disposed of according to engineering best practice would have major and irreversible effect as follows:

\(^{12}\) It has been assumed that new separators will be installed according to adequate engineering specs. It has been also assumed that the oil has been oxidized to an extent that it is not considered flammable thus not considered as hazardous waste.
• Mishandling and uncontrolled disposal of hazardous liquid and solid wastes have major health impacts for on-site workers, inhabitants in the project’s area of influence, people who get in contact with waste during transportation and disposal, and flora and fauna exposed to such wastes.
• Uncontrolled disposal of hazardous wastes, in particular in liquid form, would cause soil contamination through direct contact or leaching.
• There is a high possibility that uncontrolled disposal of hazardous wastes may affect the groundwater quality, through extended leaching since the groundwater level is high in Assiut governorate.
• Air quality could also be highly affected since uncontrolled dumping of hazardous and non-hazardous materials would result in most of the cases in open burning and potential release of toxic emissions.

The impacts listed above are evaluated as presented in Table below. Most of the impacts should be considered of **Moderate significance** and will be fully controlled by implementing the mitigation and monitoring measures listed in the following section.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability of Occurrence (P)</th>
<th>Temporal Scale (A)</th>
<th>Spatial Scale (B)</th>
<th>Intensity (C)</th>
<th>P*(A)<em>(B)</em>(C) Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous Waste generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of natural resources</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Health impacts</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Soil and groundwater</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Air quality due to open burning</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Visual Impacts</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

### 5.5.4.3 Mitigation and monitoring measures

**Mitigation measures for handling of hazardous substances**

1. Diesel ASTs should be surrounded with impermeable bund with a capacity equal to the AST capacity. Any leaked diesel from ASTs should be pumped to diesel trucks until the leakage in AST has been repaired. No USTs should be used in the project; this has been further discussed in the screening criteria.
Mitigation measures for the handling and disposal of hazardous wastes

A waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of potential hazardous wastes shall be developed and implemented by the project’s operator. This plan shall define exact procedures and locations for waste management and disposal. The waste management plans should also refer to health and safety procedures, and emergency procedures for containing and managing accidental spillages.

HCWW/PMU should adopt the measures listed below and ensure that all waste relevant information (types, amounts, disposal methods, etc.) are included in the environmental register of the plant. In addition to that, a separate hazardous waste register (according to the Egyptian Laws) has to be prepared, containing all information relevant to the generation, handling and disposal of hazardous wastes.

a) General measures

- All types of hazardous waste can only be transported by licensed hazardous waste service providers and disposed of in licensed landfill. Both, the service providers and disposal sites have to be identified at the beginning of the operation phase. At the time of producing this study, the nearest and only hazardous waste disposal site is the Nasreya Centre in Alexandria.
- The different types of hazardous wastes should not be mixed.
- Spent mineral oils shall be collected, stored in sealed containers and recycled using a licensed company which also has to be identified at the beginning of the operation phase.
- Remove oil from oil separators in petrol stations and workshops and dispose it in hazardous solid waste disposal sites.
- Use appropriate procedures for handling chemicals and petroleum products during facility operation.

b) Adopting an Identification system for hazardous wastes generated on site

The operator shall be able to identify the different potential hazardous wastes. Identification shall be performed according to the Egyptian hazardous waste classification system by the operator’s in-house staff (PMU-EM and RSUs or with the aid of an independent waste management consultant).

c) Storage and Management of the waste accumulation area

The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light:

- It is recommended that the maximum period for storing hazardous waste is 270 days from the start date of accumulation of waste.
- The storage area must have a water supply
- A hazardous waste label that has a “Hazardous Waste” mark on it must be placed on the container while still at the generation point.

Monitoring measures
1. Diesel leaks from ASTs will be detected through visual observation. Any leakage should be documented in monthly reports, along with measures taken by the operator to contain the leakage.
2. Records of empty containers returned to vendors, or contaminated soil transported to hazardous waste facilities should be kept in the WWTP, along with signatures of hazardous waste facility operator acknowledging receipt of the containers.
   - Registering the amount of hazardous waste sent for disposal and archiving the collection and disposal receipts. This shall be done in the form of a waste register as required by the Egyptian law.
   - Regular inspection of the waste storage area
   - Regular inspection of the site to identify random disposal of waste materials
   - The containers should be inspected monthly for leaks or any other form of damage and are kept in good condition.
   - Regular inspection of the site to identify randomly dumped hazardous waste materials.

5.5.5 Summary of impact assessment during the operation phase

The Table below shows a summary of the impact assessment during the operation phase.
<table>
<thead>
<tr>
<th>Activities causing the impact</th>
<th>Overall Impact significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ambient Noise</td>
</tr>
<tr>
<td>Operation of gravity sewer and house connections</td>
<td>N/A</td>
</tr>
<tr>
<td>Operation of the FS including all sub-components</td>
<td>Minor</td>
</tr>
<tr>
<td>Operation of PUs</td>
<td>N/A</td>
</tr>
<tr>
<td>Operation of WWTP including all sub-components</td>
<td>Moderate</td>
</tr>
<tr>
<td>Impacts due to Hazardous Waste generation and hazardous substances handling</td>
<td>N/A</td>
</tr>
<tr>
<td>Impacts due to non-hazardous waste generation</td>
<td>N/A</td>
</tr>
<tr>
<td>Impacts associated with the issue of final treated effluent in irrigation</td>
<td>N/A</td>
</tr>
<tr>
<td>Impacts to Sludge Management</td>
<td>Minor</td>
</tr>
</tbody>
</table>
5.6 SOCIO-ECONOMIC IMPACTS

5.6.1 Methodology

Environmental and social impacts were assessed on several levels to provide accurate results about the project impacts, available alternatives, appropriate mitigation measures necessary for reducing the negative impacts of and maximizing potential positive impacts. These impacts were classified into two types: direct or indirect impacts and short or long-term impacts. Assessment of impacts is divided into impacts during construction and operation phases.

Although it is difficult to calculate socio-economic impacts in a quantitative method, but assessment was conducted based on several indicators that can be monitored as follows:

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Time of impact</th>
<th>Type of impact</th>
<th>Level of impact</th>
<th>Sensitivity of recipient</th>
<th>Duration of impact</th>
<th>Scope of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>During construction</td>
<td>Negative - Positive +</td>
<td>Direct In direct</td>
<td>Children Youth Elderly Women</td>
<td>Short term Long term</td>
<td>Limited Moderate High</td>
</tr>
</tbody>
</table>

5.6.2 Perceptions towards the project

Before monitoring the impacts, it was important to record the sample perception towards the project (this data was collected during the original field work held in 2014). The perception was mostly positive. 25% of the sample mentioned that the project will help in cleaning the houses and streets and getting rid of malodors. 22.4% mentioned that the project will save the costs of cesspit pumping and pesticides. 18% said that the project will remove the burdens of pumping the cesspits and will help prevent spread of insects and diseases. In addition to other benefits that will be gained by the community as a whole.

<table>
<thead>
<tr>
<th>Respondent point of view</th>
<th>sample</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streets / houses cleaning</td>
<td>21</td>
<td>24.70%</td>
</tr>
<tr>
<td>Saving costs of pumping</td>
<td>19</td>
<td>22.40%</td>
</tr>
<tr>
<td>People’s relieve</td>
<td>15</td>
<td>17.60%</td>
</tr>
<tr>
<td>Diseases prevention</td>
<td>14</td>
<td>16.50%</td>
</tr>
<tr>
<td>Insects prevention</td>
<td>4</td>
<td>4.70%</td>
</tr>
<tr>
<td>Environment protection</td>
<td>4</td>
<td>4.70%</td>
</tr>
</tbody>
</table>
5.6.3 Identification of Potential Impacts during Construction

Impacts are an important factor to determine the success of the project. Environmental studies aim at monitoring impacts and suggesting different mitigation measures to limit negative impacts. Positive impacts are very limited during construction phase. Usually the community suffers more during this phase.

5.6.3.1 Positive Impacts

**WWTP and PSs**
Positive impacts during construction of the WWTP, timber forest and pump station can be summarized as follows:

Direct Impacts:

1. Creating job opportunities for companies working in construction of sewage networks. The company usually hires around 60 workers, technicians and engineers during construction of the pump stations, divided as follows: 3 engineers, 3 administrative support staff, 35 skilled workers (drivers, artisans..etc) and 20 non skilled workers generally from the local community (excavation and construction).
2. Reviving economic activities for shops supplying construction material in the area, due to selling necessary construction material.
3. Reviving some restaurants and small shops which sell meals for workers. Especially were workers will be living in the village.

**Gravity sewers and FMs**
1. Creating opportunities for companies working in contracting and construction of sewage networks. The expected number of employed labourers will be about 300 persons divided as follows: 5% engineers, 40% skilled workers, and 60% non skilled workers (from the surrounding area).
2. Reviving economic activities for some restaurants and workers in the business of selling meals to the workers, especially were workers will be living at the area.

5.6.3.2 Negative Impacts

**WWTP and PSs**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Weight</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>disputes prevention</td>
<td>1</td>
<td>1.20%</td>
</tr>
<tr>
<td>Treatment costs</td>
<td>1</td>
<td>1.20%</td>
</tr>
<tr>
<td>Protection of agricultural lands</td>
<td>1</td>
<td>1.20%</td>
</tr>
<tr>
<td>House protection</td>
<td>4</td>
<td>4.70%</td>
</tr>
<tr>
<td>Solving the problem</td>
<td>1</td>
<td>1.20%</td>
</tr>
</tbody>
</table>
1. Potential temporary inconvenience as result of the construction activities. This could be in the form of accumulation of wastes (both construction and domestic waste in the construction areas, associated odor, air emissions, especially dust as a result of excavation. These impacts are of temporary nature and will be of moderate severity, particularly since in some cases the construction areas may be 4-5 meters away from residential areas, where the streets are quite narrow.

**Gravity sewers and FM**

1. Impacts on other infrastructure networks, especially drinking water, which may lead to disruption of other services.
2. Impacts on old buildings near the excavation areas, which may cause impacts on the occupants.
3. Impacts on road quality, it is widely known that the contractors do not usually rehabilitate the streets. Subsequently, there is a high probability of street conditions deterioration.

**5.6.4 Identification of Potential Impacts During Operation Phase**

**5.2.4.1 Positive Impacts**

**WWTP and PSs**

1. Creating job opportunities for engineers, technicians and non skilled workers at the stations. Only 10 job opportunities can be offered the 2 PSs, including 4 opportunities for the local community (administrative and services). In addition to 18 job opportunities can be offered at the WWTP.

**Gravity sewers and FM**

1. Provision of sewage services to wide sector of the community as part of the government development plan to deliver quality services to citizens.
2. Ending the current problems related to sewage and sanitation.
3. Provision of sewage services to the four clusters will decrease the demand on evacuation cars, leading to improving evacuation services at other villages.
4. Increasing the value of houses after connecting to the sewage network.
5. Possibility for provision of other infrastructure services afterwards such as natural gas.
6. Improving the health conditions of the population especially school children who are currently suffering.
7. Improving the socio-economic conditions of families by saving the amounts paid currently for evacuation services. This was posing a lot of economic burden upon families. Based on the analysis of the savings related to this issue, the dwelling pays consumption of water and wastewater in one bill each 3 months. The average consumption is about 50 EGP per each three months. Wastewater cost represents
only 1/3 of the total cost. Thus, sewage evacuation costs are about 15 EGP. It is almost half of one round of septic tanks evacuation vehicle. Regarding maintenance of the network, the service is provided free of charge for community people. However, the community collect limited amount of money as tips for the workers. Consequently, we can conclude that the households will benefit from the savings of wastewater evacuation.

8. Improving the quality of the groundwater, as a result of stopping leakage from septic tanks to the ground aquifer.

From a Gender perspective, women suffer more from the current sewage situation, the project will lead to the following positive impacts:

9. Relieving the financial burden for female headed families related to evacuation of septic tanks. Women who support their families suffer more from the recurrent evacuation cost.

10. Improving the quality of life for women who bear the household responsibilities. They are the ones who stay more at home and suffer from the odours of the septic tanks.

11. Women will no longer have to carry used water outside of the house in order to dispose of it.

12. Improving the health conditions of the families will lower the burden that mothers face in cases of child sickness.

5.6.4.2 Negative Impacts

1. Lack of efficient maintenance for networks may cause several problems to the surrounding area, including overflow of wastewater.

2. Illegal household connections to the system may cause over flooding to the sewage network.

Mitigation measures
• Raising awareness among the local community about the negative impacts of illegal connections.
• In case of illegal connections the water company has the right to file a case against the person. The official procedure for connection is that the household has to receive a clearance from the LGU before approval to connect to sewage network.
• In all cases the water company conducts regular maintenance for the sewage network. The water company is responsible to clear regular blockage from the network.

5.6.5 Impact Assessment and Proposed Mitigation Measure during the Construction Phase

In the current section, impacts are classified according to the type of activity.

5.6.5.1 WWTP and PSs

1. Potential temporary inconvenience as result of the construction activities. This could be in the form of accumulation of wastes (both construction and domestic waste in
the construction areas, associated odor, air emissions, especially dust as a result of excavation. These impacts are of temporary nature and will be of moderate severity.

Mitigation measures

- Conduct education and awareness campaigns on environmental and health issues.
- Integrate protection measures nearby schools and densely populated areas

5.6.5.2 Gravity sewers and FMIs

2. Impacts on other infrastructure networks, especially drinking water, which may lead to disruption of other services.

Mitigation Measures:

- Conducting some surveillance activities to detect any available pipelines or networks (water or electricity)
- Coordination with the Local Governmental Units and the water and network companies to repair any damages. The contract should pay for this cost.

3. Impacts on old buildings near the excavation areas, which may cause impacts on the occupants.

Mitigation Measures:

- Boreholes should be used to identify the type of soil and the potential of impacts on the current structures
- In case the soil is fragile, wood support may be provided to the houses and land
- Measuring ground water levels before construction

4. Deterioration of street conditions due to the lack of street rehabilitation

Mitigation measures:

- A time plan should be developed for street rehabilitation
- Inform the local community with any potential delay of street rehabilitation
- Paving the streets immediately after the construction. That should be done by specialized companies or the contractors but not by the Local Governmental Units
- Monitor the process of street rehabilitation and realistic fines should be applied on the entities responsible of street rehabilitation
5.6.7 Impacts on vulnerable groups

This project has several positive impacts in addition to some negative impacts on vulnerable groups such as:

Positive Impacts

1. The project has several positive impacts on women, since it will ease the burden of carrying water to throw it away in the septic tank or the street. Improving the living conditions of community members especially children, which reduces the risk of illness. Mothers have to care for sick children at the house.
2. Providing sanitation services for free for the poorest groups. This will make poorest groups feel that the government cares for them and is concerned with their welfare.
3. School children will benefit from the project. Awareness raising seminars can be held at schools.

Negative impacts

1. Vulnerable groups such as children and elderly groups are more likely to face serious accidents during excavation works. This is a serious threat based on experience from previous projects. It is recommended to impose strict compliance measures for the contractor with the proposed mitigation measures. Mitigation measures include proper signage and providing alternative routes for pedestrians to avoid accidents.

5.6.8 Assessment of land acquisition impacts in relation to OP 4.12

Original Land allocated for the WWTP (During ESIA preparation in 2014):
Nawawra’s WWTP; State owned lands, situated in the desert east of Nawawra’s village. The total area is 1794 Feddan, 9 Qirates and 19 Sahm (7,536,514 meter square). Among this total area, the ISSIP II phase 1 project will only use 492 Feddan (92 Feddan for the WWTP and 400 Feddan for the tree forest). The remaining land are allocated for future projects of NOPWASD.

The National Organization for Potable Water and Sanitary Drainage (NOPWASD) has communicated with the governorate and the army force to transfer the ownership of the land allocated for the Nawawra’s WWTP to NOPWASD. A presidential decree is expected to be issued soon. The site visits paid to the WWTP site reflected no type of any illegal customary ownership of the plots of lands. As well, no tenants were located on the lands, particularly due to the nature of land (desert vacant land).

Updates in 2016, NOPWASD is no longer involved in the project. Its responsibilities have been transferred to Assuit Water and Wastewater Company.
Updates on the assessment of land acquisition impacts for the new WWTP location, (August 2016):

1. The total land for the project has been allocated by the Cabinet decree number 1666/2015, with a total area of 8309512 m².

2. The new location of the WWTP is located inside the total area allocated for the project. The area allocated for the WWTP is 389125 m². The area allocated for the WWTP is located inside of the total area allocated for the project as shown in the following figure 5.1.

Figure 5.1 – Layout of the total area of the project as well as the area allocated for the WWTP

As discussed in section 3.7 with regards to the update of land use in the ESIA prepared in August 2016, the area is public owned land that was clear of any land use. The Consultant’s team has paid a visit to the new location during August 2016 in order to assess the current situation of the site.

Based upon land inspection through the various visits conducted by the consultant and the water company even before the consultant, the land has never been used for any activities.
It can be concluded that no impacts will occur as a result of the change of the location with regards the current land use.

Lands allocated for the PSs
Al Etmania PS; 2500 m² of state owned lands - the ownership of the land has been preliminary transferred to NOPWASD.

Al Nawawra’s PS; State owned, site previously used as a water station site. The approvals associated with the lands listed above are included in Annex 2.

The ESIA team has paid two visits to the PS’s sites identified above. Surrounding neighboring communities were invited for interviews/discussions regarding the current uses for the lands. The site visits were conducted by the ESIA team’s Social Expert and Assiut RSU’s staff, on the 5th and 6th of October 2014. The results of the visits and the discussions reflected no type of any illegal customary ownership of these plots of lands. As well, no tenants were located on the lands.
Based on the above, OP 4.12 on Involuntary Resettlement will not be triggered for the project in Assiut Governorate.

5.6.8 Impacts related to land encroachments during operation

Land encroachments are common phenomena at Upper Egypt. A general trend is that owners of cultivated areas would start reclaiming surrounding desert areas. Later they would start paying necessary usufruct fees until they finally settle the situation with the government to own the land as a status quo.

It can be expected that encroachments may occur especially at the timber forest area. Owners of the land surrounding the station may gradually start using the land of the timber forest for farming or pasturing. This will have an impact on the total capacity of the timber forest causing shrinking of the area allocated for growing trees.

Mitigation measures:

- Strict protection of the timber forest site must be applied.
- Protection measures must include fencing and adding proper signage that this land is owned by Assuit Water Company.
- Regular patrolling of the land is also recommended to avoid situations of land users settling in and later claiming permanent rights.
- Registering of any encroachments on the timber forest as soon as they occur in order to take necessary legal procedures immediately.
5.7 HEALTH IMPACT ASSESSMENT

5.7.1 Introduction
This section reflects on the potential health impact of implementing the ISSIP II project. The current practices of using cesspits are expected to stop and the withdrawal and collection of wastewater using evacuation vehicles and random discharging of the wastewater in drains and canals would come to an end. This project is expected to have a positive impact on the current health conditions of the beneficiaries and the community.

To explore the potential impact of the project, this section will shed light on the diseases transmitted through water. Then, it will reflect on the most common diseases that are associated with contaminated water and sanitation (Annex B). The consultant has prepared a set of tools and questionnaires, based on which, he has collected health baseline information in the project’s areas of influence (please refer to Chapter 4). Supplementary interventions to improve health conditions related to water and sanitation and the logical framework to evaluate hand washing awareness campaigns will be given as well as a monitoring plan to evaluate the health outcome of the project (Chapter 7).

Figure 5. – Routes of fecal disease transmission and protective barriers, source: Wagner & Lanoix 1959
The categories of diseases that could be addressed by improving water, sanitation and hygiene in Egypt are infectious waterborne, water-based, water washed, and water-related insect diseases. In order to prevent the spread of these diseases any intervention should contain three components: improving sanitation, improving water quality and enhancing personal hygiene (Figure 5…). ISSIP II is primarily concerned with improving sanitation; nevertheless improving water quality is an essential secondary outcome of improving sanitation.
5.7.2 Health impact assessment

It is expected that the implementation of the ISSIP II project could prevent several diseases (Figure 5. ) and improve health conditions of the villagers in the project’s area of influence. The potential impacts of the project’s implementation on the different diseases identified during the health baseline investigation are discussed below.

Source (Prüss-Üstün et al. 2008)

5.7.2.1 Diarrheal diseases

ISSIP II baseline assessment indicated that around half of the children between 1-5 years in had at least one diarrheal episode in the last period while around one quarter of adults had diarrheal diseases. The core of the WHO recommendations to prevent diarrheal diseases is to improve water supply, sanitation facilities and hygienic education (WHO website, 2014). Improving sanitation through ISSIP II can contribute to 36% reduction in the diarrheal attacks for children under five years (Cairncross et. al, 2010). However, including hygiene improvement supplementary interventions will reduce diarrhea by 48% (Cairncross et. al, 2010).

Persistent diarrhea is the second leading cause of death among children. 90% of deaths from diarrhea are linked to the lack of access to safe, clean drinking-water and basic sanitation, as well as poor hygiene (WHO, 1999). Diarrhea can, also, lead to nutritional deficiencies, and reduced resistance to other infections, impaired growth and development. More than half of child deaths due to diarrhea are associated with malnutrition.

It could be argued that diarrhea is treated easily with oral rehydration therapy (ORT). Nevertheless, the ORT focuses on reducing mortality rates from diarrhea rather than addressing the morbidity. WASH interventions is superior as it is a primary prevention. In Addition, ORT does not treat the persistent diarrhea and dysentery which can lead to under nutrition (Bartram & Cairncross 2010).

5.7.2.2 Intestinal parasites

The baseline assessment indicated the self reported prevalence of some intestinal worms is round 10 percent. Amoebiasis is thought to be present in most of the villagers while
Guardias is prevalent to lesser extent. Other intestinal worms such as Ascaris, Trichuris and hookworm are spread among villagers.

These parasites can lead to malnutrition, anemia, and retarded growth and cognitive abilities depending upon the severity of the infection (Chan, 1997). All are spread due to contamination of the environment with feces containing parasite eggs. Hence, improved sanitation through ISSIP II and improving domestic hygiene through supplementary interventions are effective control measures of intestinal parasites.

5.7.2.3 Bilharzias/Schistosomiasis

ISSIP II baseline suggested that, in some villages, around quarter of males have Bilharziasis. In reviewing epidemiological studies, we found that well-designed water and sanitation interventions (such as ISSIP II), which prevent feces and urine from entering surface water, can reduce 77% of schistosomiasis.

Bilharziasis is a serious disease that has severe consequences such as anemia, impaired growth, poor cognition, and substandard school performance. Potential long-term effects include bladder cancer and serious kidney, liver or spleen complications. The parasites enter water from feces and urine and, after a short development period in a freshwater snail, are able to infect new human hosts by penetrating the skin; schoolchildren are particularly at risk through playing in water.

5.7.2.4 Children malnutrition

Around one third of the Egyptian children are suffering from malnutrition (EDHS, 2008). Poor growth in early life increases the risks of illness and death in childhood. The two immediate causes of childhood under-nutrition are inadequate dietary intake and infectious diseases such as diarrhea. Evidence from the cluster-randomized trials suggests that comprehensive interventions such as ISSIP II can have a long term impact on children growth. Supplementary plans to improve child nutrition should be included to ensure the impact of ISSIP II on children nutritional status.

5.7.2.5 Respiratory illness

Acute respiratory infections (ARI) are the global leading cause of child mortality. It causes 4.2 million deaths each year (Black et al 2010). A systematic review of the effect of hand washing with soap on acute respiratory illnesses found, after updating 23% risk reduction (Rabie & Curtis 2006). Hand washing interventions decreased significantly the incidence of all illnesses and absenteeism among school children. In Egypt, an intervention study in 60 elementary schooled showed a reduction of 40% of absenteeism due to influenza-like illnesses, and a reduction of 50% of absenteeism due to laboratory confirmed influenza cases (Talaat et al., 2011).

5.7.2.6 Trachoma

ISSIP II baseline estimated that a considerable number of villagers are suffering from eye infections. Trachoma is an eye infection and it is the leading cause of preventable blindness worldwide. Trachoma is an endemic disease in Egypt. It is transmitted via contact with discharge from the eyes of an infected person. Evidence shows that, improved sanitation through ISSIP II can lower trachoma levels by 30% through reduction in fly populations which act as vectors for the infective agent and which breed in scattered human feces. A 25% reduction of trachoma can be achieved through provision of supplementary interventions to provide an adequate water supply and increased personal hygiene practices.
5.7.2.7  Disease Vectors
Mosquitoe larvae are known to live in small, shallow water bodies. An environmental impact assessment13 carried out for a wastewater treatment plant in Lebanon, financed by USAID, stated that mosquitoes do not travel more than 500 m from their breeding sites. Flight range studies14find that most female Ac. aegypti may spend their lifespan in or around the homes where they develop into adults and they typically fly an average of 400 meters. This suggests that people, rather than mosquitoes, promptly spread viruses within and between populations and residences. Studies15 on the distribution of Ac. aegypti demonstrate that females normally fly 100-500 m. This range is small in comparison to other mosquito species.
The newly proposed location of the WWTP is located over 1,000 m away from the nearest residential area. However, the impact can be minimized by controlling the larva populations with some techniques that can be implemented. For instance, emulsifiable concentrates of mosquito larvicides applied by a continuous drip methods has achieved excellent results.

5.7.2.8  Health status of the people working in sewage disposal
People who are working on sewage disposal and drainage need a special assessment. Adding to the above mentioned diseases burden. They might be suffering from musco-skeletal diseases related to carrying on heavy weights. They might be also more prone to infected skin infections and sores. ISSIP II will lead to a career shift for this vulnerable group. Changing workers career to different field, either to serve in the wastewater treatment plant or elsewhere, will reduce the burden of occupational health hazards (please refer to section 5.4.6 for the set of proposed mitigation measures related to occupational health and safety).

According to the health hazard manual16for wastewater treatment plants developed by Cornell University, hepatitis B does not appear to be effectively transmitted via exposure to wastewater itself. In the US, hepatitis B has not been linked to exposure to sewage in, according to the US based Center to Protect Workers’ Rights17. Based on Trout et al.’s

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17 CPWR (2004). Biological Hazards in Sewage and Wastewater Treatment Plants
study on the transmission of hepatitis A among wastewater workers, wastewater work was not significantly associated with an increase in the prevalence of the disease.

Cornell University’s health hazard manual for wastewater treatment plants states that organisms (found in aerosols) that can affect lungs include mycobacterium tuberculosis and other enteric viruses but studying the effect on health is difficult when WWTPs are in the area they serve. Such is the case for the Nawawra WWTP and therefore, it would be difficult to determine whether or not the route of transmission for a disease was wastewater contact or contact with other people. It is important to note that, as explained in more detail in section 4.3.4 of this ESIA study, prevalent winds blow from the NW. Therefore, in the even that aerosols are released into the atmosphere, they are likely to travel away from the Nawawra village, located NW of the proposed site, and move SW.

A visit to an operational WWTP in Al Quseya village in Assiut was carried out on 7 and 8 August 2016 to get a more factual understanding of the potential health impacts. The WWTP in Al Quseya is located 5 km away from the nearest residential area, and 500 m away from an ambulance unit. Based on observation, the WWTP does not have a timber forest to discharge its treated wastewater into; instead, treated wastewater is discharged into ponds and left to evaporate naturally. To gain a better understanding of whether or not the risk of disease is increased in proximity to a WTTP, the Consultant conducted interviews with members of the local health unit and hospital in Al Quseya, Assiut on 7 August 2016. Responses concluded that diseases contracted in Al Quseya cannot be associated to the operation of a WTTP, and those diseases found in Al Quseya are common across many villages in Egypt, including those without WTTPs. The Consultant concludes that after site revisits and reassessment of potential impacts, there will be no further, unforeseen adverse health impacts resulting from the shift of the site location.

In summary, the impact of ISSIP II with supplementary interventions can be divided into three phases.

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short term impact

- Improve sanitation
- Improve water quality
- Improve personal hygiene and reduce other risk factors (Knowledge, attitude, practice)

Intermediate term impact

- Decrease the spread of diarrheal diseases
- Decrease the spread of intestinal parasites
- Decrease the spread of respiratory illnesses
- Decrease the spread of Bilharzias
- Decrease the spread of eye infection including trachoma

long term impact

- Improve children nutrition
- Improve children cognitive development
CHAPTER 6 ANALYSIS OF ALTERNATIVES

The objective of analyzing different project alternatives is to evaluate project options, which have been considered during the ISSIP II FS phase, from the environmental perspective. This analysis of alternatives shall help in reaching/confirming optimum options for the project design from both the economical and environmental perspective.

6.1 NO PROJECT ALTERNATIVE

The ISSIP II is expected to result in significant environmental improvement in the project areas. The existing situation, in which target areas are deprived from sanitation services, leads to major environmental and health problems to inhabitants. Even though there are some impacts associated with ISSIP II construction and operation as previously indicated, the overall environmental impacts are expected to be positive.

Environmental improvements expected from the ISSIP, over the existing situation include:

- Improving surface water quality in the project areas. Although there are risks of discharging noncompliant effluent to drains as discussed earlier, overall the pollution loads received in water courses will be significantly reduced, because currently a large ratio of the generated sewage is discharged by tankers to drains. Although the rate of sewage generation could increase as a result of the project, due to expected increase of water consumption as reaction to the availability of sanitary drainage, the better effluent quality discharged will make the received load of each pollutant much lower.

- Improve the quality of groundwater and the high water table in most of the project areas, through preventing infiltration of sewage to groundwater

- Although there may be odour problems associated with operation of WWTP and PSs, the impacts of odours and vectors problems are expected to significantly improve. In the existing situation the infrequent evacuation of cesspits and land discharge of sewage makes the odours/vectors problems much more acute and disperse than the expected impacts around WWTPs and PSs.

- The socioeconomic benefits of the project significantly overweigh the expected impacts. The ISSIP II shall upgrade the quality of life of inhabitant, through improving public health, reducing water borne diseases, improving psychological stress resulting from odours, vectors, stagnant water, unavailability of appropriate urban drainage, …etc. Although there may be few economically effected groups such as inhabitants of neighboring lands to WWTPs and PSs and cesspits evacuation contractors, much more groups will gain economic benefits such as workers in construction and operation and owners of served areas with the sanitation services, in which real estate prices are expected to raise.

The overall environmental and social advantages are believed to significantly overweigh the disadvantages, especially when the ESMP is implemented. Moreover, the ISSIP II will directly contribute to achieving the objectives of the IIIMP, which target significant improvement to water resources management in the project area.
The ISSIP II institutional structure will have a Monitoring and Evaluation unit (M&E) to verify the expected improvements of ISSIP II to surface water quality. Operation of the ISSIP II will be designed to achieve maximum possible improvement, which will be continuously monitored by the M&E Unit.

Regarding the timber forest, it is expected to result in significant environmental improvement in the project area. The existing situation, in which target areas are deprived from sanitation services, leads to major environmental and health problems to inhabitants. Even though there are some impacts associated with ISSIP II construction and operation as previously indicated, the overall environmental impacts are expected to be positive. Treated wastewater from the proposed WWTP, if not reused, will serve no useful purpose.

Environmental improvements expected from the ISSIP, over the existing situation include:

- Economizing on the use of freshwater resources, thereby reducing demand for freshwater resources already under pressure
- Decreasing the demand for fertilizer, thereby reducing run-off problems associated with fertilizer use
- Enhancing soil quality in the area, otherwise poor in nutrients
- Increasing green spaces in areas largely characterized as being barren desert land

The overall environmental and social advantages are believed to significantly outweigh the disadvantages, especially when the ESMP is implemented. Moreover, the timber forest will directly contribute to achieving the objectives of the IIIMP, which target significant improvement to water resources management in the project area.

6.2 ALTERNATIVES OF PIPING MATERIALS

The are no direct preferences for piping materials from the environmental and social points of view related to the direct impacts of the ISSIP. However, the preferences will be based on the life cycle analysis of these piping materials.

Using asbestos pipes is completely not allowed in the ISSIP II, due to the problems associated with its disposal during the project maintenance and/or decommissioning.

6.3 ALTERNATIVES FOR WWTP LAND SELECTION

The newly proposed WWTP location was selected based on its economic and environmental merits. Economically speaking, the newly proposed WWTP is located in the north western corner of the area designated for the project, strategically making use of the project area, rather than leave unused spaces as was originally case for the previously proposed WWTP location. The newly selected location, as was the previous one, does not require any resettlement or compensation for locals as it is situated in barren desert land with no known historical or current uses. Therefore, the newly proposed WWTP is not likely to have an impact on the livelihood of locals. The WWTP has also been strategically located based on climate data, such as wind direction, in order to avoid potential odor impacts.
6.4 ALTERNATIVE TECHNIQUES FOR BIOLOGICAL TREATMENT

Options for biological treatment include:
- Extended aeration activated sludge process
- Trickling filters
- Rotating Biological Contactors
- Up-flow Anaerobic Sludge Blankets
- Stabilization ponds

The first four alternatives depend on engineered methods for enabling aerobic (or anaerobic in UASBs) bacteria to stabilize organic matter in wastewater. Whereas stabilization ponds utilize on natural systems for the stabilization process.

With the exception of minor environmental concerns associated with methane venting or flaring in the USAB process, there is no clear preference among the first four alternatives. Although the activated sludge process is more common it will be left to the PIU to select the best feasible alternative from contractors’ offers, given that these offers include mitigation measures recommended in the EMP.

The stabilization ponds alternative is less expensive in operation while achieving similar treatment objectives. The disadvantage is the large area requirements which will lead to a greater loss of agricultural land. Therefore the stabilization ponds alternative is the least preferable.

The project proponent will adopt the oxidation pond system. The system will comprise of the following components:

Stage 1 until 2030:
- Anaerobic ponds; two ponds will be operating during the first stage (until 2030), each has a capacity of around 15,000 m³, 44m x 87m (dimensions at mid-height)
- The ponds will incorporate for two parallel lines to account for emergency and/or maintenance periods.
- For stage 2 (until 2050), the number of ponds will be doubled to become 4.
- Sludge storage ponds; Two ponds will serve during stage 1, to be doubled in stage 2. Each pond will be 100m x 30m x 1m. The capacity is designed to accommodate to the generated sludge for a period of three years (which is estimated at 6257 m³)
- Facultative ponds; Two ponds will be operating each with an area of 23870 m² and depth of 1.5m. The number of ponds will be doubled to become 4 during the second stage (until 2050).
- Maturation ponds; four ponds will be operating, each with an area of 9000m² and a depth of 1m

6.5 ALTERNATIVES TO THE UTILIZATION OF SLUDGE

The sludge generated from WWTPs could be utilized in conditioning agricultural lands, after being subjected to a stabilization and hygienization process as previously discussed in Chapter 5. Sending to cement factories as RDF is a second option, and the third option is
dispose of it in landfills. Various environmental risks associated with these options have already been discussed.

The utilization of sludge as RDF is the preferred option, followed by the use on agricultural land, providing there are safe concentration levels of heavy metals, safe biological properties, and safe land application rates followed according to the specifications of Law 93/1962 and the guidelines of USEPA. The reason for this preference over landfill disposal is that volume of waste received in disposal sites will be reduced and an equivalent quantity of fuel/chemical fertilizers, associated with an environmental cost for their production, will be saved.

On the other hand, the sustainability of using sludge as a land conditioner will be doubtful if the costs for sludge quality monitoring are not covered by revenues from sale of the sludge. In other words if revenue from the sale of sludge does not cover the extra WWTP operating costs resulting from stabilization processes and monitoring activities recommended in the ESMP, it will be better to go for the disposal alternative.

Although land disposal of sludge will be practiced by a waste contractor as mentioned in the EMP, the process could be easily monitored by the RSU to check its compliance with the waste disposal contract. However, as previously presented in Chapter 5, the landfill disposal of sludge has the following risks/negative environmental impacts:

- Loss of resources
- Waste directives in many parts of the world prohibit the disposal of organic wastes (or place an upper limit of around 5% of total organic carbon in the waste for it to be accepted for disposal). The potential of applying similar laws in Egypt during the life cycle of the project exit and this puts a risk on the sustainability of the landfill disposal option.
- Although the waste contractor could be monitored, random/illegal dumping of the sludge on agricultural lands or water streams still remains possible.
- Nearby disposal sites have not been identified during the site visits at most of the villages and the practice of waste burning has been observed. So the risk of not finding a close disposal site exists.

The co-composting of sludge with solid waste is a fourth option and will result in environmental benefits but the main disadvantage will be that the handling of sludge will not be within the control of the ISSIP. Adequate sludge handling methods, in terms of the safe application of land will not be guaranteed in the composting plant location. Furthermore, the mixing with solid waste may cause degradation of the sludge quality as a land conditioner because most of the existing solid waste composting plants do not separate impurities efficiently, especially glass.

However, the conclusion which could be made is that under the current conditions, the following options are listed in order of preference:
• RDF
• Stabilization and soil fertilizer
• Controlled landfill disposal.
• Co-composting with solid waste

6.6 ALTERNATIVES FOR IRRIGATION WATER RESOURCES
According to a USAID report issued in 2010\textsuperscript{20} on the reuse of treated wastewater, Egypt has 57 billion cubic meters of renewable water resources available to it per year. With 97\% of that quantity coming from the Nile, and the remaining 3\% from precipitation (mainly confined to the north coast), the quantity of supply is fixed, meanwhile demand continues to rise. The use of treated wastewater will relieve the demand for freshwater resources while simultaneously recharging groundwater resources.

6.7 ALTERNATIVES FOR TREATED WASTEWATER USE
Treated wastewater, if not reused, will be left in oxidation ponds with no useful purpose. This may result in its disposal, therefore incurring costs on the project proponent, or its dumping in directly in the desert. Instead, using the treated wastewater will allow the WWTP to continue operating at its designed capacity, while accruing environmental and economic benefits to both the area and project proponent.

6.8 ALTERNATIVES FOR TIMBER FOREST LAND SELECTION
The proposed location of the timber forest was selected based on its economic and environmental merits. Economically speaking, the timber forest surrounds the newly proposed location for the WWTP located in the north western corner of the area designated for the project; therefore, strategically making use of the project area, rather than leave unused spaces. The timber forest’s areadoes not require any resettlement or compensation for locals as it is situated in barren desert land with no known historical or current uses. Therefore, the timber forest is not likely to have an impact on the livelihood of locals.

CHAPTER 7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 OBJECTIVES OF THE ESMP

The Environmental and Social Management Plan (ESMP) presented in this chapter reflects the implementation procedures and mechanisms as well as the roles and responsibilities for the implementation of the mitigation measures and monitoring activities for the expected impacts as outlined in Chapter 5.

Environmental and Social Management and Monitoring matrices have been prepared for the actions to be taken during the full Project cycle:

- Tables 7.1 and 7.2: Environmental Management and monitoring matrices during the construction (and decommissioning) phase
- Tables 7.3 and 7.4: Environmental Management and monitoring matrices during the operation phase
- Tables 7.5 and 7.6: Social Management and social monitoring matrices respectively.

The effectiveness of the proposed mitigation measures and environmental management plan will be then monitored throughout the construction and operation phases of the project. Monitoring will be performed using calibrated equipment (where relevant) and standard techniques in order to ensure accuracy of the results. These results will be stored in an easy to access database and will be analyzed and corrective/additional actions shall be undertaken as necessary.

7.2 ESMP INSTITUTIONAL SET-UP

The project is implemented through the following institutional setup:

**Project Steering Committee (PSC)**: provides guidance and ensure coordination between different project stakeholders. The steering committee is headed by the Minister of Housing and Urban Development and is formed of representatives from NOPWASD, HCWW, the RSUs at the four governorates, Ministry of Water Resources and Irrigation, Ministry of Health and Population, Ministry of Agriculture and Land Reclamation, Ministry of Social Affairs and Ministry of State of Environmental Affairs.

**Project Implementation Unit (PIU)**: is established at the HCWW and is responsible for the overall management of the project, coordinating between different project units, and monitoring of the contracts implementation. The PIU is also responsible for the overall supervision of the Monitoring and Evaluation (M&E) component of the ISSIP project.

**Rural Sanitation Units (RSUs)** are established at the four governorates with mandate of planning, social mobilization / awareness, tendering, construction supervision, in addition to delegation of operation and maintenance tasks, and supervision of their performance.
Local Public Units: responsible for granting necessary government approvals during the project activities. They are also considered a main actor in handling complaints.

7.3 ROLES AND RESPONSIBILITIES FOR IMPLEMENTATION AND SUPERVISION OF THE ESMP

The mitigation measures and monitoring activities that are recommended shall be implemented according to the institutional set-up shown in Section 7.2. Tables 7-1 to 7.6 present the responsibilities of different stakeholders for mitigation measures and monitoring activities during the construction and operation phases.

The current environmental management scheme is as follows:

- **PIU:**
  Roles and responsibilities:
  - Overall supervision for the environmental performance of the project.
  - Monitoring the compliance with the ESMMP through follow up on the reporting presented by the RSUs.
  - Regular reporting to the WB on the implementation of the ESMMP.

- **Environmental Management Expert (PIU-EM):**
  Roles and responsibilities:
  - Supervising the environmental performance of PIU, Construction Supervision Consultants (CSCs) and M&E.
  - Responsible for assigning specialized environmental experts for specific tasks, as will be indicated later in the mitigation measures, liaising with the RSU for support from other stakeholders and project counterparts.

- **Social Development Officer (PIU-SDO):**
  Roles and responsibilities:
  - Work in partnership with the different stakeholders to support and facilitate implementation of the project.
  - Ensure participatory approaches to support implementation of community initiatives (related to land acquisition - donation).
  - Manage and coordinate relevant events and activities
  - Facilitate communication and negotiation with the target communities and relevant government stakeholders
  - Monitoring of the implementation of the Social Management plan through reporting from the RSUs
  - Coordinate and foster partnerships with relevant stakeholders including Local Government Units and civil society initiatives
  - Reporting on the land acquisition process: ensuring a diligent, transparent and well documented process is followed in acquiring land for the project.
SDO should participate in the proposed capacity building activities to be able to successfully conduct his role. Such as the following capacity building topics:

- OP 4.12 World Bank regulations, Egyptian Legal requirements
- Effective communication and negotiation skills
- Mechanisms for building effective community participation
- Monitoring and evaluation of ESMP
- Effective handling of grievance mechanisms (including documentation)
- Data collection and analysis methodology
- Participatory Rapid Approach

- Each RSU has one Environmental Regional Officer (RSU- ERO) and one Social Regional Officer (RSU-SRO), report on environmental management and monitoring activities as assigned to them in Tables 7.1 to 7.4. PIU-EM will provide CSCs with checklist of items to report on environmental measures taken during construction; these checklists will be part of the tender document for Construction Supervision Consultants.

RSU is responsible for liaising between different environmental and social management and monitoring activities undertaken at the local level, and the PIU-EM and PIU-SDO respectively. The RSU-ERO will also supervise contractors during construction to ensure the implementation of the ESMMP which became an integral part of the contractual procedure starting phase II.

**On building the capacities of the RSU – SRO on awareness and information sharing:** It is important to develop a framework for awareness and information sharing with the local community. This framework should be based on the principles of strategic communication. This framework needs to analyze strategically the local community and provide a solid framework on addressing any risks that may emerge.

- The M&E will report to the PIU-EM on their activities, so as to take necessary actions to maintain water quality improvement expectations of the ISSIP

Implementation of the ESMMP should be adapted to the local community in order to maximize the positive impacts and minimize negative impacts, especially among the most vulnerable groups such as (farmers, village population and women). These groups should be consulted during the construction to ensure their views are taken into account and appropriate actions are taken to mitigate the negative impacts. Consultation with the local community and the relevant stakeholders are among the requirements for the success of the ESMMP which is also a role that should be enhanced for the RSU-SRO.

The organizational setup for the ISSIP and the input of the environmental and social management team is illustrated in Figure 7.1.
Reporting on ESMMP

- Currently reporting on the ESMMP measures is done on a monthly basis. The RSU presents a monthly report to the PIU about the implementation of the ESMMP. The report.
- Monthly reports are presented to the PIU-EM and PIU-SDO who is responsible to ensure that the EMP measures are implemented in due course according to the progress report.
- The monthly report\(^{21}\) include monitoring on the following activities: implementation of the ESMMP – Grievances – Community engagement activities and the contractor compliance with the ESMMP
- The PIU-EM and PIU-SDO report to the PIU manager
- The PIU reports to the World Bank on quarterly basis
- Currently all RSUs use the same forms.
- It is recommended to document all the received forms or grievances in the same manner. Ensure proper documentation of all activities. It would also be important the RSU members do not change regularly to ensure they are more familiar with the procedures and the local community.

\(^{21}\) The monthly report is presented regularly since September, 2015.
7.4 GRIEVANCE AND COMPLAINTS MANAGEMENT

Currently the HCWW and its affiliate companies are implementing an effective grievance mechanism in order to enhance their abilities to justly address community concerns. Grievances and redress represent one of the important processes that should be tackled carefully during the project implementation. Establishing a grievance mechanism is perceived as a key proactive measure to ensure that the concerns of local communities are sufficiently handled in an efficient manner and that all local feedback is well heard.

The GRM will be a key mechanism to deal with future complaints related to different issues during the construction and operation of the ISSIP project such as complaints related to odor in case of any malfunction of the WWTP or PS or any other complaint that may occur during operation.

7.4.1 Grievance Mechanism

This part explains the following the grievance mechanism implemented by the HCWW and its affiliate companies:

1. Institutional responsibility for handling grievances
2. Grievance tiers
3. Grievances channels
4. Response to grievances
5. Monitoring of the GRM
6. Disclosure of grievances

In general all grievances and communications are registered and the actions taken/responses are tracked and recorded. Proper administration and internal records of stakeholder complaints and communications are essential for transparency and quality as well as ensure responsiveness and reporting to stakeholders on the resolution of grievances.

All grievances are acknowledged within 10 days. Due to the complexity of some of the complaints, not all of them can be resolved immediately. In this case medium or long-term corrective actions are required, which needs a formal procedure recommended to be implemented within 30 days. The current practice to acknowledge receipt of the grievance is:

1. The aggrieved person (community member or worker) is informed of the proposed corrective measure.
2. In case no corrective action is required, the aggrieved person is informed accordingly.
3. Implementation of the corrective measure and its follow up is communicated to the complainant and recorded in the grievance register.

22The current grievance mechanism allows community members as well as construction workers to submit their grievances.
The current Grievance mechanism depends mainly on the project level GRM. The RSU-SRO is the main channel for receiving grievances. It is worth mentioning that the Water Company applies an open door policy in coordination with the Local Governmental Units as well as the community leaders who refer any grievances to the SRO.

A. Institutional responsibility for handling grievances
The RSU is the main responsible entity for handling grievances. The PIU-SRO works in close collaboration with the Local Government Unit, to investigate the submitted grievance. The main responsibilities for the PIU-SRO are as follows:

i. Raise awareness among the local community about the grievance channels.
ii. Collect complaints received from different communication channels
iii. Document received grievances
iv. Direct grievances to the concerned bodies
v. Follow up on proposed procedures
vi. Document, report and disclosure of grievances
vii. Monitor grievance handling activities

B. Grievances’ tiers:

The current grievance mechanism consists of two tiers:

Tier 1:
1. The RSU – SRO is responsible for handling the first level of grievances.
2. He/ She is responsible for documentation of the received grievances and will follow up on taken measures.
3. He/she will then direct the grievance to relevant internal department at the water company or other concerned stakeholders
4. The RSU – SRO is responsible for informing the local community of the outputs of the grievances.

The expected duration for resolving the grievance at this level is 15 days.

Tier 2:
In case no resolution is reached, the aggrieved person should resort to the second level as follows:

1. A grievance mediation committee is formed of the concerned LGU and relevant government stakeholders. The committee is responsible for examining grievances that were not solved at the first tier then make necessary decisions towards solving the grievance.
2. The mediation committee convenes periodically.

C. Grievances channels
Complaints can be submitted using different channels including submission by hand, mail or by email. Given the diversity of socio-economic characteristics among the community...
members appropriate grievance mechanisms must be identified to communicate with them, and the following are the main channels of communication to submit complaints:

1. RSU-SRO (project level GRM)
2. The hotline ‘125’
3. Website, facebook page and other social media

The RSU-SRO currently conducts awareness raising activities among community leaders and local NGO’s in order to refer any complaints to the SRO. These are not considered as an official grievance channel but they play a role in referring any complaints: (Religious institutions in the area (mosques and churches), NGO’s, local public units and community leaders).

D. Response to grievances

Responses to grievances will be conducted through the following channels:

1. Response should be given using the same channel used by the aggrieved person to submit the grievance. Written grievances are replied in written format. Grievances submitted via the website are replied by email. In cases of phone calls the RSU-SRO calls the aggrieved person to inform him of the resolution.
2. Grievances are resolved within the identified time frame, to give the community the sense of responsibility towards their concerns and taking effective measures to solve arising issues.

E. Monitoring of the GRM

All grievance activities are monitored in order to verify the process. The following indicators are applied in the monitoring process:

1- **Grievance register**: Received grievances per month (Channel the grievance was submitted, gender, age, basic economic status of the complainants should be mentioned)
2- Type of grievance received (according to the topic of the complaint)
3- Number of grievances solved
4- Dissemination of the results of the grievances
5- Level of satisfaction with the resolution
6- Documentation efficiency
7- Efficiency of response to grievance provided (efficiency in time and action taken)

F. Disclosure of grievances

All grievances and communications are registered and the actions taken/resolutions are disseminated through the LGU, NGOs and Assuit Water and WasteWater Company website. Frequently asked questions for the most common grievances and methods for handling them can be added to the website. This report must be published through the website of the water company, the NGO’s and the LGU.

7.4.2 Assessment of the current grievance mechanism
It is worth mentioning that Assuit RSU has made a good practice in implementing an effective GRM. This section aims to shed light on the current practices of the GRM.

1. Advertising of the GRM

In order to ensure that the GRM is working efficiently, the RSU conducts awareness raising activities to inform the local community of the channels to submit the grievances. The GRM has been advertised at the Local Government Units, and through the local NGOs and the main streets in the villages where the project will be implemented. The RSU at Assuit Water and WasteWater Company has prepared a brochure including a brief description about the project activities in addition to the contacts of the RSU to enable the local community to submit any grievances. Refer to Annex 8 for a sample of the advertising sheet of the GRM and samples of the grievance brochures.

2. Grievance Receipt Acknowledgment and Documentation

The RSU-SRO is responsible for receiving grievances submitted using the different channels. He/she prepares a form including the details about the aggrieved person as well as the subject of the grievance. The grievance is documented using a special reference code for internal reference. Then a copy of the grievance is sent to the PIU for documentation as well. The aggrieved person is then informed of the procedures for resolving the grievance as well as the duration. Then the RSU forwards the grievance to the concerned department of the relevant authority.

Samples of the grievance receipt form as well as the acknowledgment form are included in Annex 8.

3. Grievance resolution and monitoring

The RSU-SRO prepares a monthly report about the outcomes of the submitted grievances to the PIU. (Form included in annex 8)

In order to measure the effectiveness of the GRM, the HCWW is planning to conduct a quarterly survey among the aggrieved persons. This step will also allow updating the GRM based upon the results of the survey to avoid any weaknesses.

7.5 CONTRACTORS RESPONSIBILITIES

The contractors’ responsibilities in the implementation of the ESMP have been indicated in Tables 7.1 and 7.2, and summarized in Annex 6: Obligations of the Contractors. They are responsible for issuing all necessary permits to do their work.

7.6 EMERGENCY PLAN
- An emergency plan during the operation phase shall be developed by a specialized agency and in accordance with the rules and standards for safety and security and under the supervision of the competent authorities.

- During the construction phase, the contractor will be responsible for the preparation of the emergency plan for the construction sites.

- The emergency plan will include the following measures:
  - identify stakeholders
  - Fire-fighting plan
  - Emergency response plan for spills and leaks of hazardous substances and oils.
  - First Aid and Injury Plan
  - Evacuation plan in case of emergency

- A competent team of employees will be identified to work with the project’s emergency team and shall receive certified training.
- Emergency scenarios shall be developed and run regularly.

7.7 DEVELOPMENT OF ENVIRONMENTAL REGISTERS

The Environmental Register (ER) and Hazardous Waste Register will be developed in accordance with Appendix 3 of Law No. 4 of 1994, amended by Law No. 9 of 2009 and using the Guidelines for environmental registers issued by the Department of Environmental Inspection at EEAA.

The Contractor and Project Operator will be responsible for the issuance of the ER under the supervision of the HCWW.

7.8 ESMP ESTIMATED BUDGET

7.8.1 Required Human Resources and Training

The PIU-EM, SDO and four RSU-ERO will be recruited on full-time basis for the project. This will cover all four governorates. At least 2 RSU-EFS should be recruited for each RSU, so as to back each others in site supervision of construction works and to help the RSU-ERO in supervision and reporting. After the completion of project's first phase, estimated by two years, another RSU-EFS will need to be recruited for following up operators of centralized and decentralized systems. The following Table summarizes the required human resources for environmental management of the ISSIP II for the four governorates, their correspondent qualifications and estimated salaries.
Human Resources

<table>
<thead>
<tr>
<th>Staff Member</th>
<th>Number</th>
<th>Recruited by</th>
<th>Minimum Qualifications</th>
<th>Estimated annual cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIU-EM</td>
<td>1</td>
<td>PIU</td>
<td>- Environmental degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 10 years technical experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 5 years environmental management experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Experience in wastewater treatment</td>
<td>L.E. 96,000</td>
</tr>
<tr>
<td>PIU - SDO</td>
<td>1</td>
<td>PIU</td>
<td>Social degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 10 years technical experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 5 years social management experience</td>
<td>L.E. 96,000</td>
</tr>
<tr>
<td>RSU-ERO</td>
<td>4</td>
<td>RSUs</td>
<td>- Technical degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 5 years technical experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Experience in wastewater treatment</td>
<td>L.E. 144,000</td>
</tr>
<tr>
<td>RSU-SRO</td>
<td>4</td>
<td>RSUs</td>
<td>- Technical degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 5 years technical experience</td>
<td>L.E. 144,000</td>
</tr>
<tr>
<td>Total for 4 governorates</td>
<td></td>
<td></td>
<td></td>
<td>L.E. 480,000</td>
</tr>
<tr>
<td>Total for Assiut</td>
<td></td>
<td></td>
<td></td>
<td>L.E. 120,000</td>
</tr>
</tbody>
</table>

The following training courses are recommended for the environmental staff, to acquire know-how for the tasks assigned to them. The training budget covers the four governorates.

**Training requirements**

<table>
<thead>
<tr>
<th>Training Support</th>
<th>Components</th>
<th>Time schedule</th>
<th>Participants</th>
<th>Estimated cost</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training programs on the ESMP and WB regulations</td>
<td>Project characteristics and legal aspects, environmental impacts, mitigation measures, monitoring, evaluation, reporting, documentation (shapes and figures)</td>
<td>Before implementation</td>
<td>PIU staff members RSU at the water company</td>
<td>20,000 L.E per session</td>
<td>A week training, field visits.</td>
</tr>
<tr>
<td>Environmental auditing and inspection</td>
<td>Environmental auditing, check lists and reporting</td>
<td>Once before implementation then once every two years</td>
<td>PIU staff members RSU at the water company</td>
<td>25,000 L.E per session</td>
<td>A week training</td>
</tr>
<tr>
<td>Documentation and data analysis</td>
<td>Data analysis methods and documentation</td>
<td>Once before implementation then once every year</td>
<td>PIU staff members RSU at the water company</td>
<td>25,000 L.E per session</td>
<td>A week training</td>
</tr>
<tr>
<td>Preparing reports, communication skills, public outreach, social</td>
<td>Once before implementation</td>
<td>RSU at the water and company</td>
<td>25,000 L.E per session</td>
<td>A week training</td>
<td></td>
</tr>
<tr>
<td>community outreach, social surveys and inspection</td>
<td>surveys, sampling, data analysis and preparing report</td>
<td>then once every two years</td>
<td>wastewater company</td>
<td>session</td>
<td>training and on job training</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------</td>
<td>-------------------</td>
<td>---------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Safe handling and reuse of sludge (will be performed at each governorate separately)</td>
<td>Handling options for sludge Safety measures Legal framework Health risks</td>
<td>Once before implementation then once every year</td>
<td>- RSU at the water and wastewater company - Farmers - Water Users Associations, - NGOs</td>
<td>100,000 L.E per session 400,000 L.E. for the 4 governorates</td>
<td>Three days</td>
</tr>
<tr>
<td>Adequate and consistent water quality monitoring</td>
<td>Water quality Testing procedures Sampling procedures Relevant standards</td>
<td>Once before implementation then once every two years</td>
<td>RSU at the water and wastewater company</td>
<td>30,000 L.E per session</td>
<td>One week</td>
</tr>
<tr>
<td>Total Cost for the 4 governorates (for the first round of training sessions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 7.8.2 Management and Monitoring budget

The total budget for the management and monitoring plans as presented in Tables 7.1 to 7.6 is as follows

<table>
<thead>
<tr>
<th>During Construction (presented for a total of two years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management (L.E)</td>
</tr>
<tr>
<td>Monitoring (L.E)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>During Operation (annual cost)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management (L.E)</td>
</tr>
<tr>
<td>Monitoring (L.E)</td>
</tr>
</tbody>
</table>
It is worth noting that the presented costs do not include the following expenses, for certain measures recommended in the ESMP, because they are already included in the main project budget:

- Survey of existing WWTPs and the correspondent improvements (if any) for these WWTPs to qualify them for receiving ISSIP wastewaters
- Geotechnical investigations for PSs
- PPE for workers
- Delays of chance finds
- Warning signs
- Cost of lime
- Installation of oil/solid separators at commercial units to prevent sewers clogging
- Annual efficiency assessment for WWTPs
- Subsidies for unaffordable groups of community

7.9 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING MATRICES

Tables 7.1 to 7.6
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activities causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of Direct Supervision</th>
<th>Means of Supervision</th>
<th>Estimated Cost of Implementation / Supervision Assumptions</th>
<th>Total Costs&lt;sup&gt;23&lt;/sup&gt; (L.E.)</th>
</tr>
</thead>
</table>
| Air Quality Impacts | Construction of WWTP, PSs, FMs and gravity sewers | Implement a construction site management plan including the following measures:  
  - Store construction materials in pre-identified storage areas.  
  - Cover friable materials during storage.  
  - Wet the network of unpaved roads on site. The use of water should be restricted to extremely active areas.  
  - Regulation of speed to a suitable speed (20 km/h) for all vehicles entering the village’s boundaries.  
  - Implement preventive maintenance program for vehicles and equipment working on site and promptly repair vehicles with visible exhaust fume. | Construction | Construction Contractor | CSC PIU/RSU | Field supervision | - Contractor cost in normal bid price  
  - Normal CSC price | 0.0 |
| Ambient noise impacts | Construction of WWTP, PSs, FMs and gravity sewers | On site Construction noise shall be mitigated to ensure a safe work environment by implementing an occupational health and safety plan, which considers national and international requirements. The plan shall include the following measures:  
  - Ear muffs/protective hearing equipment shall be made available to all workers in noise critical areas  
  - Training on how and when to use protective hearing equipment shall be conducted as part of the workers’ induction sessions.  
  - Place visually clear instructions in areas where noise emissions are significant.  
  - Off-site construction noise shall be mitigated as follows:  
  - Optimize the use of noisy construction equipment and turn off any equipment if not in use.  
  - Regular maintenance of all equipment and vehicles  
  - Stop all construction activities during the night  
  - Communicate the construction schedule with neighboring communities and sensitive receptors  
  - Implement a complaints system | Construction | Construction Contractor | CSC PIU/RSU | Field supervision | - Contractor cost in normal bid price  
  - Normal CSC price | 0.0 |

<sup>23</sup>Costs are estimated over a construction period of two years
Soil and groundwater quality Impacts | Construction of WWTP, PSs, FM and gravity sewers | Design and construct an impermeable protective base layer underlying areas with potential hazardous liquids storage or use. Use appropriate procedures for handling chemicals and petroleum products during facility operation. This includes proper storage, use, and cleanup of these materials. Adjust the proper quantities of water applied in the timber forest, clean drainage canals and consider planting flood tolerant species. Apply contour plowing, conservation tillage and other soil erosion prevention techniques. | Pre-construction & Construction | Construction Contractor | CSC PIU/RSU | Field supervision | Contractor cost in normal bid price - Normal CSC price | 0.0 |

Risks of uncontrolled disposal of non-hazardous solid wastes generated during construction | Construction of WWTP, PSs, FM and gravity sewers | A waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of construction waste shall be developed and implemented by the construction contractors. This plan shall define exact procedures and locations for waste management and disposal. The waste management plan shall include the following measures:
- Implement a segregation system based on compatibility of different waste streams during each phase of project implementation
- Specify an area/containers for non-hazardous wastes which accommodate for the generated segregated streams
- Dispose of non-recycled wastes in the nearest landfill; the location of which needs to be confirmed at the beginning of the construction phase.
- Register the amounts of disposed of wastes and keep waste disposal and transportation receipts/manifests, to be ready for review by the PMU/HCWW.

The measures listed above represent the minimum measures to be included in the waste management plan which will be prepared and implemented by the contractor, and supervised by the PMU/HCWW. They should part of the contracting tender documents.
<table>
<thead>
<tr>
<th>Risks of improper disposal of liquid wastes generated during construction</th>
<th>Construction of WWTP, PSs, FMs and gravity sewers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prior estimation of dewatered liquid volume during the digging works</td>
<td></td>
</tr>
<tr>
<td>• Collect and analyze samples of the dewatered liquid.</td>
<td></td>
</tr>
<tr>
<td>• Arrange for disposal by tankers in nearest sewers, PSs, existing WWTP or pre-determined drain locations, depending on the sample analysis results in consultation with and after getting approval of the CSC and RSU/PMU</td>
<td></td>
</tr>
<tr>
<td>• Evacuation of closed household cesspits and construction site sewage to existing WWTP, or pre-determined drain locations in consultation with and after getting approval of the CSC and RSU/PIU</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Construction</th>
<th>Construction Contractor</th>
<th>PIU/RSU CSC</th>
<th>review Contractor's reports</th>
<th>Normal CSC price - PIU and RSU management cost and normal CSC price</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risks of improper handling and/or disposal of hazardous solid wastes generated during construction</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>A hazardous waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of construction waste shall be developed and implemented by the construction contractors. This plan shall define exact procedures and locations for waste management and disposal. The waste management plans should also refer to health and safety procedures, and emergency procedures for containing and managing accidental spillages.</td>
<td>The measures listed below represent the minimum measures to be included/adopted in the waste management plan which will be prepared and implemented by the contractor, and supervised by the PMU/HCWW. They should be part of the contracting tender documents.</td>
<td>The Contractor shall be able to identify the different potential hazardous wastes.</td>
<td>The Contractor shall be able to identify the different potential hazardous wastes.</td>
<td></td>
</tr>
<tr>
<td>e) General measures</td>
<td>e) General measures</td>
<td>e) General measures</td>
<td>e) General measures</td>
<td></td>
</tr>
<tr>
<td>• All types of hazardous waste can only be transported by licensed hazardous waste service providers and disposed of in licensed landfill. Both, the service providers and disposal sites have to be identified at the beginning of construction works. At the time of producing this study, the nearest (only) hazardous waste disposal site is the Nasreya Centre in Alexandria.</td>
<td>• The different types of hazardous wastes should not be mixed.</td>
<td>• Spent mineral oils shall be collected, stored in sealed containers and recycled using a licensed company which also has to be identified by the contractor.</td>
<td>• The different types of hazardous wastes should not be mixed.</td>
<td></td>
</tr>
<tr>
<td>f) Adopting an Identification system for hazardous wastes generated on site</td>
<td>f) Adopting an Identification system for hazardous wastes generated on site</td>
<td>The Contractor shall be able to identify the different potential hazardous wastes.</td>
<td>The Contractor shall be able to identify the different potential hazardous wastes.</td>
<td></td>
</tr>
<tr>
<td>The Contractor shall be able to identify the different potential hazardous wastes. Identification shall be performed according to the Egyptian hazardous waste classification system by the contractor's in-house staff or with the aid of an independent waste management consultant appointed by the contractor.</td>
<td>Identification shall be performed according to the Egyptian hazardous waste classification system by the contractor's in-house staff or with the aid of an independent waste management consultant appointed by the contractor.</td>
<td>Identification shall be performed according to the Egyptian hazardous waste classification system by the contractor's in-house staff or with the aid of an independent waste management consultant appointed by the contractor.</td>
<td>Identification shall be performed according to the Egyptian hazardous waste classification system by the contractor's in-house staff or with the aid of an independent waste management consultant appointed by the contractor.</td>
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<tr>
<td>g) Storage and Management of the waste accumulation area</td>
<td>Storage and Management of the waste accumulation area</td>
<td>Storage and Management of the waste accumulation area</td>
<td>Storage and Management of the waste accumulation area</td>
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<tr>
<td>The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light.:</td>
<td>The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light.:</td>
<td>The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light.:</td>
<td>The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light.:</td>
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</tr>
<tr>
<td>• It is recommended that the maximum period for storing hazardous waste is 270 days from the start date of accumulation of waste.</td>
<td>• The storage area must have a water supply</td>
<td>• A hazardous waste label that has a “Hazardous Waste” mark on it must be placed on the container while still at the generation point.</td>
<td>• A hazardous waste label that has a “Hazardous Waste” mark on it must be placed on the container while still at the generation point.</td>
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<tr>
<td>h) Emergency Response</td>
<td>h) Emergency Response</td>
<td>h) Emergency Response</td>
<td>h) Emergency Response</td>
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<tr>
<td>For the purpose of first response, when a hazardous substance release is first discovered or witnessed, the individual of concern who had to be previously trained would initiate an emergency response sequence by notifying the proper authorities of the release. The individual will take no further action beyond self-evacuation and notification. The aim of the response at this level is limited to protect nearby persons, property, or the environment from the effects of the release. No trials are performed at this stage to actually stop the release. This level of response includes:</td>
<td>For the purpose of first response, when a hazardous substance release is first discovered or witnessed, the individual of concern who had to be previously trained would initiate an emergency response sequence by notifying the proper authorities of the release. The individual will take no further action beyond self-evacuation and notification. The aim of the response at this level is limited to protect nearby persons, property, or the environment from the effects of the release. No trials are performed at this stage to actually stop the release. This level of response includes:</td>
<td>For the purpose of first response, when a hazardous substance release is first discovered or witnessed, the individual of concern who had to be previously trained would initiate an emergency response sequence by notifying the proper authorities of the release. The individual will take no further action beyond self-evacuation and notification. The aim of the response at this level is limited to protect nearby persons, property, or the environment from the effects of the release. No trials are performed at this stage to actually stop the release. This level of response includes:</td>
<td>For the purpose of first response, when a hazardous substance release is first discovered or witnessed, the individual of concern who had to be previously trained would initiate an emergency response sequence by notifying the proper authorities of the release. The individual will take no further action beyond self-evacuation and notification. The aim of the response at this level is limited to protect nearby persons, property, or the environment from the effects of the release. No trials are performed at this stage to actually stop the release. This level of response includes:</td>
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<tr>
<td>• actions to contain the release from a safe distance</td>
<td>• actions to contain the release from a safe distance</td>
<td>• actions to contain the release from a safe distance</td>
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<tr>
<td>• prevent its spread</td>
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<td>• evacuation</td>
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<tr>
<td>Impacts related to Archaeology and cultural heritage</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>Prior to construction works the project’s construction plan should be presented to the Supreme Council for Antiquities, who shall identify project locations (including PSs, WWTPs, sewer lines and FMs) that require providing protection against possible damage to near antiquities.</td>
<td>Pre-construction and construction</td>
<td>Contractor</td>
</tr>
<tr>
<td>Disturbance of traffic and access difficulty</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>Chance find procedures will be employed, in case an antiquity is found during excavation. The process includes immediate cessation of excavation works, leaving the antiquity object exactly on its found location, taking photographs to document time and status of the object, assigning guards to watch the found antiquity and contacting the Supreme Council of Antiquities to handle the site within 48 hours.</td>
<td>Construction</td>
<td>CSC</td>
</tr>
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<td>All mitigation measures for safeguarding long delays of vehicles and trains traffic will be undertaken by Local Traffic Department. The role of the project management will be focused on involving the authorities in the project planning process, to identify the type of crossing works, and to take permission for the duration and method of execution for specific crossings.</td>
<td>Planning and pre-construction</td>
<td>PIU for approval during planning - Contractor (aided by RSU) for specific approvals right before/during construction</td>
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<td>During the excavation of roads in villages, there should be a wood or metal bridge for pedestrians access over each opened trench. Pedestrian paths beside or across trenches should be as flat as possible, and clearly marked with warning signs that are visible at night. In all cases the maximum length of an open trench in certain road should not exceed 500 meters24.</td>
<td>Construction</td>
<td>Construction Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternate access routes should be identified and communicated with the residents before starting /during construction.</td>
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<td></td>
<td>Assign one worker to be present 24 hours for helping people with difficulty in access or respond to falling accidents</td>
<td>Construction</td>
<td>Construction Contractor</td>
</tr>
</tbody>
</table>

24 This condition has been recommended by the HCWW
### Occupational health and Safety impacts

The Contractor shall adopt an Occupational Health and safety plan during the construction phase. According to OSHA standards, the main mitigation measures to prevent common construction hazards are:

- Workers must follow safety standards and use protective equipment to minimize hazards while trenching and excavating.
- Workers should be trained to identify and evaluate fall hazards and be fully aware of how to control exposure to such risks as well as know how to use fall protection equipment properly.
- Workers must comply with OSHA’s general rule for the safe use of ladders and stairways.
- The scaffolding hazard shall be addressed as stated by OSHA standards. They give specific requirements for the maximum load, when to use scaffolding, bracing systems, and the use of guardrails.
- To prevent Heavy Construction Equipment risk, workers should follow all construction safety guidelines necessary to eliminate the exposure to such injuries and accidents.
- The best way to prevent the Electrical hazard is for the workers to be at a safe working distance away from the power lines. Other precautionary measures include guarding and insulating of the vehicle from which they might work. This would help prevent electrical hazards from injuring them while working.

The Occupational Health and safety plan shall also include the Egyptian Labor law No. 12 for 2003 and the international construction standards requirements, including but not limited to, the following measures:

- Identification of hazard sources to workers
- Eliminating the sources of hazards
- Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to how to use the Personal Protective Equipment (PPE).
- Inspection and testing of all equipment and machines
- Appointing an Accident Prevention Officer at the site to take protective measures to prevent accidents

<table>
<thead>
<tr>
<th>Occupational health and Safety impacts</th>
<th>Construction</th>
<th>Construction Contractor</th>
<th>CSC</th>
<th>Field supervision</th>
<th>CSC normal price</th>
</tr>
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<tbody>
<tr>
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<td>0.0</td>
</tr>
<tr>
<td>Community Safety</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>Designation of restricted areas, such as construction sites</td>
<td>Preparation of an emergency response plan</td>
<td>Provision of necessary rescue equipment</td>
<td>Elaboration and management of a safety guarantee plan</td>
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<tr>
<td>Visual Impacts</td>
<td>Construction of WWTP, PSs, FMs and gravity sewers</td>
<td>To prevent Excavation and Trenching accidents and injuries, both the contractors and workers must follow safety standards and use protective equipment to minimize hazards while trenching and excavating. The sides of the trenches should be strengthened by wood or aluminum reinforcement sheets installed on both sides of the excavated trench, in critical areas (adjacent to existing houses and near canals and drains).</td>
<td>Using fences and warning signs during the construction phase</td>
<td>Using protective barriers and safe walkways</td>
<td>Appointing of an officer on site, to take protective measures to prevent accidents and/or to respond to accidents.</td>
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<tr>
<td>Total costs</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Construction</th>
<th>Construction Contractor</th>
<th>CSC</th>
<th>Field supervision</th>
<th>CSC normal price</th>
<th>0.0</th>
</tr>
</thead>
</table>

| Design, and construct a suitable interim fence to improve the aesthetics until the designed concrete fence is constructed. | Pre-construction & construction | Design Consultant and Construction Contractor | CSC, during the construction phase | PIU during the design phase | Field supervision by CSC | - Contractor cost in normal bid price. | - RSU and PIU management costs | - price | 0.0 |

| Total costs | 0.0 |

<p>| 0.0 |</p>
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost Assumptions</th>
<th>Total Costs (L.E)</th>
</tr>
</thead>
</table>
| Air emissions    | HC, CO% and opacity for construction machinery | Construction site | Onsite gas analyzer measurement for exhaust | Once before construction + once quarterly for each machine during construction | CSC/RSU | - L.E. 800 / machine  
- Number of machines per site, selected randomly is 1  
- Number of sites is 3 | 21,600 |
|                  | Opacity and black flame | Construction site | Visual inspection | Once before construction + once quarterly for each machine during construction | CSC/RSU | | |
|                  | Dust complaints | Construction site | Record and document complaints | Recording to be once complaint is received. Documentation shall be in monthly reports | CSC/RSU | - normal CSC price and RSU management costs | 0.0 |
| Noise emissions  | Noise intensity, exposure durations and noise impacts | Construction site | Onsite noise meter measurements from representative locations (Map1) | Once quarterly during construction | CSC/RSU | - L.E600 / site  
- Number of sites is 3 | 14,400 |
| Complaints from residents | Construction site | Record and document complaints received from residents | Recording to be once complaint is received. Documentation shall be in monthly reports | CSC/RSU | - normal CSC price and RSU management costs | 0.0 |

25 Displayed Monitoring costs are for two years
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Assumptions</th>
<th>Total Costs (LE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Impacts</td>
<td>• Amount of soil disposed of and the amount of soil brought in</td>
<td>Construction site</td>
<td>Record</td>
<td>Whenever soil is disposed of or brought in</td>
<td>CSC/RSU</td>
<td>normal CSC price and RSU management costs</td>
<td>0.0</td>
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<tr>
<td></td>
<td>• Document foul odors in timber forest and increased number of insects, mosquitoes and flies</td>
<td></td>
<td></td>
<td>Bi-annual sampling</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Collect groundwater samples from existing groundwater wells for reassurance to ensure wastewater from timber forest has not caused groundwater contamination</td>
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<td></td>
<td>• Analyze wastewater effluent to ensure it is compliant with Egyptian Code 501/2005 for reuse of treated wastewater in agriculture</td>
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<td></td>
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</tr>
<tr>
<td>Risks of improper handling of waste generated during construction</td>
<td>Accumulation of waste</td>
<td>Construction sites</td>
<td>Regular inspection Observation, documentation</td>
<td>Daily field observation and documentation in monthly reports</td>
<td>CSC/RSU</td>
<td>- normal CSC price and RSU management costs</td>
<td>0.0</td>
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</tr>
<tr>
<td></td>
<td>Amount of delivered hazardous waste to licensed facility</td>
<td>Construction sites</td>
<td>Manifests and waste disposal receipt review</td>
<td>Monthly</td>
<td>Environmental consultant supervising clearance of contaminated sites</td>
<td>- Environmental consultant costs included in his management costs</td>
<td>0.0</td>
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</tr>
</tbody>
</table>

<sup>a</sup> Estimated monitoring cost includes normal CSC price and RSU management costs.
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Costa(^b)</th>
<th>Assumptions</th>
<th>Total Costs (L.E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of improper management of culturally valuable sites</td>
<td>Date, time, locations and status of chance finds</td>
<td>Construction site</td>
<td>Documentation of chance-find procedures</td>
<td>In case an object has been found</td>
<td>CSC/RSU</td>
<td>- normal CSC price and RSU management costs</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Disturbance of traffic and access difficulty</td>
<td>Accidents, complaints and remarks from residents Contractors’ access facilitation adequacy</td>
<td>Construction site</td>
<td>Record and document complaints received from residents</td>
<td>Recording to be once complaint is received. Documentation shall be in monthly reports</td>
<td>CSC/RSU</td>
<td>- CSC normal price</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Occupational Health &amp; Safety</td>
<td>Regular reporting of any accidents, as well as records and reports on health, safety and welfare of workers Regular inspection of workers against pathogenic agents and provision of immunization when needed</td>
<td>Construction site</td>
<td>Record and document accidents – Medical inspection</td>
<td>Monthly</td>
<td>CSC/RSU</td>
<td>- normal CSC price and RSU management costs</td>
<td>0.0</td>
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<tr>
<td>Total Costs</td>
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<td>36,000</td>
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</table>

Table 7-3: Environmental Management Matrix during the operation phase
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
</tr>
</thead>
</table>
| Air Quality and Odour Impacts | Operation of the WWTP and PSs | - Maintain high efficiency of biological treatment and lime application to sludge  
- Regular checks and maintenance of the drainage system to ensure no significant ponding of leachate  
- Handle and store waste in a manner which ensures that it is held securely without loss or leakage, thereby minimizing the potential for pollution  
- Remove waste in a timely manner  
- Maintain and clean waste storage areas regularly  
- Sludge containers should be flushed with water regularly  
- Sludge should be transferred to and in closed containers to minimize odor escape  
- Frequent sludge withdrawal from tanks is necessary to prevent the production of gases | Operation | PO | RSU | Review of monthly reports and field supervision | RSU and normal operation management costs | 0.0 |
| | Establish close communication with the neighboring areas, establish a complaints handling system and assign a staff member in the WWTP to receive odour complaints. This could be done through posters and the distribution of brochures that illustrate the right to complain, and the contacts information of the responsible staff, and the RSU officer assigned to supervise the plant. | Operation | RSU | PIU | - Field audit to ensure that a communication system and complaints handling system are established | - Allow L.E. 6,000 / WWTP / year for awareness  
- Number of WWTP is 1  
- RSU and PIU normal management costs | 6,000 |
| | Supplied standby generators to PSs and WWTPs should be checked with suppliers for their emission standards | Operation | RSU | PIU | - Review certificate for emission standards from the supplier | - Normal supplier price | 0.0 |
| Noise Impacts | Operation of the WWTP and PSs | Off site:  
- Cultivate and maintain a tree belt around the site  
- Implement a complaints system to investigate any noise complaints from neighbouring communities. | Operation | PO | PIU/RSU | - Field audit | - L.E. 10,000 / WWTP for cultivation, irrigation and maintenance  
- Number of WWTP is 1 | 10,000 |
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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<tbody>
<tr>
<td></td>
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<td>On site noise emissions control during operation shall be achieved by implementing an occupational health and safety plan, which considers national and international requirements. This to ensure a safe work environment and to ensure that on-site noise levels stay within the allowable limits. The plan shall include the following measures:</td>
<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>Field audit -Review H&amp;S records</td>
<td>Included in normal operation budget</td>
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<tr>
<td></td>
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<td>• Ear muffs/protective hearing equipment shall be made available to all workers in noise critical areas</td>
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<td>• Training on how and when to use protective hearing equipment shall be conducted as part of the workers’ induction sessions.</td>
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<td>• Place visually clear instructions in areas where noise emissions are significant.</td>
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<td></td>
<td></td>
<td>• Regular maintenance of all equipment and vehicles</td>
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<tr>
<td>Potential Impact</td>
<td>Main activity causing the impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
<td>Responsibility of direct supervision</td>
<td>Means of supervision</td>
<td>Estimated Cost of implementation / supervision</td>
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</table>
| Soil and Groundwater Impacts | Operation of the WWTP | - A leak detection plan shall be developed and implemented for the oxidation ponds. When the leakage rate exceeds a threshold limit defined by the contractor, the WWTP operator shall cease discharge to the identified leaking oxidation pond, and shall implement all necessary corrective action measures to mitigate the liner leakage.  
- Leak-detection monitoring wells may be required to assess impacts to environment.  
- Adopt best practices for irrigation, ensuring water quality and water quantity are maintained to standard  
- The flow connection between the different oxidation ponds should be regularly maintained and cleaned from precipitated sludge  
- Ensure that a layer of water with a depth around 20cm is maintained in any non-operating oxidation pond in order to protect the sealing system and surface material from cracking  
- Maintain and operate oxidation ponds to meet permitted discharge requirements, including proper functioning of the outfall  
- A method for recording the wastewater levels in each oxidation pond shall be provided. This may include staff gages, sidewall depth markings, or pressure-depth sensors.  
- Adjust the proper quantities of water applied in the timber forest, clean drainage canals and consider planting flood tolerant species  
- Create runoff collection ponds to prevent surface run off from potential breaches from seeping into soil or groundwater  
- Sloping and contouring to prevent sliding or collapsing of the oxidation ponds  
- Apply contour plowing, conservation tillage and other soil erosion prevention techniques  
- Adjust water quantities for irrigation of the timber forest and ensure flood irrigation practices are completely prohibited | Operation | PO | PIU/RSU | Review of monthly reports and field supervision | RSU and normal operation management costs |
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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</thead>
</table>
| Risks of improper handling of sludge | Operation of the WWTP | Sludge handling and treatment  
- Following the drying process, the stabilization and hygienisation of sludge using quicklime should be implemented on site  
- The sludge and lime should be thoroughly mixed. A pH not less than 12 and a temperature not less 55°C should be maintained for at least 2 hours after mixing.  
- A manual for sludge treatment shall be developed and should be annually revised based on the actual sludge quality, actual quantity, news laws and regulations.  
- Workers handling sludge, or working near sludge tanks in the WWTP should wear suitable gloves and boots. Hygiene instructions should be disseminated to workers, before they start working. These instructions should be clearly illustrated in posters placed in the offices and rest rooms of workers. | Operation | PO | PIU/RSU | Field supervision and check that the procedures for sludge treatment are documented and are being followed. | PIU and RSU normal management costs | 0.0 |

**Assumptions**

**Total Costs/year (LE)**
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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<td></td>
<td>Assumptions</td>
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<td></td>
<td>Total Costs/year (L.E)</td>
</tr>
<tr>
<td>Sludge application on land (if proven feasible by PIU):</td>
<td></td>
<td></td>
<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>Field supervision and check that the procedures and regulations for sludge management are documented and are being followed.</td>
<td>PIU and RSU normal management costs</td>
</tr>
<tr>
<td>• It is very important to ensure that sludge is of adequate quality for reuse. The quality of the sludge has to fulfill the quality standards for heavy metals as indicated in Table 5.5 according to the Executive Regulations of Law 93/1962, and the US EPA threshold concentrations of heavy metals of sludge to be applied on agricultural land (whichever is lower). The monitoring activities for assessing the sludge quality and the effectiveness of the treatment are included in the sludge management monitoring activities in Table 7.4.</td>
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<tr>
<td>• Sludge must not be applied to soil in which fruit and vegetable crops are being grown, or less than ten months before fruit and vegetable crops are to be harvested.</td>
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<tr>
<td>• Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge.</td>
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<tr>
<td>• Treated Sludge shall not be used as fertilizer unless it has been tested and approved by (i) the competent administrative authority within the Ministry of Housing, (ii) the Ministry of Health and (iii) EEAA after preparing an EIA for the production, distribution, utilization and disposal process, if necessary.</td>
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<td>• Health precautions and buffer zones should be respected and indicate that the application of sludge should be within the following ranges according to soil type (law 93/1962): 8-14 m³/feddan/year for thick soil, 10-16 m³/feddan/year for medium soil and 12-20 m³/feddan/year for light soil.</td>
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<td>Potential Impact</td>
<td>Main activity causing the impact</td>
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<td>Project Phase</td>
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<td>Operation</td>
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<td>PIU/RSU</td>
<td>Field inspection and check that RDF contract is being implemented</td>
<td>PIU and RSU normal management costs</td>
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<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>Field inspection, and documents review</td>
<td>- L.E. 150 / ton sludge above normal operation costs in case of dumpsite. - Potential sludge amount is around 200ton/year/WWTP. - Number of WWTPs is 1 - RSU normal management costs</td>
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<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>Field inspection, and documents review</td>
<td>- Normal PO costs - PIU and RSU management costs</td>
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**Sludge Use as RDF (if proven feasible by PIU):**

- Dried sludge could be sent to cement factories as RDF according to a contractual agreement between HCWW and the Cement Company. In that case the need for lime treatment should be reconsidered if it will affect the calorific value/properties of the sludge.
- If the sludge was found hazardous (based on the sludge sampling results), it shall be handled by workers wearing PPE and transported by a licensed contractor to a cement factory licensed to incinerate hazardous wastes.

**Sludge disposal in landfill:**

- If sludge cannot be reused, the right landfill category must be determined. Based on the chemical analysis of the sludge, it should be sent to the respective landfill (HW landfill or non HW landfill).

**Risks associated with disposal and/or reuse of final treated effluent**

- Implement preventive maintenance Programme to all structures and electromechanical equipment in PSs and WWTPs. The supplier of each equipment should provide a preventive maintenance schedule for supplied equipment. Implementing this schedule should be part of the WWTP and PS operational manual.
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<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
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<td>In case the influent is totally or partially bypassed to the tree forest, the PIU-EM should be immediately notified with the reasons, durations and applied control measures for such event. The PIU-EM should directly notify the PSC and EEAA with the incidents. After returning to normal operation mode, reasons for using the bypass line should be analyzed to prevent repeating these incidents in future. This should be considered during the analysis of the results of the regular monitoring program.</td>
<td>Operation</td>
<td>PO</td>
<td>PIU</td>
<td>Field inspection and documents review</td>
<td>- PO normal costs</td>
</tr>
<tr>
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<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>Field supervision and review that the PS/WWTP's waste management plan is documented and being implemented</td>
<td>- Waste disposal is included in normal operations costs</td>
</tr>
<tr>
<td></td>
<td>Claims of improper handling and/or disposal of non-hazardous solid wastes generated during operation</td>
<td>A waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of potential non-hazardous wastes shall be developed and implemented by the project's operator. This plan shall define exact procedures and locations for waste management and disposal.</td>
<td>Operation</td>
<td>PO</td>
<td>PIU</td>
<td>Field supervision and review that the PS/WWTP's waste management plan is documented and being implemented</td>
<td>- Waste disposal is included in normal operations costs</td>
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</table>

*HCWW/PMU should adopt the measures listed above and ensure that the all waste relevant information (types, amounts, disposal methods, etc.) are included in the environmental register of the plant.*
<table>
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<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
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<td>Assumptions</td>
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<td>Prepare schedule for solids and oils removal from household separation unit. Sludge from household interceptors and septic tanks should be discharged to WWTP. Remove oil from oil separators in restaurants and bakeries and dispose it in domestic solid waste disposal sites.</td>
<td>Operation</td>
<td>Owners of the households, bakeries, and restaurants</td>
<td>RSU</td>
<td>- Occasional site supervision</td>
<td>- RSU management costs</td>
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<td>Daily removal of PS screens waste to domestic solid waste disposal sites Stabilizing separated grit with lime, dry it in separate drying beds and dispose dry grit in domestic solid waste disposal sites</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-ERO</td>
<td>- Documents review and occasional site supervision</td>
<td>- L.E. 100/ton for normal waste contractor, above PO price.</td>
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<td>Assumptions</td>
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</table>

26 It has been assumed that new separators will be installed according to adequate engineering specs. It has been also assumed that the oil has been oxidized to an extent that it is not considered flammable thus not considered as hazardous waste.
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
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<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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</thead>
</table>
| Risks of improper handling and/or disposal of hazardous solid wastes generated during the operation phase | Operation of the WWTP and PSs    | A waste management plan complying with international best practice and relevant Egyptian regulations and covering all types of potential hazardous wastes shall be developed and implemented by the project’s operator. This plan shall define exact procedures and locations for waste management and disposal. The waste management plans should also refer to health and safety procedures, and emergency procedures for containing and managing accidental spillages. **HCWW/PMU should adopt the measures listed below and ensure that all waste relevant information (types, amounts, disposal methods, etc.) are included in the environmental register of the plant. In addition to that, a separate hazardous waste register (according to the Egyptian Laws) has to be prepared, containing all information relevant to the generation, handling and disposal of hazardous wastes.**  

**d) General measures**  
- All types of hazardous waste can only be transported by licensed hazardous waste service providers and disposed of in licensed landfill. Both, the service providers and disposal sites have to be identified at the beginning of the operation phase. At the time of producing this study, the nearest and only hazardous waste disposal site is the Nasreya Centre in Alexandria.  
- The different types of hazardous wastes should not be mixed.  
- Spent mineral oils shall be collected, stored in sealed containers and recycled using a licensed company which also has to be identified at the beginning of the operation phase.  | Operation | PO                     | PIU/RSU               | Field inspection and check that hazardous wastes operating procedures are being documented and implemented                                                                                                                                  | - 1500 L.E./ton or batch  
- Number of batches is 4 per each WWTP per year                                                                 | 6,000                                   |
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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<tbody>
<tr>
<td>Risks of handling hazardous substances</td>
<td>Operation of the WWTP and PSs.</td>
<td>• Diesel ASTs should be surrounded with impermeable bund with a capacity of 110% of AST capacity. Any leaked diesel from ASTs should be pumped to diesel trucks until the leakage in AST has been repaired. No USTs should be used in the project, this has been further discussed in the screening criteria.</td>
<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>- Documents review and occasional site inspections</td>
<td>PIU and RSU management costs</td>
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<td></td>
<td>• Remove oil from oil separators in petrol stations and workshops and dispose it in hazardous solid waste disposal sites</td>
<td>Operation</td>
<td>Owners of petrol stations</td>
<td>PIU/RSU</td>
<td>- Documents review and occasional site inspections</td>
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<td>e) Adopting an Identification system for hazardous wastes generated on site</td>
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<td>The operator shall be able to identify the different potential hazardous wastes. Identification shall be performed according to the Egyptian hazardous waste classification system by the operator’s in-house staff (PMU-EM and RSUs or with the aid of an independent waste management consultant).</td>
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<td>f) Storage and Management of the waste accumulation area</td>
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<td>The waste storage area for hazardous wastes could be integrated with the general waste storage area but shall be fenced, secured with limited admission and shaded from rain and sun heat/light.:</td>
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<td>• It is recommended that the maximum period for storing hazardous waste is 270 days from the start date of accumulation of waste.</td>
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<td>• The storage area must have a water supply.</td>
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<td>• A hazardous waste label that has a “Hazardous Waste” mark on it must be placed on the container while still at the generation point.</td>
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<td>Potential Impact</td>
<td>Main activity causing the impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
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<td>Responsibility of direct supervision</td>
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<td>Occupational health and safety impacts</td>
<td>Operation of the WWTP, tree forest and PSs</td>
<td>The project's operator shall implement an occupational health and safety plan, which shall include, but not be limited to, the following measures; 1. <strong>Immunization</strong> Ensure routine vaccinations for workers for influenza, tetanus, and Hepatitis “A” (according to Consultations with the institute’s physicians). 2. <strong>Safe Practices and Personal Protective Equipment (PPE)</strong> It is recommended to avoid liquid contact with exposed skin, by using a full-body impervious suit in addition with using rubber boots, gloves, hard hats and eye protection. Using the Respirator instrument is based on an evaluation of respiratory hazards in the workplace and other relevant workplace and user factors. During cleaning operations performed outside a tank or and pipelines, where the atmosphere is not immediately dangerous to life or health, the worker(s) shall wear supplied-air or air-purifying respirator with organic vapor HEPA (High-Efficiency Particulate Arresting cartridge). When working in confined spaces, the team (inside and outside) must have extra flashlights and two-way radios readied for communication. A first-aid kit must be readily available; an eyewash and flushing station, neutralizing solutions, cleaning</td>
<td>Operation</td>
<td>PO</td>
<td>PIU/RSU</td>
<td>Documents review and occasional site supervision</td>
<td>- PO normal costs - RSU management costs</td>
</tr>
</tbody>
</table>

**Assumptions**

- Total Costs/year (L.E)

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**Notes**

- Holding Company for Water and Wastewater (HCWW)
- ESIA for ISSIP II Project Assiat – Final
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<thead>
<tr>
<th>Potential Impact causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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<tbody>
<tr>
<td>Equipment, and emergency medical services.</td>
<td>3. Training</td>
<td>Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate Personal Protective Equipment (PPE).</td>
<td>4. Control Measures Prior to entering and/or maintenance</td>
<td>• Assess and review sewage systems, components and piping.</td>
<td>• Perform jobsite safety and health analyses and be aware of all associated risks and hazards. Inform all workers involved of the risks and hazards determined by the jobsite safety and health analyses.</td>
<td>• Post warning signs and labels.</td>
</tr>
<tr>
<td>Potential Impact causing the impact</td>
<td>Main activity causing the impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
<td>Responsibility of direct supervision</td>
<td>Means of supervision</td>
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<td>employees are working in a confined space on the sewage system so they can prepare to respond in the event of an emergency.</td>
<td>Follow confined space entry testing and permitting procedures. If feasible, use sample ports to test for atmospheric contaminants inside the tank or / and pipeline manholes.</td>
<td>Cautiously and deliberately remove bolts and nuts off manholes and piping, while staying alert to any immediate change of conditions, and be prepared to take necessary action.</td>
<td>Use appropriate tools and operating procedures.</td>
<td>Install and use adequate exhaust ventilation devices, ducting, lighting, and tank-cleaning equipment.</td>
<td>Immediately following the piping being broken or the tank opened, apply or insert ducting to begin exhaust ventilation. Pipe all exhausts downwind, overboard, or away from people.</td>
<td>Cover and isolate all work areas with disposable plastic sheeting to prevent possible contamination.</td>
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<tr>
<td>Potential Impact causing the impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
<td>Responsibility of direct supervision</td>
<td>Means of supervision</td>
<td>Estimated Cost of implementation / supervision</td>
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### Potential Impact: 5. Post-Work Cleanup
- Remove contaminated clothing and bag for proper disposal or decontamination.
- Shower or wash face, arms, hands and legs with soap, using a substantial amount of water.
- Disinfect equipment (e.g., using iodine compounds, bromine, chlorine, ozone, or their equivalent) and wash contaminated spaces, decks and bulkheads with detergent, sanitizer, or bleach.
- Dispose of or re-wash rubber boots, gloves, eye goggles, face shields and respirators with a disinfectant solution.
- Wash contaminated clothing separately.
- Do not enter other spaces while still wearing contaminated clothing.

### Potential Impact: 6. Measures at the tree forest
- HCWW will consider and adopt cost-effective fire protection and response measures such as prohibiting smoking in or near the timber forest, prohibiting the burning of any yard or other waste, limiting vehicle access to dry areas, establishing a fire break area around the forest, establishing fire lookouts, having firefighting tools and equipment at various points, creating access points in the event that fire trucks will need to enter the timber forest to control/extinguish a fire, providing communication equipment to forest workers to be able to rapidly communicate the potential occurrence of a fire and providing firefighting training to forest workers. Fire protection and response plans will be developed by HCWW.
- HCWW will ensure at least one forest worker per
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
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<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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<td>shift is first aid certified. In addition, a first aid kit will be made available at a well communicated and designated area. HCWW will ensure all timber forest workers are properly trained and well informed of the various kinds of work stress, nutrition, hydration and identifying and managing hazards. No workers working in the timber forest will be permitted to perform any work that may be harmful to them or the environment. Workers will have the right to refuse to perform such work and make sure their working hours include regular rest breaks as well as a meal break. Timber forest workers shall make a concerted effort to identify any potential hazards in their place of work. HCWW shall provide all timber forest workers with the appropriate personal protective equipment (PPE), with a minimum of safety footwear, safety helmets, eye protection and gloves. In cases where workers are exposed to dust and/or chemicals, respiratory protective equipment shall be provided by HCWW. Where chemical or sludge handling is involved, HCWW will ensure workers wear personal protective clothing and follow handling procedures carefully. To protect the timber forest from potential vertebrate pests, HCWW will establish physical barriers both around the timber forest site and also around seedlings in the initial planting stages. Physical site barriers may be constructed of wire and barriers for seedlings may be composed of wire mesh or plastic. HCWW shall consider controlling insect larvae populations by using emulsifiable concentrates of mosquito larvicides applied by continuous drip methods. Before applying pest control measures, HCWW will seek to correctly identify the pest(s) in question, assess the potential damage that may be caused by the pest, determine what control methods are available and outline their benefits and risks, identify the most cost-effective methods that will have the least harm on humans and the environment, and most importantly, ensure they are complying with all local laws and regulations.</td>
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**Assumptions**

**Total Costs/year (LE)**
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<th>Potential Impact</th>
<th>Main activity causing the impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
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<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Estimated Cost of implementation / supervision</th>
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</thead>
</table>
| Community health and Safety | Operation of the WWTP, PSs, FMs and Gravity sewers | • Using fences and warning signs during maintenance periods and/or close the roads  
• Regular inspection for all the components of the sewage system especially the manholes covers and take instantaneous measurements for correction.  
• Preventive maintenance program  
• Adjust the maintenance schedules away from the rush hour | Operation | PO | PIU/RSU | Occasional site supervision | Assumptions: PO normal costs - RSU management costs | 0.0 |
| Impacts related to encroachment’s on the timber forest land | Land owners at the surrounding area | • Strict protection of the timber forest site must be applied.  
• Fencing and adding proper signage that this land is owned by Assuit Water Company.  
• Regular patrolling of the land is also recommended to avoid situations of land users settling in and later claiming permanent rights.  
• Registering of any encroachments on the timber forest as soon as they occur in order to take necessary legal procedures immediately. | Operation | PO | PIU/RSU | Occasional site supervision | Assumptions: PO normal costs - RSU management costs | 0.0 |
| **Total** | | | | | | | **Total = 95,000** |
Table 7-4: Environmental Monitoring Matrix during the operation phase

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unacceptable odours</td>
<td>Neighbors complaints</td>
<td>PSs and WWTPs</td>
<td>• Record odour complaints received from neighboring areas. The record should include name of the person who has made the complaint, time of complaint, GPS location of the affected area, time and duration of unacceptable odour. Complaints records should be reported in monthly reports. The RSU should analyze odour complaints on monthly basis and document how each complaint was confronted</td>
<td>Daily</td>
<td>PIU/RSU</td>
<td>RSU management costs</td>
</tr>
</tbody>
</table>
| Air emissions | CO, SO₂, total hydrocarbons and NOx | Generators at WWTPs and PSs | • Onsite gas analyzer measurement for exhaust  
• Monitor the air quality on site downwind of the WWTP (SE direction) at the closest location possible.  
• Monitor air quality downwind at the closest sensitive receptor | Annually | PO | LE 1000 / generator / year |
| Ambient Noise | Noise intensity, exposure durations and noise impacts | PSs and WWTP | • Measuring the ambient noise level in noise critical areas, using a portable noise meter.  
• Measuring the ambient noise level using a portable noise meter at the nearest sensitive receptors (Map1).  
• Investigate noise complaints from workers and neighboring communities in the affected locations | Annually | PO | LE 1000 / PS/year |
| Soil and groundwater | Any leaks  
Soil and groundwater quality | PSs , WWTP, timber forest (random samples in timber forest; areas showing evidence of contamination) and pipeline network | • Regular inspection of all components of PSs and WWTP for any potential leaks  
• Monitor the WWTP for physical stability features, such as tension cracks, surface erosion, piping failures and other features  
• Document foul odors in timber forest and increased number of insects, mosquitoes and flies  
• Analyze soil samples to ensure wastewater from the timber forest has not caused elevations in heavy metals and other toxic elements  
• Analyze groundwater samples from existing groundwater wells (or leak-detecting wells, if installed) to ensure wastewater from the timber forest has not caused groundwater contamination  
• Analyze wastewater effluent to ensure it is compliant with Law 93/1962 for reuse of treated wastewater in agriculture  
• Take representative sludge samples and analyze it according to requirements of Law 93/1962 | Monthly | PO | Normal operation costs |

(LE) = Egyptian Pounds
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost/year</th>
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</thead>
<tbody>
<tr>
<td>Risks of improper handling of sludge</td>
<td>pH of fresh sludge</td>
<td>WWTP drying beds</td>
<td>Undertake continuous monitoring of pH of immature sludge drying beds. Logs of pH values should be used for controlling the lime dosing.</td>
<td>Continuous for two days after laying fresh sludge in drying beds (2 days average to be documented)</td>
<td>PO</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Zn, Cu, Ni, Cd, Pb, Hg, Cr, Mo, Se, As, fecal coliforms, salmonella and escharis eggs</td>
<td>WWTP drying beds</td>
<td>Taking representative sample and analyze it according to requirements of Law 93/1962</td>
<td>Four samples each 3 month, or whenever sludge is being sold</td>
<td>PO</td>
<td>16,000</td>
</tr>
<tr>
<td></td>
<td>Water borne diseased for WWTP workers</td>
<td>Identified medical center</td>
<td>Periodical medical examination for the workers and lab analysis</td>
<td>Quarterly</td>
<td>PO</td>
<td>10,000</td>
</tr>
<tr>
<td>Risks associated with disposal of final effluent</td>
<td>Discharge rate of influents</td>
<td>PS and WWTPs</td>
<td>Continuous monitoring of PS and WWTPs incoming and outgoing discharges. Daily averages should be calculated and documented</td>
<td>Continuous, average flow to be recorded daily</td>
<td>PO</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>pH, COD, BOD, TSS, TDS, TKN, Oil &amp; Grease, DO</td>
<td>WWTPs influent and effluent</td>
<td>Sampling and analysis in WWTP lab</td>
<td>Every 3 days</td>
<td>PO</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Performance efficiency of WWTPs</td>
<td>WWTP</td>
<td>Detailed environmental audit of the WWTP to review performance efficiency</td>
<td>Annually</td>
<td>Environmental consultant</td>
<td>25,000</td>
</tr>
<tr>
<td>Risks of improper management of solid hazardous and non hazardous wastes</td>
<td>Data and information in waste and environmental registers</td>
<td>PSs and WWTPs</td>
<td>Auditing waste and environmental registers</td>
<td>Quarterly</td>
<td>RSU</td>
<td>0.0</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Monitoring Indicator</td>
<td>Monitoring Location</td>
<td>Monitoring Methods</td>
<td>Monitoring Frequency</td>
<td>Monitoring Responsibility</td>
<td>Estimated Monitoring Cost/year</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------------</td>
<td>---------------------</td>
<td>------------------------</td>
<td>----------------------</td>
<td>--------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Risks of handling hazardous substances</td>
<td>Integrity of ASTs</td>
<td>WWTP</td>
<td>Visual observation</td>
<td>- Daily</td>
<td>PO</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Leak incidents to be documented in monthly reports</td>
<td>- Normal PO price</td>
<td></td>
</tr>
<tr>
<td>Total Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58,000</td>
</tr>
</tbody>
</table>
Table 7.5 - Social Management plan

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Proposed Mitigation Measures</th>
<th>Performance Indicators</th>
<th>Institutional responsibilities</th>
<th>Direct Responsibilities</th>
<th>Supervision</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts on infrastructure</td>
<td>Conducting surveillance activities to detect available pipelines or networks (water or electricity)</td>
<td>Reducing rates of complaints related to infrastructure</td>
<td>Water and wastewater company in Assiut, Contractor, LGUs</td>
<td>Contractor</td>
<td>Field visits, Accidents register</td>
<td>Cost by the contractor</td>
</tr>
<tr>
<td></td>
<td>Coordination with the Local Governmental Units and the water and network companies to repair any damages. The contractor should pay for this cost.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts on old buildings</td>
<td>Boreholes should be used to identify the type of soil and the potential of impacts on the current structures</td>
<td>Reducing rates of complaints related to structures</td>
<td>Water and wastewater company in Assiut, Contractor and LGUs</td>
<td>Contractor</td>
<td>Field visits, Accidents register</td>
<td>Cost by the contractor</td>
</tr>
<tr>
<td></td>
<td>In case the soil is fragile, wood support may be provided to the houses and land</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measuring ground water levels before construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts on road quality</td>
<td>A time plan should be developed for street rehabilitation</td>
<td>Site visits checklists related to street conditions, Photos that shows how streets were rehabilitated</td>
<td>Water and wastewater company in Assiut</td>
<td>Water Companies</td>
<td>Site visits reports and Minutes of meetings</td>
<td>Cost by the company</td>
</tr>
<tr>
<td></td>
<td>Inform the local community with any potential delay of street rehabilitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paving the streets immediately after the construction. That should be done by specialized companies or the contractors but not by the Local Governmental Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor the process of street rehabilitation and realistic fines should be applied on the entities responsible of street rehabilitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 7.6 - Social Monitoring Plan

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Monitoring Indicators</th>
<th>Monitoring Site</th>
<th>Monitoring Method</th>
<th>Monitoring Frequency</th>
<th>Responsibility</th>
<th>Estimate cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land requirements</td>
<td>Allocated plots (Approvals and permits)</td>
<td>Site location</td>
<td>Field visits</td>
<td>Once before construction</td>
<td>Water and Wastewater Company in Assiut (SDO)</td>
<td>Among company activities</td>
</tr>
<tr>
<td>Impacts on Infrastructure</td>
<td>Rates of impacts on available infrastructure (water pipelines broken)</td>
<td>Site location</td>
<td>Complaints related to the impact</td>
<td>Monthly</td>
<td>Water and Wastewater Company in Assiut Rural Sanitation Unit</td>
<td>Among company activities</td>
</tr>
<tr>
<td>Impacts on Old houses</td>
<td>Rate of impact on structures</td>
<td>Site location</td>
<td>Complaints related to the impact</td>
<td>Monthly</td>
<td>Water and Wastewater Company in Assiut Rural Sanitation Unit</td>
<td>Among company activities</td>
</tr>
<tr>
<td>Deterioration of street conditions due to the lack of rehabilitation</td>
<td>Rates of problems with the community</td>
<td>Site location</td>
<td>Complaints related to the impact</td>
<td>Monthly</td>
<td>Water and Wastewater Company in Assiut Rural Sanitation Unit</td>
<td>Among company activities</td>
</tr>
<tr>
<td><strong>Impacts during Operation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encroachments on the timber forest</td>
<td>Capacity and operation of the timber forest</td>
<td>Site location</td>
<td>Complaints from LGU</td>
<td>Monthly</td>
<td>Water and Wastewater Company in Assiut Rural Sanitation Unit</td>
<td>Among company activities</td>
</tr>
</tbody>
</table>
7.10  HEALTH MANAGEMENT AND MONITORING PLAN

7.10.1 Supplementary interventions to enhance the health outcome of the project
(Public health management plan)

As it is presented in the previous sections, ISSIP II should be supplemented by hygiene improvement interventions to maximize the positive health impact of the project on the short term. In addition, nutritional interventions are required to support the potential long term impact on children growth.
The proposed conceptual framework upon which the supplementary interventions will be built is included in Annex 7 as well as different approaches to adopt these public health interventions.

7.11  WILLINGNESS TO PAY

Discussion of the will and ability to pay is an important element to determine the significant interest of the local community in the project. Discussion of the willingness to pay, includes several aspects that can be summarized as follows:

1. Willingness to pay in cash or installment
2. Amount to be paid in Cash (minimum and maximum amount)
3. Desired amount to be paid in installments (minimum and maximum amount)

The preferred payment method indicated by families was as follows: female headed families indicated that they prefer to pay in cash, while 50% of the male headed family indicated that prefer to pay in cash.

Proposed payment categories range between 100 L.E. to 2000 L.E., the mean is 346.88 L.E. for household connection. The average lowest amount mentioned was 184.12 L.E, while the mode was 150 L.E. We can thus conclude that the acceptable amount by the families to be paid for the household connection is 100 L.E.

Sample distribution according to Payment categories and head of household

<table>
<thead>
<tr>
<th>Cash Payment Categories</th>
<th>Highest amount to be paid</th>
<th>Lowest amount to be paid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Head of household</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Less than 100 L.E.</td>
<td>6.7%</td>
<td>6.3%</td>
</tr>
<tr>
<td>From 100 L.E. to 500 L.E.</td>
<td>73.3%</td>
<td>100.%</td>
</tr>
<tr>
<td>From 500 L.E. to 1000 L.E.</td>
<td>6.7%</td>
<td>6.3%</td>
</tr>
<tr>
<td>From 1000 L.E. to 1500 L.E.</td>
<td>6.7%</td>
<td>6.3%</td>
</tr>
</tbody>
</table>
With regards to installment payment categories, values varied widely between female headed families and male headed families. The average monthly installment among male headed families was about 37% of the sample, while it did not exceed 50 L.E. for female headed families. Two thirds of the sample indicated that they can pay the equivalent of evacuation cost. About half of the sample (male and female headed families) indicated that they cannot pay more than 10 L.E. per month.

<table>
<thead>
<tr>
<th>Installment Payment Categories</th>
<th>Head of household</th>
<th>Total</th>
<th>Head of household</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>From 1:10 L.E.</td>
<td>25.0</td>
<td>100.0</td>
<td>33.3</td>
<td>50.0</td>
</tr>
<tr>
<td>From 11:20 L.E.</td>
<td>12.5</td>
<td>11.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From 21:30 L.E.</td>
<td>37.5</td>
<td></td>
<td>33.3</td>
<td></td>
</tr>
</tbody>
</table>

We can conclude that the water company should take into consideration that most of the poor families prefer to pay for the household connections in installments. The proposed value for cash payment is between 250 and 500 L.E.

7.12 COMMUNICATION STRATEGY

7.12.1 Objectives

- Ensure the support of the local community and other stakeholders during the construction and operation of the WWTP and timber forest at Nawawra village
- Avoid misconceptions spreading among the community members about the impacts of the WWTP and timber forest among the local community
- Ensure that relevant stakeholders (governmental and civil society members) support the project during construction and operation of the WWTP and timber forest
- Raise awareness during construction to avoid any accidents or problems occurring during the work of the contractor
• Communicate the benefits of the new WWTP and sanitation facility to the community members
• Avoid problems from surrounding villages that will not be spread
• Avoid encroachments occurring on the land allocated to the timber forest

7.12.2 Target Audience

• Local community members
• Government officials at the village level (LGU officials)
• Opinion leaders and community heads
• Religious institutions including mosques and churches
• Local NGOs and CBOs
• Contractor and workers in construction
• Water Company staff
• Women at the household

7.12.3 Core Messages

• Disclosure of land ownership of the timber forest and Cutoff date
• Avoid land encroachments at the timber forest area
• Public health messages – No animals or pests or insects are expected to spread from the timber forest
• Health and safety – Avoid accidents during construction by applying necessary health messages
• Local community should continue providing support to the water company to face any local conflicts that may arise
• Appropriate practices in using sanitation services to sustain the provided services
• Grievance mechanism to report any problems to the water company
7.12.4 Mode of Delivery

- Meetings held twice a month with stakeholders and villagers
- Monthly field visits to ensure there is no illegal encroachment on the project’s land, as well as to disclose any transactions on land in the area and ensure there are no conflicts with land owners
- Place appropriate signs to indicate that the land is owned by the water company at the site and at the LGU
- Place illustrated print material about occupational health and safety at the construction area
- Use illustrated print materials such as brochures or posters to inform community about best practices using sanitation facilities at the household
- Hold meetings at the local NGOs or awareness seminars to spread about propose use of sanitation facilities
- Use of religious figures to spread the relevant messages

CHAPTER 8 STAKEHOLDER ENGAGEMENT AND CONSULTATION ACTIVITIES

The public consultation chapter aims at highlighting the key consultation and community engagement activities and their outcomes, in addition to outlining the validity and reliability of the collected data.

Throughout the various consultation and engagement activities, the work team experienced and recorded remarkable and overwhelming public acceptance, even eagerness, by the community and the governmental stakeholders towards the proposed project.

Consultation activities (scoping, interviews, focus group discussions, public hearings/consultations) with various stakeholders and community people in the host communities were held in the project areas: El Nawawra village, El Etmanea and Wadi El Sheih villages affiliated to El Badary District.

All activities conducted are in compliance with the following regulations and operational polices:

- WB policies related to disclosure and public consultation, namely,
  - World Bank’s Access to Information Policy
  - World Bank Operational Policy (OP 4.01)
- Egyptian regulations related to the public consultation
- Egyptian Law of Environment (Law No. 4 of 1994) and its amendment by Law 9 of year 2009), stipulated that group C projects must conduct two public consultation events. The first event should be held by the consultant as part of the scoping activities to explain the applied ESIA methodology to relevant stakeholders. The second consultation session should be held after completion of the ESIA study.

During August 2016, the consultant held further consultation activities with the local community at Nawarwra village as part of the WWTP and timber forest ESIA. The consultation activities included holding FGDs with the local community members, interviews with the stakeholders as well as a public consultation session held on August 24, 2016.

8.1 CONSULTATION OBJECTIVES
The objective of the SE is to ensure the safe and successful Project delivery by:

- Properly informing stakeholders including persons or groups who are directly or indirectly affected by the project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively;
- Actively listening to comments, ideas and concerns raised by stakeholders and recording their concerns for follow up;
- Avoiding conflict by addressing impacts and issues raised by stakeholders promptly; particularly with the communities that will not be served by the project;
- Ensuring that fears and apprehensions about the nature, scale and impact of the operation have been properly considered in the development and management of the Project;
- Accessing and making good use of existing local knowledge of the area;
- Avoiding any misunderstandings about the project and properly manage expectations;
- Communicating and implementing a viable community feedback mechanism.
- Sharing the drafted social impacts assessment for the shifted location and collect views and feedbacks about the new location from the local community.
- Ensure that the new location of the WWTP is accepted by the local community.

The output of consultations will:
1- Define potential project stakeholders and suggest their possible project roles
2- Identify the most effective outreach channels that support continuous dialogue with the community
3- Get stakeholders feedback on the defined impacts and mitigation measures as part of the drafted ESIA and integrate their feedbacks and comments in the production of the final ESIA. As well as, to invite those who donated lands in order to audit the process of land taken.
4- With regards the updated ESIA in August 2016: ensure that community members at Nawarwra support the project including construction of the WWTP and the timber forest. And ensure that the new location of the WWTP is accepted by the local community.

8.2 CONSULTATION METHODOLOGY AND ACTIVITIES

The research team for this study has adopted a multi-level of consultation activities that enable the marginalized, voiceless, youth and women to gain information about the project. As well, raise their concerns and worries regarding the project during various implementation phases.

1- The study team visited the project area in order to define the various stakeholders
2- Meeting was conducted on the 20th of September in order to develop an engagement plan that is tailored for the rural communities
3- Based on the identification of stakeholders, various questionnaires and guidelines were prepared in order to engage: i) the residents in the project areas, ii) the residents of the villages situated in the vicinity of the project areas, iii) the NGOs, iv) the agriculture directorates, v) the health department, vi) the environmental departments, vii) the workers of septic tanks evacuation vehicles. As well as, the Water and Wastewater Company in Assuit Governorate.
4- The study team divided the various engagement of the project to 1) scoping phase, 2) data collection phase and final consultation phase.
5- All activities conducted were documented with photos and lists of participants in order to warrantee appropriate level of transparency

Consultation activities conducted during August 2016:

6- The study team visited the project area in order to define the various stakeholders and visit the new location of the WWTP.
7- The study team engaged with the surrounding neighbours in discussions to ensure they have clear perceptions about the expected impacts including the group who submitted the grievance.
8- Based on the identification of stakeholders, various questionnaires and guidelines were prepared in order to engage: i) the residents in the project areas, ii) the residents of the villages situated in the vicinity of the project areas, iii) the NGOs, iv) the agriculture directorates, v) the health department, vi) the state property administrator, vii) directors of the closest sensitive receptors including Ezbet Abdel Samad youth center and schools.
9- The study team divided the various engagement of the project to 1) scoping phase, 2) data collection phase and final consultation phase.
10- All activities conducted were documented with photos and lists of participants in order to warrantee appropriate level of transparency

8.3 STRENGTHS AND LIMITATION OF CONSULTATION

Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project Assiut – Final
8.3.1. Strengths of the consultation

The consultation process and methodology involved a number of strengths that maximized the benefits from the consultation activities. This could be summarized in the following:

- Appropriate tools were used for consultation to fit with the culture of the targeted communities (e.g. reaching out to women instead of inviting them to public meetings that they are unlikely to attend in rural areas).
- Vulnerable groups including poor women, female headed households and handicapped were reached out to during the process of the ESIA participation. Efforts were also made to ensure they are engaged in public consultations.
- Local surveyors were hired and mobilized to facilitate access to villagers, governmental and non-governmental entities.
- Prior information sharing activities have been guaranteed through mobilizing the local surveyors to invite the community people to public meetings and consultations through the distribution of flyers and posters.
- To ensure participation of both villages and due to the long distance between the El Nawawra and El Etmania, The consultant secured means of transportation free of charge to facilitate local community people access to the meetings.

On the other hand, the second public consultation coincided with the occurrence of floods in the village on the 8th of March 2014. Hundreds of families were disadvantaged from this crisis. The consultation had to be postponed for two weeks to ensure the appropriateness of the timing to the villagers. Although this crisis has nothing to do with the project, it affected the consultation schedule and local villagers were bearing bitterness from the damages they encountered.

8.3.2. Limitation of the consultation

1- Females were targeted and mobilized by the local NGOs and rural promoters. Thus, more vulnerable females were represented.

2- The community people in project areas were of low educational background. Thus, the study team managed to build communication channels through speaking simple Arabic that can be comprehended by the community people. The word Sewage Network was completely ambiguous for them. Explaining the sewage in extremely simple way was crucial.

3- During the final consultation event, females came early in the morning waiting for the team of consultants. That left limited places for men.

8.4 DEFINING THE STAKEHOLDERS

Given the fact that the project areas have been thoroughly defined and project details have been finalized at this stage, stakeholder identification was based on analysis of geographical, legal, institutional, and operational scope of the project. The following table represents the stakeholders contacted and engaged for the consultation activities:

Table 0-1 Main stakeholders identified for the ESIA
<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Role/ concern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local Governmental entities</strong></td>
<td></td>
</tr>
<tr>
<td>Governorates</td>
<td>The main role of the governorates is the provision of support to the project through providing various permissions needed.</td>
</tr>
</tbody>
</table>
| Local Governmental units (District authorities and village authorities) | - Permissions for the road cut during the implementation of the sewage grid.  
- Permissions for the lands needed for Pumping stations should be prepared by the governorate and approved by the LGU.  
- Rehabilitation of roads, which is one of the major issues raised by the community, will be performed by the LGU. |
| **Other governmental entities** | |
| Information Centers on the governorate level | Provide the project with the underground utilities and infrastructure maps. |
| Governmental Authorities | Various authorities in the governorate will support the project through permissions, maintenance, health related issues, etc. |
| Ministry of Agriculture and the agriculture directorates | That provides the project with permissions.  
As well, they suffer due to the farmers’ abusive usage of the untreated sewage water in cultivation activities |
| Ministry of Water Resources | They are classified as direct beneficiaries of such project due to the potential enhancement of the water quality of canals and drainage |
| The Social Fund for Development | Supplement additional funds to the villages that will not be connected under this project. That will result in amicable implementation of the project.  
They will also share their experience in rural sanitation that was implemented under the Department of Public Works within the SFD |
<p>| Egyptian Environmental Affair Agency (HQ and RBOs) | Responsible for reviewing and approving ESIAas, and monitoring implementation of the Environmental Management Plan |
| Security Department | Secure the construction sites and prevent people from in-flushing into it |
| Ministry of Health | Providing health facilities to the project workers |
| Ministry of Antiquities | Issue permissions for excavations and accompany the working teams. |
| <strong>Media</strong> | Inform the community about the project and its impacts and support dissemination of ESIA studies’ results |
| Television and radio representatives | |
| Press people | |
| Websites editors | |
| <strong>NGOs and community based societies working on environmental and social related</strong> | |</p>
<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Role/ concern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NGOs on the central level</strong></td>
<td>Play an active role in various awareness-raising related to the project</td>
</tr>
<tr>
<td><strong>NGOs on district level</strong></td>
<td>1- Importance of having proper sewage network</td>
</tr>
<tr>
<td><strong>Specific union of NGOs</strong></td>
<td>2- How to observe and maintain the sewage system</td>
</tr>
<tr>
<td></td>
<td>3- The role of community</td>
</tr>
<tr>
<td><strong>Water unions (Rawabet El Meial)</strong></td>
<td>They might provide support to the ultra-poor families in paying the house</td>
</tr>
<tr>
<td></td>
<td>connection</td>
</tr>
<tr>
<td></td>
<td>Some of the NGOs work in tanks evacuation activities. Thus, they should</td>
</tr>
<tr>
<td></td>
<td>be aware about the project in order to define the potential impact on their</td>
</tr>
<tr>
<td></td>
<td>business</td>
</tr>
<tr>
<td><strong>Universities and Educational institutes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Faculty of Engineering</strong></td>
<td>They participate in decision making and community monitoring for waste water</td>
</tr>
<tr>
<td><strong>Secondary vocational schools</strong></td>
<td>disposal</td>
</tr>
<tr>
<td><strong>Researchers/consultants</strong></td>
<td>Review results of the study and provide feedback</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Review and enrich the ESIA study with feedback</td>
</tr>
<tr>
<td><strong>Private companies</strong></td>
<td>Propose needed capacity building for their students to potentially find</td>
</tr>
<tr>
<td><strong>Traders</strong></td>
<td>employment with the project</td>
</tr>
<tr>
<td><strong>Contractors</strong></td>
<td>Review results of the study and provide feedback</td>
</tr>
<tr>
<td><strong>Community leaders</strong></td>
<td>From the project adjacent areas, may be affected.</td>
</tr>
<tr>
<td><strong>Community leaders</strong></td>
<td>Main cornerstone in mobilizing the communities.</td>
</tr>
<tr>
<td><strong>Potential beneficiaries</strong></td>
<td>Potentially benefit from the project</td>
</tr>
<tr>
<td><strong>Potential Project Affected Persons (PAPs)</strong></td>
<td>The workers on septic tanks evacuation trucks</td>
</tr>
<tr>
<td></td>
<td>The residents who will suffer due digging the streets</td>
</tr>
<tr>
<td><strong>Water and Wastewater companies</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NOPWASD</strong></td>
<td>Responsible for the implementation of the Treatment Plants and the monitoring</td>
</tr>
<tr>
<td><strong>HCWW</strong></td>
<td>activities</td>
</tr>
<tr>
<td><strong>Assuit Water and Wastewater Company</strong></td>
<td>The direct implementer of the project</td>
</tr>
</tbody>
</table>

The abovementioned stakeholders were targeted using various communication tools i.e. individual interviews, group meetings and public consultation. Most of them were represented in the public consultation hearings conducted. However, some of them were
interviewed in their premises in order to enable them to spell out their concerns and worries freely.

8.5 SUMMARY OF CONSULTATION ACTIVITIES
The citizen engagement and consultation activities along with the three stages of study preparation might be summarized as follow:

Table 0-2: Citizen Engagement and consultation activities

<table>
<thead>
<tr>
<th>Date</th>
<th>location</th>
<th>Participants</th>
<th>Number</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Awareness specialist, water company</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental specialist, water company</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5th of</td>
<td>Assuit Water</td>
<td>Irrigation zone general manager at the water company</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>October 2013</td>
<td>Company</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head of the Local Government Unit at Nawawra</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6th of</td>
<td>El Nawawra LGU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 2013*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7th of</td>
<td>Etmania Village</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7th of</td>
<td>El Badary village</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th of</td>
<td>Etmania Village</td>
<td>Freedom Community Development Association (FCDA)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>October 2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th of</td>
<td>Etmania Village</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>October 2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th of</td>
<td>Etmania Village</td>
<td>Executive director Freedom CDA</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>location</td>
<td>Participants</td>
<td>Number</td>
<td>Methods</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------</td>
<td>---------------------------------------------</td>
<td>--------</td>
<td>--------------------</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th of October 2013</td>
<td>Etmania Village</td>
<td>Local Mobilizer</td>
<td>6</td>
<td>Interview</td>
</tr>
<tr>
<td>7th of October 2013</td>
<td>Qouseya District</td>
<td>General director at Education, member of the popular committee</td>
<td>1</td>
<td>Interview</td>
</tr>
<tr>
<td>7th of October 2013</td>
<td>Qouseya District</td>
<td>Engineer at the water and sanitation network in Qouseya</td>
<td>1</td>
<td>Interview</td>
</tr>
<tr>
<td>8th of October 2013</td>
<td>Assuit</td>
<td>Environmental responsible at Assuit governorate</td>
<td>1</td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>During data collection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The first week of October 2013</td>
<td>Etmania and El Nawawra</td>
<td></td>
<td>126</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Etmania</td>
<td></td>
<td></td>
<td>Structured questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>FGD</td>
</tr>
<tr>
<td><strong>During public hearing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26th of March 2014</td>
<td>Etmania village</td>
<td></td>
<td>105</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Public Consultation</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>239</td>
<td>115</td>
</tr>
</tbody>
</table>

Consultation activities during ESIA updates, August 2016

<table>
<thead>
<tr>
<th>Date</th>
<th>location</th>
<th>Participants</th>
<th>Number</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During Field Work</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From 8 August to 12 August</td>
<td>El-Nawawra</td>
<td>Community members</td>
<td>40</td>
<td>Focus Groups + Individual interviews</td>
</tr>
</tbody>
</table>
From 8 August to 12 August

<table>
<thead>
<tr>
<th>Government stakeholders</th>
<th>9</th>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Head of El-Nawawra Local Government Unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• State property administrator (Local Government Unit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Agricultural Association Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Monitoring and environment administrator (Local Government Unit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Head of roads and Enterprise Development Department (Local Government Unit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vice Director of Abdul Samad Primary school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The Health Unit Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Director the youth center of Ezbet Abd Samad</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**During Public Consultation**

<table>
<thead>
<tr>
<th>24 of August, 2016</th>
<th>El-Nawawra</th>
<th>130</th>
<th>Public Consultation</th>
</tr>
</thead>
</table>

**Total consulted persons during August 2016**

<table>
<thead>
<tr>
<th>Total</th>
<th>179</th>
</tr>
</thead>
</table>

Holding Company for Water and Wastewater (HCWW)
ESIA for ISSIP II Project Assiut – Final
Figure 0-1 - Pictures from the field work conducted during August 2016
8.6 CONSULTATION ACTIVITIES

8.6.1 During the scoping and data collection phase

The ESIA team held several scoping sessions with different stakeholders through individual meetings, group meetings with the local community, executives and civil society representatives at Assuit governorate, the following activities were held:

A. 151 households were interviewed based on the percentage of household connections to be constructed at the area. 62 respondents were interviewed at Etmania and Nagaa Sheih villages and 89 at Nawawra village. The percentage of males was 83.4% and the females 16.6%. The research team tried to include women by holding a community meeting at one NGO in collaboration with the local rural coordinators.

B. A group meeting was held with the RSU at the water and wastewater company

C. Individual meetings with heads of the local government unit at Nawawra and Etmania.

D. A group meeting with female community mobilizers

E. Group meetings were held with the local population at some mosques

F. A focus group discussion was held with 20 females at the areas that will not be served by the project, to indicate their perceptions, fears and willingness to pay.

Different groups were targeted by the RSU, it must be noted that in general there was wide acceptance towards the project.
The heads of the governmental units provided all necessary support for the research team, although they were worried about the implementation schedules.

Data collection activities were conducted in collaboration with the local mobilizers from Freedom community development association, which allowed easy access to the team to households at different target areas.
The community people raised various comments and concerns. Following is a sample of the comments received during the scoping and the data collection phase.

Table 0-3: Sample of the comments received during the scoping & the data collection phase

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng. Essam Ahmed, water network engineer</td>
<td>Assuit water company representative Household connections will be free at target villages</td>
</tr>
<tr>
<td>The socioeconomic conditions in the village are very deteriorating with</td>
<td>Assuit water company representative Household connections will be free at target villages</td>
</tr>
<tr>
<td>lack of sanitation, some NGO’s build bathrooms in households for free</td>
<td>Assuit water company representative Household connections will be free at target villages</td>
</tr>
<tr>
<td>thus household connections should be free as well.</td>
<td>Narrow streets were taken into consideration during the design</td>
</tr>
<tr>
<td>Abdel Mohsen Mohamed Amin</td>
<td>Narrow streets were taken into consideration during the design</td>
</tr>
<tr>
<td>The security situation is not good, there are disputes among families,</td>
<td>Narrow streets were taken into consideration during the design</td>
</tr>
<tr>
<td>sometimes there are fire shooting. You should take that into consideration</td>
<td>Narrow streets were taken into consideration during the design</td>
</tr>
<tr>
<td>during construction. Also streets are very narrow.</td>
<td>Narrow streets were taken into consideration during the design</td>
</tr>
<tr>
<td>Wafaa Hamdy, Freedom CDA</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>Our village is deprived of all types of services, there used to be</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>health convoys from the ministry of health and some services provided by</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>Misr el Khier association, but there targeted only limited group.</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>You should take into consideration the poor groups, awareness raising</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>campaigns must be conducted in collaboration with the local NGO’s.</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>Fifi Khalaf, head of local NGO</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>I propose that you connect all households</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>I will submit your recommendation to the</td>
<td>Social Expert Poorest groups are taken into consideration, we are trying to prepare a community database in collaboration with the local</td>
</tr>
<tr>
<td>Comment</td>
<td>Response</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
</tr>
<tr>
<td>at Etmania not only some areas, we can help with money or effort. People can help in excavation activities if they will be connected to the network.</td>
<td>water company</td>
</tr>
<tr>
<td>12 year child We are tired of carrying water, please start the project and we will help you. We will tell our friends at school to help you</td>
<td>Social Expert What you are saying is very important, we will be very happy if you are going to help</td>
</tr>
</tbody>
</table>

### 8.6.2 Public consultation

To verify the results of the drafted ESIA including the defined impacts and mitigation measure, a public consultation event was arranged, announced for and conducted with the main purpose of getting diverse stakeholders together to receive their feedback on the ESIA and incorporate their views on the final ESIA. The following actions were taken to arrange for this event:

1. Selection of the meeting hall within the district that will host the event and provision of buses to move people to the event Hall,
2. The avenue was accessible and suitable to host 150 guests,
3. The preparation team deployed brochures and flyers in all project areas, particularly around the pumping station and treatment plant
4. An advertisement was published four weeks before the event in public widely disseminating newspaper (see photo number 8-7)
5. Assuit water company invited the governmental stakeholder and prepared roll-ups to inform about the project
6. Freedom and development NGO were participated in inviting the females and the community members
7. Site visits were paid to the project villages in order to invite the community people and their leaders.
8. A banner was set in the entrance of the Local Governmental unit in Etmania village
8.6.2.1 Participants profile

166 persons attended the meeting and registered their names. Two hours before conducting the event, females occupied the event hall. 36.7% of the participants were females. While 63.3% of the participants were males. Young groups and old people were interested to attend the meeting. The majority of the participants were illiterate. They brought their national ID in order to register their names and ID number. The majority of participants were among the poorest family that lost their houses in the flood. They aimed at obtaining compensation. Regardless of informing them about the objective of the consultation session, they were willing to attend it. The young people stood close to the venue windows in order to leave room for the women and old people.
Given the fact that the study team mobilized the residents of the project areas, 77.7% of the participants were from El Etmania village (Wadi El Sheih is included), 11.4% from El Nawawra. Representatives of the governmental units attended the meeting. That was relatively a challenge as the Prime Minister planned to visit the district in the same day allocated for the public consultation. The governor sent his counselor for water and wastewater projects.
The participants reflected various occupations, particularly, farming. 25.3% of the participants were farmers. 13.9% were among administrative staff. It was obvious that the majority of female participants are jobless. Thus, the percentage of those who don’t work was 37.3%. The high managerial positions represented 6.6% of the total participants.

Table 0-4: Distribution of the Public Consultation participants by their occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>42</td>
<td>25.3</td>
</tr>
<tr>
<td>Administrative</td>
<td>23</td>
<td>13.9</td>
</tr>
<tr>
<td>Specialist</td>
<td>13</td>
<td>7.8</td>
</tr>
<tr>
<td>Manager and high administrative staff</td>
<td>11</td>
<td>6.6</td>
</tr>
<tr>
<td>Business sales and services</td>
<td>8</td>
<td>4.8</td>
</tr>
<tr>
<td>Unspecified laborer</td>
<td>4</td>
<td>2.4</td>
</tr>
<tr>
<td>Drivers</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>Army and police officers</td>
<td>1</td>
<td>.6</td>
</tr>
<tr>
<td>Does not work / pension / housewife</td>
<td>62</td>
<td>37.3</td>
</tr>
</tbody>
</table>
Given the fact that the project areas have a high illiteracy rate and the governmental entities representatives were literate, the variation between the two groups was stark. The diversity between literate and illiterates, workers and unemployed enriched the discussion to a great extent. A variety of organizations as well as representatives from governmental and community based authorities, institutes, and entities. Following is a brief distribution of the sectors attended the meeting:

- 66.5% of the total participants were community people who work as farmers and administrative staff,
- 13.0% represented NGOs and civil society
- 9.3% represented the Local Governmental Unit of El Etmania, El Nawawra and El Badary District
- 8.6% were invited from the Water Company in Menoufia
- EEAA and the associated branches attended the event

<table>
<thead>
<tr>
<th>Sector</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and water resources</td>
<td>66.5%</td>
</tr>
<tr>
<td>WWHC</td>
<td>1.2%</td>
</tr>
<tr>
<td>Health</td>
<td>1.2%</td>
</tr>
<tr>
<td>Egyptian Environmental Affair Agencies</td>
<td>1.2%</td>
</tr>
<tr>
<td>WWC in the Governorate</td>
<td>6.8%</td>
</tr>
<tr>
<td>Local Governmental unit</td>
<td>9.3%</td>
</tr>
<tr>
<td>NGOs&amp;Civil Society</td>
<td>13.0%</td>
</tr>
<tr>
<td>Community People</td>
<td>66.5%</td>
</tr>
</tbody>
</table>

Figure 0-4: % distribution of participants by sector

8.6.2.2 Activities of the public Consultation

The event started with an introductory speech presented by Eng. Abd El Reheim Mohamed Abd el All the head of Etmania Local Governmental Unit. He acted as a moderator for the session.

1. Eng. Medhat Mohamed Hassan the representative of Assuit Governorate thanked the participants and encouraged them to provide support to the project
2. Eng. Mohamed Fawzy, the head of Environmental Management Unit in the Governorate, shed light on the ESIA and the importance of developing robust mitigation measures. He added that the project is crucial in order to solve the problem of the underground water.
3. Eng. Safwat Khashaba environmental expert in the holding company emphasized on the following points:
a. The importance of the project to the community
b. The duration of construction activities 18 months
c. The unfavorable impacts during construction
d. The benefits of the project

4. Dr. Magdy Assar the social expert in the holding company thanked the audience. He set focus on the problem of sewage, particularly for females. As well, He explained the objective of the session. He mentioned few remarks about the unfavorable impacts that might be encountered during the construction. He added that informing people about the project is crucial now.

5. General Hasan Abd El Ghany, the chairman of Assuit Water and Wastewater Company, explained the problem of sewage. He emphasized on the importance of sewage system and the necessity to cover all rural areas with sanitary system

6. Dr. Abd El Hamid Beshara the environmental expert presented the results of the Environmental impacts of the study.

7. Ms. Zeinab Hafez the social expert in EcoConServ made an interaction presentation about the project social impacts. She added that Assuit, during similar projects, faced some con-artists who deceived people by informing the community that they affiliate to the water company. They collected money from the community people. She emphasized on not being any money to such people. They have to contact the water company directly.
8.6.2.3 Summary of discussions
All participants expressed their eagerness for the commencement of project implementation without further delay and many participants demanded the extension of the project to additional areas. Following is a summary of all discussions conducted.
### Table 0-5: Key points raised and actions to be taken

<table>
<thead>
<tr>
<th>Subject</th>
<th>Questions and comments</th>
<th>Responses</th>
<th>Actions to be taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidy to the house connections</td>
<td>Due to the nature of area, poverty prevails among all categories. The project will be free of charge, but the community is in need for additional subsidy to be connected to the network</td>
<td>Dr. Magdy</td>
<td>Additional stakeholder engagement activities to be conducted along the life of the project</td>
</tr>
<tr>
<td>Other unfinished sewage projects</td>
<td>In El Aqbat village, a sewage project started in 2010 until now it hasn’t been completed</td>
<td>G-Hassan</td>
<td></td>
</tr>
<tr>
<td>Digging the streets without installing any sewage pipelines</td>
<td>In El Salmania village, streets were dug to install sewage network, but nothing happened</td>
<td>Dr. Magdy</td>
<td>Rigid monitoring mechanism to warrantee the commitment of the contractor to rehabilitate the streets</td>
</tr>
<tr>
<td>Grievance mechanism</td>
<td>What should we do in case of facing a problem, to whom we should address our complaints?</td>
<td>Dr. Magdy</td>
<td>Information should be provided about the GRM</td>
</tr>
<tr>
<td>Subject</td>
<td>Questions and comments</td>
<td>Responses</td>
<td>Actions to be taken</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Emergency plans against floods</td>
<td>Have the consultants proposed any protective measures to protect the treatment plants and pumping stations from floods?</td>
<td>Dr. Magdy</td>
<td>Floods were considered in the site assessment</td>
</tr>
<tr>
<td>Probability of water contamination</td>
<td>It is recommended to construct the sewage plants far enough from the water pipelines?</td>
<td>G-Hassan</td>
<td></td>
</tr>
<tr>
<td>Final disposal of sewage water</td>
<td>Will sewage water be disposed to the canals?</td>
<td>G-Hassan</td>
<td>As Dr. Abd El Hamid mentioned, it will be disposed to an adjacent tree forest</td>
</tr>
<tr>
<td>Risks</td>
<td>It is recommended to protect project equipment, as robbery is widely spread here</td>
<td>G-Hassan</td>
<td>All recommendations will be considered</td>
</tr>
<tr>
<td></td>
<td>People might pretend that their houses (damaged during flood) were affected by the project, thus the contractor would pay them compensation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Each one will be willing to employ his son or relative, Employment activities should be handled wisely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td>Questions and comments</td>
<td>Responses</td>
<td>Actions to be taken</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
</tbody>
</table>
| Community participation and awareness raising | It is recommended to provide awareness raising sessions about:  
   1- Contracting procedures  
   2- Importance of sewage system  
   3- How to maintain the sewage network  
   4- Grievance mechanism  
   5- Health hazards result due to sewage system  
   It is recommended to implement such activities in cooperation with the NGOs. They know how to talk to the illiterate community and fully aware about their problems | Dr. Magdy  
Such proposal is good and the holding company would be much in favor for such cooperation |                                                                                   |
| Job creation                                  | It is recommended to employ the young people from the project areas                                                                                                                                                      | G-Hassan  
The community residents have the priority to be employed                  |                                                                                   |
8.6.2.4 **Second Public Consultation Disclosure Activities**

Due to the importance of the project for the government and the community people, various newspapers were interested to present some news related to the project, particularly, because the governor shed light on the project.

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**Photo 0-21: Sample of published news**

http://www.almehwar.info  
http://elwatannews.com
8.6.2.5 Public consultation During the ESIA August, 2016

To verify the results of the drafted ESIA for el Nawawra WWTP and timber forest, including the defined impacts and mitigation measure, a public consultation event was arranged, announced for and conducted with the main purpose of getting diverse stakeholders together to receive their feedback on the ESIA and incorporate their views on the final ESIA. The following actions were taken to arrange for this event:

1- Selection of the meeting hall within the district that will host the event.
2- The avenue was accessible and suitable to host 150 guests.
3- The preparation team deployed brochures and flyers in all project areas, particularly around the pumping station and treatment plant.
4- An advertisement was published one week before the event in public widely disseminating newspaper.
5- Assiut Water Company invited the governmental stakeholder and prepared roll-ups to inform about the project.
6- Freedom and development NGO were participated in inviting the females and the community members.

7- Site visits were paid to the project villages in order to invite the community people and their leaders.
8- A banner was set in the entrance of the Local Governmental unit in El-Nawawra village.
The consultation session was attended by 130 persons. Young groups and old people were interested to attend the meeting. The majority of the participants were illiterate. The majority of participants were among the poorest family. They were interested to attend the consultation session in order to declare to support the project and that they want the project activities to proceed as soon as possible.

The participants reflected various occupations, particularly, farming. 10% of the participants were farmers. 27.6% were among administrative staff. It was obvious that the majority of female participants are jobless. Thus, the percentage of those who don’t work was 8.4%. The high managerial positions represented 3.8% of the total participants.

**Summary of discussion:**

Mr. Salah Abdallah, **Head of the Local Government Unit at Nawawra** has started the session by welcoming all the participants in the consultation session. He emphasized the importance of the project for the village and that it is the largest sewage project at Bedary district. He invited all the community members to support the project.

**Eng. Fakhry Abdel Khalik, the Environmental Expert – EcoConServ**, has also welcomed all the participants in the public consultation. He also noted that consultant team has held several consultation activities at the village in addition to the consultation held during preparing the original ESIA. The purpose of the current session is to assess the impacts related to the new location of the WWTP.

**Dr. Mohamed Atef, RSU member at Assuit Water and Wastewater Company** has given a brief overview of the project. As this is project is funded by the World Bank it is considered an integrated project, meaning that the project includes the household connections unlike projects funded by Egyptian government where the beneficiaries have to pay the cost of the household connection. The total cost of the project is about 180 million EGP and the construction period is 18 months.

Then the consultant team delivered the presentation of the project social and environmental impacts during both construction and operation phases.
Key comments raised during the discussion:

The following table presents the main comments raised during the public consultation.

Table 0-6: Key points raised during the session

<table>
<thead>
<tr>
<th>Questions and comments</th>
<th>Responses</th>
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<tbody>
<tr>
<td>Kindly indicate if the Cabinet decree to allocate the land is the latest? Have there</td>
<td>We have explained during the presentation the location that has been included in the decree number 1666. We have shown on the map the whole plot that has been allocated for the project including the new and old location of the WWTP. The allocation decree number 1666 is the only decree that has been issued. There is no old decree that was changed later.</td>
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<td>been previous decrees to allocate the land plot for the project?</td>
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<tr>
<td>What are the negative impacts of the timber forest? Wasn’t it better to use drying beds</td>
<td>Each project has some negative and positive impacts. We always try to minimize the negative impacts and maximize the positive one. The timber forest is not irrigated with the discharged water directly. Water is treated first before used in the forest. There are very strict regulations for water treatment. And the water is only used for irrigation of wood trees. The water is not used for irrigation of fruits or vegetables at all. And the wood trees can be sold and used later by the community.</td>
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<td>instead? We heard that the timber forest can have adverse health impacts?</td>
<td></td>
</tr>
<tr>
<td>Questions and comments</td>
<td>Responses</td>
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<tr>
<td>Can the water discharged from the WWTP be used for irrigation?</td>
<td>Secondary treatment will be conducted for the water before discharged. It has to be compliant with the Egyptian code for treated water then it can only be used for irrigating wood trees but not trees that can be eaten.</td>
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<tr>
<td>With regards the sludge from the drying beds can the local community benefit for it to use it as fertilizers?</td>
<td>Of course the local community can arrange with the WWTP to receive the sludge and all farmers from the village can benefit from it. Administrative arrangements can be made to ensure that all farmers have access to it in turns.</td>
</tr>
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<td>Can the timber forecast bring animals and beasts to the area or snakes?</td>
<td>The timber forest area is like any farm or cultivated land in the village. There are also staff in charge of farming and security it is not an abandoned place. It is a safe place like any other cultivated land.</td>
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<td>Has the construction of the WWTP been delayed after all those problems to apply the Egyptian codes and regulations? Why only are all those requirements being applied at Nawawra WWTP? We know that other WWTPs do not comply with all regulations you mentioned now.</td>
<td>The consultant is only discussing those regulations and ensuring that the WWTP is compliant with them. The consultant is trying to show in the presentation that the new location is also compliant with the regulations. But construction work was not delayed specifically for this purpose.</td>
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<td>We are currently suffering from the water leakage and we expect the house structures will collapse as a result of the sewage water. Please we need the project as soon as possible. We are also suffering from mosquitos and diseases as a result of the current sewage situation. We urgently need the sewage project in our village.</td>
<td>Noted. The project will directly proceed after the approvals. No more delays should be expected.</td>
</tr>
<tr>
<td>We have been invited to other meetings and similar conferences, please we had enough meetings and talk we would like the project to proceed as soon as possible.</td>
<td>Noted</td>
</tr>
<tr>
<td>Questions and comments</td>
<td>Responses</td>
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<tr>
<td>We are noticing that there are delays with the implementation schedule. The project was supposed to extend for 18 months, now 6 months have passed and construction has not started yet. We would like the project to start and enough delays. If all government approvals are granted we would like the project to proceed. All the village supports the project.</td>
<td>After all the approvals, the project will proceed as was originally planned</td>
</tr>
<tr>
<td>We lost confidence from too many conferences and meetings. We have also collected signatures to ensure that we approve the sewage project in our village.</td>
<td>This is the last conference. We only needed to confirm that there are no objections for the new location of the WWTP</td>
</tr>
<tr>
<td>We are from a neighboring village El Zahree, shall we be included in the project?</td>
<td>Unfortunately El Zahree is not part of this project ISSIP-II, but it is included in the NOPWASD plans. The budget we have does not allow us to include all villages. We would wish to connect all villages to the sewage service. And the government has an ambitious plan. This project is one step and we have all to collaborate and understand that we will be connected someday. We are aiming for the future of our children. And we have to be patient and support each other.</td>
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<tr>
<th>Written comments received by the consultant</th>
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<tbody>
<tr>
<td>Not to leave the discharge beds directly open to the light and make it closed so as not to come out unpleasant odors for residents of the village.</td>
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<td>The whole forest allocated area (400 feddans) should be planted from the beginning to avoid any encroachments.</td>
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<td>You are too late in implementing the project and we hope to meet the deadline of the end of it</td>
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<td>What are the measures included for maintenance and monitoring during the operation phase?</td>
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8.6.2.6 Consultation activities conducted by the HCWW and Assuit Water and Wastewater Company

The HCWW and Assuit Water and Wastewater Company have held several consultation meetings during the preparation of the updated ESIA.

The first consultation session was held on the June 25, 2016 at the Local Government Unit in Nawawra. It was attended by 65 community representatives in addition to the RSU members.
The aim of the meeting was to discuss the grievance submitted by Mr. Sayed Mahmoud Abdel Wahab about the negative impacts of the project. The RSU in addition to the head of the local government unit at Nawawra have explained the impacts and discussed the new location of the WWTP.

In general the participants were all supportive for the project and they expressed their will for the project activities to proceed. They have not shown any negative perceptions towards the project. Especially that the allocated land is publically owned and it is currently vacant. And the closest neighboring houses are about 3 kms from the location.
The **second session** was held at the house of Mr. Sayed Mahmoud Abdel Wahab, the person who submitted the grievance on July 13, 2016. The session was attended by 25 persons including other persons who submitted the grievance, the RSU team and the World Bank team. During the session all negative impacts expressed by the complainers were discussed and explained.
During the session impacts and concerns raised by the persons who submitted the grievance were discussed. It was explained to Mr. Sayed and the others that all their environmental and social concerns will be studied deeply by an independent consultant. All concerns from anyone from the surrounding community will be properly raised to the RSU, PIU-HCWW and WB with proper assessment of the severity of these impacts.

It was mentioned to the participants that the HCWW is preparing an updated ESIA study for the WWTP and the timber forest taking into consideration all concerns raised by the local community. The ESIA will be finally approved by EEAA and the WB before proceeding into implementation of the project.

8.7 CLOSING NOTE
The key message from the consultation events carried out for this project is that the Public and government acceptance is simply overwhelming. Aside from limited concerns regarding arrangements for installation, delay and the underground water, stark acceptance of the project were highlighted during the consultation events.

Consultation activities are expected to continue in cooperation with the community leaders and the local governmental entities. The awareness department within Assuit Water and Wastewater Company will decide on the most appropriate consultation tool to reach out to the different stakeholders during the implementation of the project activities.