Environmental Assessment Report

Volume 1

Part 3: Chernihiv City

FINAL

November 2005
NOTE TO FILE:

The following Environmental Assessment Report is one of several that was prepared in support of the Urban Infrastructure Project for Ukraine which was under preparation in 2005-2006. This is a category B project for rehabilitation of various utilities, including water supply, waste water treatment, and solid waste. The EAs cover investments under Component B for Rehabilitation Investments under the project. Any technical variations in the final plans for these sites will be addressed in the review of the EMPs scheduled to take place in conjunction with the launch workshop. All subsequently identified works under Component B. must comply with the preparation of similar EAs in accordance with the Environmental Framework Policy dated November, 2005, before the disbursement of any funds for the specific site. Investments under C. for Energy Efficiency under the Project must comply with the preparation of an abbreviated EA/EMP specified under a separate Environmental Framework Policy prepared specifically for Component C.
Ukraine: Urban Infrastructure Project

ENVIRONMENTAL ASSESSMENT REPORT

Volume 1
Part 3: Chernihiv City

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PREFACE

Urban Infrastructure Project (UI Project) and Nistru River/Black Sea Protection Project (NR/BSP Project) (GEF sub-project) have been merged into a single Urban Infrastructure Project (GEF sub-projects are treated under the UI Project) as their broad environmental goals include improvement of hygiene and health of the population, provision of low-cost and sustainable water supply and sanitation delivery services, and improvement of environmental conditions in Ukraine, with a special focus on the Nistru River and Black Sea basin as a priority region.

Within the framework of this integrated project, the EA Consultant is responsible for preparation of:
- Environmental Framework Policy (EFP);
- Environmental Assessment (EA).

Environmental Framework Policy

The Environmental Framework Policy document reflects key provisions of environmental policies adopted by Ukraine and the World Bank, the results of their comparative review, and demonstrates their compatibility on all major issues.

The existing methodological frameworks for environmental assessment, developed in Ukraine and adopted by the World Bank, have been reviewed as part of the EFP preparation. This review reveals a very close similarity of these frameworks, with only few minor inconsistencies, which have not been encountered in the preparation of environmental assessments for selected investment projects.

Environmental Assessment

The Environmental Assessment documents, presented in this submission, have been prepared according to the World Bank environmental policies (OP4.01) and procedures, which are compatible with the Law of Ukraine “On Environmental Review” and the EIA-related State Construction Standard DBN A.2.2-1-2003 “The Environmental Impact Assessment Content and Composition for Construction Projects” (Kyiv, 2004).

There have been numerous changes in the list of proposed projects, which should be subject to environmental assessment. The most recent list of projects, provided to the EA Consultant and dated 12 October, 2005, appears to be different from the initial list, included in the Terms of Reference.

At the same time, the Environmental Assessment studies were carried out for a number of other projects/locations, included in the expert’s findings/e-mails dated 13 May, 11 June, 17 August and 26 August, 2005 (Ivano-Frankivsk, and towns in Kharkiv Oblast: Kupyansk, Izium, Chuguev).

According to above mentioned, the present report consists of two volumes:
- **Volume 1** - preliminary sub-projects identified for inclusion under UI project (according to the list dated 12 October, 2005).
- **Volume 2** - addition sub-projects reviewed according to expert’s findings.

The general content of Final EA Report is given below.
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INTRODUCTION

Chernihiv is a major administrative, industrial, economic and cultural centre, located in the northern Ukraine, approximately 140 km north of Kyiv and 60 km east of Slavutich. According to historical records, the City's history spans over 1,300 years starting from the 7th century AD. The City has numerous ancient churches, cathedrals and architectural monuments dating back to the 11th-12th centuries. These days, Chernihiv represents a unique mix of modern and ancient features dispersed across a spectacular landscape of the Desna River floodplain. Much of this heritage is concentrated in the historical part of Chernihiv, known as Val (ancient City Wall).

Major City's industries include textile manufacturing, petrochemistry, food processing and, recently, car assembling. Many industries have been on the verge of survival since the collapse of the Soviet central planning system. The impact of change has been particularly harsh for the City's Airport, which has virtually ceased its operations. At the same time, small and medium-size enterprises have shown a stable growth, especially in the agro-industrial sector. Significant part of City's population relies on small-scale trading activities for their livelihoods.

In 2003, the City's population was 303,000 people. During 2004, the City's population decreased by 1,600 to 301,400 people. The downward trend in population number is expected to stabilize in the nearest future, mainly as a result of gradual growth of City's economy.

The City occupies 7,856.3 ha, with surface elevations reaching about 38.0 m. Average number of storeys in residential buildings is 5.

The City's Water Service Reform Programme has been developed with the assistance of the US Agency for International Development and Community Development Institute within the framework of the Tariff Reform and Municipal Utility Restructuring Programme in Ukraine. The 2005-2010 Strategic Action Plan for the Chernihiv Vodokanal Municipal Utility was prepared in 2004-2005.

Further sections of this report describe the proposed improvements and results of the EA.

Climate

According to the classification system set out in the Construction Standard SNiP 2.01.01-82, the area occupied by the City of Chernihiv is classified into the Category II-B within the Wind Zone II.

The climate of the area is typically continental, with moderately cold winter and warm summer. The climate of the proposed project site is similar to that of the surrounding area.

Mean annual temperature is +6.5°C. The coldest and warmest months are January and July, with mean temperatures at −6.7°C and +19.4°C, respectively. In absolute terms, minimum and maximum temperatures are at −37°C and +38°C, respectively.

Mean annual precipitation ranges between 530 to 639 mm.

Westerly winds are predominant in the area, with average speeds at 4.2 m/s in January (18% mean annual frequency) and 3.7 m/s in July (17% mean annual frequency), followed
by the north-western winds, with average speeds in January and July at 4.5 and 3.8 m/s (13% and 24% mean annual frequencies, respectively).

Estimated ambient air temperature is at –22°C. Maximum design frost zone depth is between 0.90 to 1.00 m. Estimated snow load is 70 kgs/m². Average air humidity is at 82%.

Geology

The geology of the area comprises the Precambrian strata, which underlie a sequence of Palaeozoic, Mesozoic and Cainozoic sediments.

The Palaeogene deposits include greenish-grey or dark-green to grey sands, combined with greenish-grey silty loam. The Neogene system comprises greyish clay soils and grey silty sands.

Lower to Middle Quaternary deposits comprise glacial submorainic sediments (grey sands and yellowish grey silty clays) and glacial sediments (reddish brown or greenish grey silt with crystalline inclusions). Upper Quaternary deposits include Aeolian and Eluvian sediments (loess loamy sands and fine silty sands).

At the Wastewater Treatment Plant site, groundwater is present at depths of between 1.5 and 10 m.
1. REHABILITATION OF WATER SUPPLY SYSTEM

1.1. Existing Situation

1.1.1. General

The history of Chernihiv's water supply system dates back to 1872, when the City Council made a decision upon its development. The construction activity started in 1880 and finished in 1883. From the outset, water supply in the City was reliant on groundwater sources. Two artesian wells were constructed in Yalivschina to abstract and supply water to the City's distribution system. Four water-dispensing pumps were constructed around the City to provide water to population. The system was further expanded in 1886-1898, to include nine artesian wells, water tower, new pumping unit in Yalivschina, and additional distribution lines. The total length of distribution lines was 6 km.

Water supply service is operated by the Chernihiv Vodokanal Municipal Utility, which provides water supply service to 255,076 people and over 200 industrial entities within the City. Basic information on Vodokanal's operations is provided in Table 1.1.

<table>
<thead>
<tr>
<th>Table 1.1. Description of Water Supply Services Provided by Chernihiv Vodokanal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of service subscribers: 107,334 (as of 2004); Of that, with metering devices: 39,316</td>
</tr>
<tr>
<td>Consumers/Connections: 85,477 apartments and 1,806 apartmental buildings; 13,855 private houses; 205 industrial consumers; 1,205 other consumers/connections</td>
</tr>
<tr>
<td>Number of population served: 255,076 people (water supply service, as of 2004)</td>
</tr>
<tr>
<td>Volume of water supplied: 85,279 m³ per day (2004), or 283 l/day per capita (2004)</td>
</tr>
</tbody>
</table>

Schematic plan of service area and layout of existing water supply system are shown in Figure 1.1. Current water supply system comprises 4 water abstractions, 4 booster pump stations, and 10 precast-concrete storage tanks with total capacity of 21,300 m³, i.e. 25% of daily supply. The total length of water supply pipework is 511.3 km.

The City solely relies on groundwater for drinking water supply. Water is abstracted from two aquifers:

1. Buchak (low-productive) aquifer, lying at depths of between 100 and 120 m and accounting for 32% of the total City's water supply. Water in this aquifer is characterized by elevated concentrations of iron.
2. Lower Chalk aquifer, whose significant depths (680-760 m) are seen as a good natural protection against adverse environmental impacts. The water quality in this aquifer meets all requirements of the State Standard GOST 2874-82 “Drinking Water”. High-productive wells drilled into this aquifer account for 68% of total volume of water supplied to the City.

Thirteen of existing 97 abstraction wells are now defunct, and other 62 wells (63.9%) have reached the end of their operational life. All wells are located within the boundaries of Chernihiv. The artesian wells are grouped into four water abstraction sites (Yalivschina, Podusivka, Bobrovitsia, and Polubotki), located in different areas of the City. There are five stand-alone wells that provide water to remote residential areas.
Water Abstraction Site 1 - Yalivschina is located in the central part of the City. It comprises 26 artesian wells, Level II booster pump station, 2 clean water tanks (1250 m$^3$ and 3000 m$^3$), and chlorination plant.

Water Abstraction Site 2 - Podusivka is located in the western part of the City and comprises 18 artesian wells, 3 clean water tanks (2x1000 m$^3$ and 1x3000 m$^3$), Level II booster pump station, electrolysis unit, and electricity-run boiler house.

Water Abstraction Site 3 – Bobrovitsa, located in the northern part of the City, comprises 26 artesian wells, Level II booster pump station, 2 clean water tanks (3000 m$^3$, each), and chlorination plant.

Water Abstraction Site 4 - Polubotki is located in the north-western part of the City. It comprises 22 artesian wells, 2 clean water tanks with capacity of 3000 m$^3$ each, solid-fuel boiler house, chlorination plant, and Level II booster pump station.

City’s Water Abstraction Site consists of 5 stand-alone wells.

All Level 2 booster pump stations and stand-alone wells have water meters for metering production and distribution inputs.

Water abstraction performance review indicates that existing wells are inefficiently operated on a restricted hourly basis during a day. This is caused by the lack of sufficient storage capacity at the pump station sites, and considered to significantly affect the performance of deep well pumps as their intermittent operation increases the wear on and breakdown frequency.

Water pump stations (WPS) were constructed 30-40 years ago, in the 1969-1970s. Some of them (WPS-1, WPS-2, and WPS-3) were upgraded in 1983-1993. The state of facility buildings, mechanical and electrical equipment at the upgraded pump stations can be rated between good and satisfactory. With respect to WPS-4, its facility buildings and electrical equipment are rated as adequate, while mechanical equipment is in urgent need for repair. The following issues are common for all existing pump stations:

- The capacity of installed equipment is in significant excess of actual volume of pumped water;
- The daily operation is controlled manually, with the help of flow throttling valve;
- The pump equipment efficiency is low, leading to the increased energy consumption.

In 2003 and 2004, total annual energy consumption for the provision of water supply service was at 27.26 and 25.69 million kWh/year.

Technical inspection data indicate that 15.2% of water distribution pipework has reached the end of their operational life, and other 13.5% is in dilapidated or ‘accident-prone’ state. Poor state of pipework is the main cause of frequent pipe breaks, significant water losses and service failures. Water losses in the distribution network are estimated to about 24%. Water is supplied to customers on a continuous, 24-hour basis.

As can be seen from the above, the rehabilitation and replacement of municipal water supply network and pump stations is an urgent issue of social significance.
Figure 1.1. Layout of Centralised Water Supply System in Chernihiv
1.1.2. Site Geology

Geomorphologically, the study area lies within the Chernihiv Polissya Zone and consists of morainic plain, overlying Neogene and Palaeogene deposits. The Dnipro-Desna accumulative depression is a characteristic feature of local landscape. The landform of the area is one of a lowland, gently dipping to the west.

Structurally, the area is associated with the Pripyat/Dnipro-Donetsk Graben, located in the western part of the Dnipro-Donetsk Lowland.

The geology of the area comprises the Precambrian strata, which underlie a sequence of Palaeozoic, Mesozoic and Cainozoic sediments.

The Palaeogene deposits include greenish-grey or dark-green to grey sands, combined with greenish-grey silty loam. The Neogene system comprises greyish clay soils and grey silty sands.

Lower to Middle Quaternary deposits comprise glacial submorainic sediments (grey sands and yellowish grey silty clays) and glacial sediments (reddish brown or greenish grey silt with crystalline inclusions). Upper Quaternary deposits include Aeolian and Eluvian sediments (loess loamy sands and fine silty sands).

At the Water Treatment Plant site, groundwater is present at depths of between 1.5 and 10 m.
1.2. Proposed Investment Projects

The following sections of the report describe priority investments identified for the rehabilitation of water supply system in Chernihiv.

1.2.1. Construction of Booster Pump Stations, Replacement of Pumping Equipment at Water Abstraction Sites and Pump Stations, Automatic Control of Pump Station Operation

1.2.1.1. Construction of Booster Pump Stations

The rehabilitation programme for the Chernihiv City water supply service involves the construction of 7 booster pump stations in the following locations: Komsomolska Street, 2 Gagarin Street, 130 Tolstoy Street, 18 Dotsenko Street, Chervonoarmiysky Street, Rodimtsev Street, and 207 Mir Avenue. The proposed sites are located in the residential areas with high- to medium-rise apartmental blocks, and in the City’s recreational area. The booster pump capacity requirement is justified by the need for improved pressure control in water supply system.

The design documents for booster pump stations will be prepared and pumping equipment specifications will be identified, with special focus on the pump capacity and efficiency characteristics (Figure 1.2). For the latter, the proposed target is 75-77% in order to improve energy efficiency. Also, the automatic frequency transformation would be a useful feature.

1.2.1.2. Replacement of Pumping Equipment at Water Abstraction Sites and Pump Stations

Currently, well sites are equipped with the ECV 8,10,12,16 pumps. The total number of pumps is 84, and the proposal is to replace 83 pumps (Figure 1.3).

It should be noted that the proposed replacement does not imply an increase in water abstraction volumes, therefore there would be no excessive drawdown of wells beyond the permitted level.

At the pump stations, the replacement programme would involve the replacement of existing pumps, engines and control panels with more efficient pumping equipment, with pump efficiency of >0.82 and engine efficiency of >0.94. The need for replacement is apparently due to the wear out and low efficiency of existing pumps, estimated to about 0.5.

The replacement of well pumps would result in energy savings of between 4 to 12%. Currently, specific energy consumption is at about 0.823 kWh/m³, which is translated into approximately 45% of the cost of water supply service provision.
1.2.1.3. Automatic Control Equipment at Water Pump Stations

The proposed automatic control improvements include the following components:

- Installation of electrical frequency transformers to maintain optimum pressures;
- Operational control automation for Level 2 booster pumps;
- Installation of telecontrol equipment to control flows and energy consumption.

1.2.2. Rehabilitation of Water Distribution System

The proposed rehabilitation programme includes the replacement of water distribution piping (Figure 1.4), with a total length of 9.4 km.

It is proposed to lay new pipes along the existing lines, and replace all valves and connections. Old valves would be repaired for further use. The design features new cast-iron pipes with internal (concrete) and external (epoxide) coating. Minimum design diameter is 150 mm. Old pipes of smaller diameter would be replaced with 150 mm pipes. House service pipes of larger diameter (over 100 mm) would be made of cast iron; and PVC or HDPE pipes would be used for smaller house connections.

Project justification:

1. Increase in volume of water supplied to customers.
2. Savings in power cost for pumping service due to reduced leakage and hydraulic friction.
4. Improved water quality in the distribution network.
5. Improved quality of water supply service.
1.3. Analysis of Potential Environmental Impacts

Using the criteria set out in the World Bank's Operational Policy on Environmental Assessment, the proposed project is classified into category B1.

Existing project design documents have been developed in accordance with the following Construction and Design Standards:

- SNiP 2.04.07-86 "Heating Networks";
- SNiP 360-92* "Urban Area Development and Management Rules";
- SNiP 2.01.01-82 "Engineering Climatology and Geophysics";
- SNiP 1.02.07-87 "Engineering Survey at a Construction Site";
- SNiP 2.04.03-85 "Wastewater Management. External Networks and Facilities";
- SNiP 2.04.02-84 "Water Supply. External Networks and Facilities".

1.3.1. Physical Impact

Physical effects on the environment may arise from a number of individual activities associated with the replacement of pumping equipment and construction of booster pump stations. It should be noted that earthworks constitute an essential part of the proposed construction project.

The proposed design features specific mitigation measures, identified in accordance with existing environmental legislation and regulations, and designed to minimise the impacts on ambient air, water resource, land resource, and surrounding plantations during the construction and operation phases of the proposed project.

Atmospheric Effects

The adverse impact of emissions of polluting substances to air is unlikely to arise during the construction and operation of water pump station and water distribution pipework. The proposed project includes a suite of measures that ensure its compliance with existing regulations and standards, and prevent/minimise the potential impacts on air quality as a result of the release of polluting substances to air.

Impact on water resources

Mitigation of potential adverse effects on water resources during the construction and operation phases of the proposed project is envisaged in:

- The avoidance of change in local hydrogeology and hydrology in the execution of earthwork operations;
- The avoidance of release of polluting substances to surface waters;
- The rehabilitation of surface runoff collection system in the project area.

The operation of water pump station and distribution network is not considered to be a source of surface water pollution. The proposed pump station, new pumping equipment and water distribution pipework would not produce any adverse impact on water resources.
Land Resource
The conservation of land resource involves a suite of institutional, organisational, economic, and legal measures designed to prevent/restrict processes and practices that contribute to the degradation of soil.

According to the Ukrainian legislation, a land allocation consent for the construction activity is required to be taken out prior to the commencement of construction of pump station and associated infrastructure. All construction operations should be strictly limited by the site boundaries specified in the construction consent.

For the pipe replacement component, the project includes a provision for the removal and restoration of asphalt cover where the pipeline crosses a road or sidewalk.

Also, there is a provision for restoration of park zones affected by the proposed construction activity. Site restoration is a key land conservation measure that involves a suite of actions, aiming to ensure the land rehabilitation and landscape enhancement. Land restoration includes two phases, i.e. technical and biological.

Technical restoration is a responsibility of a construction contractor, while biological restoration is to be undertaken by a land permit holder. The cost of the whole restoration effort is covered out of the project budget.

Technical restoration involves the removal of top soil prior to the commencement of construction activity, and its replacement after the completion of construction. For pipework laying component, the restoration requirement relates to the width of pipeline trench plus 0.6 m on either side of trench. The required thickness of top soil cover which has to be removed is 0.15 m. The distance limit for the location of a temporary soil storage site is up to 25 m.

Plantations
The State Construction Standard DBN 360-92** sets a 1 m limit upon the proximity of earthwork operations to a plantation; and requires a temporary protective fence if loading/unloading equipment is operated at a distance of less than 0.5 m from a tree stem or crown.

There are no plantations in the planned locations of earthwork operations.

1.3.2. Social Impact

The replacement of pumping equipment and pipework, and completion of pump house construction would have a direct benefit to the local population by improving the quality of water supply service.

The implementation of proposed project would not have a major impact on the social situation in the City. The proposed project design meets all current sanitary standards and poses no threat to human health and living conditions.

The environmental assessment of the proposed project indicates that it would not have any adverse effect on local industries, agricultural activities, housing areas, surface and subsurface communications, recreational areas, landscape features and cultural assets. No human resettlement is required under the project.
1.4. Review of Alternative Options

Street hydrants can be considered as an alternative to centralised water supply service. However, the operation of a large number of street hydrants, with each hydrant serving a very limited number of customers, would not be feasible, both economically and environmentally. Therefore the rehabilitation of existing water supply service is seen as the most appropriate solution.

For pumping equipment, various supply options have been considered, including locally manufactured pumps. However, considering that imported equipment has better technical characteristics in terms of operational life and efficiency (5 vs. 3 years, and efficiency at 0.8), the preference was given to pumping equipment manufactured in Germany, Poland and USA.

The analysis of "status quo" scenario shows that existing situation is not sustainable and needs to be improved. The proposed project is based on new technical solutions, which have proved economically feasible and environmentally sound.

From the above, the implementation of proposed project is considered as the most preferable option, both economically and environmentally.
1.5. Environmental Management Plan

1.5.1. Brief Description of Key Environmental Issues

Existing water supply system, inherited from the former USSR, is characterized by excessive energy usage. In 2003 and 2004, total annual energy consumption for the provision of water supply service was at 27.26 and 25.69 million kWh/year, respectively. Energy is a major cost item, accounting for 45% of the total cost of water supply and wastewater treatment service. Excessive energy consumption is largely attributed to be a result of low operational efficiency of pumping equipment, and imbalance between installed pump capacity and hydraulic performance of water distribution network.

Existing pumping capacity is in significant excess of current demand. Pumping and ancillary equipment of water pump stations is in poor technical state, being operated beyond its design life and under pressure limitations of existing distribution network.

Significant parts of water distribution network are assessed as having reached the highest level of depreciation (over 15%) and/or being in the accident-prone state (13.5%). The lack of proper insulation and excessive water pressure in the mains cause frequent breaks and significant water losses. The average annual frequency of breaks per 100 km of pipeline is estimated to 119. For steel pipework, the estimated frequency of breaks is as high as 307 per 100 km per year. For comparison, average frequency of water pipe breaks in Ukraine is estimated to be at 200 per 100 km per year.

1.5.2. Mitigation Plan

The list of proposed mitigation measures is presented in Annex A.1.

1.5.3. Monitoring Plan

The ultimate objective of proposed investments is to develop a sustainable system for the provision of good quality drinking water to the service population.

In order to be able to measure the success in achieving this objective, the following performance indicators can be recommended:

1. Percentage of population connected to centralized water supply service.
2. Number of noncompliant samples (i.e. samples that do not meet drinking water quality standards due to elevated levels of chemical, bacteriological, or radionuclide contamination), collected from the distribution system.

In Ukraine, drinking water quality regulation is based upon the following guideline documents:

1. State Standard DSTU 2874-82: "Drinking Water. Hygienic Requirements and Water Quality Control": this State Standard specifies the list of 28 water quality parameters that have to be monitored.
2. State Sanitary Norms and Rules SanPiN 383-96 "Drinking Water. Hygienic Quality Requirements to the Centrally Supplied Drinking Water": this document specifies a comprehensive list of 55 parameters, which have to be introduced into the mandatory monitoring programme in a phased manner from 2005 onwards.
3. State Regulation DR-97 "Permissible Levels of Caesium-137 and Strontium-90 Radionuclides in Food Products and Drinking Water".
4. Radiation Safety Norms NRBU-97: this regulatory document sets out the admissible levels of human exposure to radiation, and provides methodological guidance on the regulation of radioactive contaminant levels in drinking water.

Intermediate performance indicators can be used to measure the progress towards the specified project objective. These can be based on actual water quality determinations made in the process of implementing improvements in existing water supply systems. Other useful performance indicators relate to proactive leakage control in the whole water supply system. Water leaks may significantly affect the hydrological regime in the project area, resulting in the elevation of groundwater levels, groundwater contamination, landslipping and subsidence.

These processes need to be carefully monitored, with a special focus on those areas where they are considered to have been triggered by leaks from water distribution mains. It is essential to continue a periodic monitoring programme for groundwater levels in the project area after the completion of construction activity, as part of post-project monitoring.

Moreover, leaking pipelines may be a factor that contributes to the contamination of drinking water supplies, giving rise to water-borne disease outbreaks, as was the case in the town of Sukhodolsk (Luhansk Oblast), where the hepatitis A outbreak was recorded in 2003.

Another group of intermediate performance indicators for monitoring and evaluation may include impact indicators that relate to the control of construction/reconstruction activity effects on the environment, including potential pollution releases, noise and vibration, waste generation and management.

The details of monitoring plan, including the parameters to be monitored, are provided in Annex B.1.
Chernihiv Water Utility: Water Supply System

Figure 1.2. Booster Pump Station Equipment

Figure 1.3. Well Pump
2. REHABILITATION OF WASTEWATER COLLECTION AND TREATMENT SYSTEM

2.1. Existing Situation

2.1.1. Wastewater Collection System

2.1.1.1. General

Municipal wastewater collection in Chernihiv is operated by the Chernihiv Vodokanal Municipal Utility, which provides service to 217,877 people and over 200 local industries (including JSC KhimTextilMach, KSK ChekSil Ltd., JSC Chernihiv Building Material Plant, JSC KhimVolokno, etc.). The guidelines with respect to quality and volumes of effluents received at the wastewater treatment plant for treatment and subsequent discharge to a receiving water body are set out in the "Rules for Industrial Wastewater Discharge to the Centralised Sewer Network in Chernihiv", approved by the City Council Executive Committee Decision No. 290 of 21.10.2003. Raw effluent quality control programme includes 21 parameters. There is a requirement for major industrial discharges to provide primary treatment to their effluents prior to the discharge to the municipal sewers.

The City's sewer system comprises gravity pipelines, sewage pumping station, high-pressure pipelines, and wastewater treatment plant (WwTP). Centralized sewer system covers 57% of City's area, or 4,501 ha.

Gravity-operated sewers transport wastewater flow to 8 sewage pumping stations (SPS). Six SPS's (No. 2, 3, 4, 6, 7, 8) pump wastewater flow via high-pressure pipelines into gravity sewers, while 2 SPS's (No. 1, 5) pump sewage to the distribution chamber, wherefrom the flow gravitates to the City's wastewater treatment plant via two sewer mains (D=1,200 mm and D=1,500 mm). The total number of sewage pumping stations, including those that are owned/operated by other industries, is 39. After treatment, wastewater is discharged into the Bilous River.

The layout of the City's sewer system is presented in Figure 2.1. The total length of sewer pipelines is 293.6 km, including 32.2 km of high-pressure pipelines and 261.4 km of gravity pipelines. The pipes are made of pig iron, ceramic, asbestos-cement and reinforced concrete, with diameters ranging between 100 to 1,500 mm.

The sewer system capacity is 126,000 m$^3$/day. In 2004, the system transported daily flows at a rate of 70,200 m$^3$/day. The City's total wastewater treatment capacity is 94,000 m$^3$/day. In 2004, the daily treatment volume was at 82,300 m$^3$/day.

For the past 2 years, annual energy consumption for the provision of wastewater collection service was at 14.73 and 16.1 million kWh/year, respectively.

Currently, about 70% of sanitary sewage from households and industries is delivered to the SPS-1, which pumps collected wastewater to the municipal WwTP. Wastewater flow is pumped via high-pressure sewer mains, made of asbestos-cement (D=500 mm), steel (D=600 mm), and reinforced concrete (D=700 mm), which were constructed in 1963, 1972, 1984, respectively, and have now reached the end of their operational life.
Figure 2.1. Layout of Sewer System in Chernihiv
The 2004 inventory data indicate that 37.6% of sewer pipelines has been in operation for 25-50 years, and 41.3% (121.3 km) of pipework is in dilapidated and accident-prone state, resulting in the increased frequency of pipe breaks and posing a continuous threat to human health. The state of high-pressure sewer mains (600 mm steel pipes, 700 mm reinforced concrete pipes, and 500 mm asbestos-cement pipes), transporting the sewage flow from the main SPS-1 to the WwTP, poses a particular challenge. They are in extremely poor, accident-prone, condition, being operated beyond their operational life limit. When at least one pipeline is out of operation, the utility operator has to maintain a reduced water supply in order to avoid overflows at a sewage pumping station. The state of gravity-operated reinforced concrete piping is similarly poor, being affected by gas-induced corrosion.

Pipe breaks have been increasingly frequent in the past years. In 2005, the recorded frequency of accidents in the sewer network is at about 448 accidents per 100 km. These accidents result in untreated effluent releases, posing a threat to human health and environment. Certain sections of high-pressure pipelines lie in the Desna River floodplain, thereby increasing the risk of accidental release of untreated effluent into the Desna River, which is a source of drinking water supply for the City of Kyiv. The sewer network expansion has been driven by the City’s growth, and any reduction in operational capacity of high-pressure mains has to be handled by bringing the supply down in order to avoid overflows at a sewage pumping station.

As can be seen from the above, the rehabilitation of sewer network is a crucial issue, which has social and environmental implications not only for the City of Chernihiv, but for other downstream water supplies, including the City of Kyiv.

2.1.1.2. Site Geology

Geomorphologically, the study area lies within the Chernihiv Polissya Zone and consists of morainic plain, overlying Neogene and Palaeogene deposits. The Dnipro-Desna accumulative depression is a characteristic feature of local landscape. The landform of the area is one of a lowland, gently dipping to the west.

Structurally, the area is associated with the Pripyat/Dnipro-Donetsk Graben, located in the western part of the Dnipro-Donetsk Lowland.

The geology of the area comprises the Precambrian strata, which underlie a sequence of Palaeozoic, Mesozoic and Cainozoic sediments.

The Palaeogene and Quaternary deposits are important elements of site geology, with the former one comprising greenish-grey or dark-green to grey sands, combined with greenish-grey silty loam.

The Neogene system comprises greyish clay soils and fine grey silty sands, relating to the Poltava period. Lower to Middle Quaternary deposits comprise glacial submorainic sediments (grey sands and yellowish grey silty clays) and glacial sediments (reddish brown or greenish grey silt with crystalline inclusions). Upper Quaternary deposits include Aeolian and Eluvian sediments (loess, loamy sands and fine silty sands).

At the Water Treatment Plant site, the groundwater table is ranging between 1.4 and 3.8 m.
2.1.2. Municipal Wastewater Treatment Plant

2.1.2.1. General

Municipal wastewater treatment plant, operated by Chernihiv Vodokanal Public Utility, is located in the south-western part of the city, on the right bank of the Desna River. Sludge lagoons and final biological clarifiers are located on the lower terrace of the Desna River floodplain. The plant occupies the total area of 146.63 ha, including the sludge lagoon site of 25.04 ha and final biological clarifier site of 52.6 ha. The WwTP site itself is located in the southern part of Chernihiv, approximately 1.5 km east of the Zhavinka village.

Table 2.1 provides basic information on effluent discharges from various customer categories, received at the municipal WwTP in 2004.

Table 2.1. Effluent Discharges Received at the Municipal WwTP in 2004

<table>
<thead>
<tr>
<th>Description</th>
<th>Volume</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total throughput</td>
<td>25,686,000 m³</td>
<td>100%</td>
</tr>
<tr>
<td>Of that:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From households</td>
<td>17,746,400 m³</td>
<td>69.1%</td>
</tr>
<tr>
<td>From industries</td>
<td>5,098,400 m³</td>
<td>19.8%</td>
</tr>
<tr>
<td>From municipal utilities</td>
<td>899,900 m³</td>
<td>3.5%</td>
</tr>
<tr>
<td>From budget entities</td>
<td>1,941,300 m³</td>
<td>7.6%</td>
</tr>
</tbody>
</table>

According to the Construction Standard DBN-173, the sanitary protection zone requirement for a WwTP is at least 500 m. The distance from the WwTP site to the nearest housing area is 1.5 km.

The existing wastewater treatment plant has been in operation since 1985. The plant development involved four phases. The estimated design capacity of existing plant is 94,000 m³/day.

The plant features a traditional biological treatment process, consisting of the following components: inlet chamber – bar screen – grit chamber – primary clarifiers – aeration tanks – secondary clarifiers. Chlorine disinfection is used prior to the final treatment stage which features biological clarifiers. After final clarifiers, the treated effluent is released to the Bilous River (the Desna River tributary).

Generally, the process is operated according to the design, with primary aerators being the only exception. They are used for primary treatment of contaminated drainage flow from sludge lagoons and biological clarifiers. No primary treatment, or stabilization, is provided to sludge before it goes to the sludge lagoons.

The initial design featured the sludge treatment process with anaerobic mesophilic sludge digesters (methane tanks), with subsequent dewatering in the sludge lagoons. In practice, wastewater treatment sludge goes to the sludge lagoons without primary stabilisation.

Being a biodegradable material, sludge has a low sedimentation rate (with sludge volume index of up to 23,500 cm³/g). This significantly affects the efficiency of suspended solid removal in the secondary clarifiers, as well as ability to maintain the required level of...
sludge in the aeration tanks in order to improve overall efficiency of biological treatment process, particularly with regard to the ammonium nitrogen.

In the absence of primary stabilization and mechanical dewatering, the sludge lagoons have become overloaded. The high water content of raw sludge poses a serious challenge in terms of emptying/restoring the sludge lagoon cells and managing the significant volumes of reject sludge water, pumped back to the beginning of treatment process for subsequent treatment. This water contains suspended solids and organic compounds (BOD and NH₄⁺) at elevated concentrations, significantly affecting the overall biological treatment performance. All these factors have contributed significantly to the alteration of natural hydrological regime and groundwater contamination at the sludge lagoon site.

The relatively high suspended solid content in the wastewater after the secondary clarifiers adversely affects the performance of final (biological) clarifiers. Sludge deposits in these clarifiers are estimated to be at 1/3 of their total capacity. This situation leads to the reintroduction of contaminants, mainly the ammonium nitrogen, into the treated water.

The application of chlorine for disinfection is likely to produce unwanted and potentially harmful chlorinated organic compounds in the treated wastewater.

Final biological clarifiers are considered to be a significant source of secondary pollution due to the presence of organic compounds in the sludge released with treated wastewater flow from secondary clarifiers. Other sources include overfilled sludge lagoons that do not have protective lining. The progressive accumulation of sludge in the aeration tanks is particularly detrimental to the performance of biological treatment process due to low sedimentation rate and high oxidation capacity of this sludge.

The secondary clarifiers are inefficient at reducing suspended solids in the effluent and maintaining sufficient concentrations of sludge in the aeration tanks, required to promote nitrification and biological degradation of organic compounds.

The poor state of equipment and lack of automatic control equipment significantly affects the overall performance of biological treatment process, resulting in inadequate treatment and excessive energy usage.

Actual volume of effluent received at the municipal WwTP is below 84,000 m³/day, with the raw effluent quality being generally compliant with the design specifications.

The official discharge permit, held by the utility, specifies discharge limits for two discharge outfalls (No. 1 and No. 2), releasing treated effluent into the Bilous River. The 2004 mean annual concentrations of contaminants in raw and treated effluents, along with official effluent standards, are shown in Table 2.2. Exceedances are marked in red.

Table 2.2. Effluent Quality Data and Official Effluent Standard (2004)

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Raw Effluent Received at WwTP, mg/l</th>
<th>Outfall I, mg/l</th>
<th>Outfall II, mg/l</th>
<th>Official Effluent Standard, mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suspended solids</td>
<td>287.4</td>
<td>14.5</td>
<td>16.18</td>
<td>13.9</td>
</tr>
<tr>
<td>2</td>
<td>Mineralisation</td>
<td>567</td>
<td>520.0</td>
<td>523.0</td>
<td>527</td>
</tr>
<tr>
<td>3</td>
<td>pH</td>
<td>7.6</td>
<td>7.8</td>
<td>7.8</td>
<td>6.5–8.5</td>
</tr>
<tr>
<td>No.</td>
<td>Parameter</td>
<td>Raw Effluent Received at WwTP, mg/l</td>
<td>Outfall I, mg/l</td>
<td>Outfall II, mg/l</td>
<td>Official Effluent Standard, mg/l</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>4.</td>
<td>BOD₅</td>
<td>380.5</td>
<td>8.79</td>
<td>13.59</td>
<td>14.2</td>
</tr>
<tr>
<td>5.</td>
<td>BOD_total</td>
<td>394.3</td>
<td>20.8</td>
<td>22.7</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>COD</td>
<td>6.72</td>
<td>53</td>
<td>53.75</td>
<td>60.4</td>
</tr>
<tr>
<td>7.</td>
<td>Dissolved oxygen</td>
<td>49.88</td>
<td>27.57</td>
<td>25.31</td>
<td>8.94</td>
</tr>
<tr>
<td>8.</td>
<td>Nitrites</td>
<td>0.5</td>
<td>0.5</td>
<td>0.48</td>
<td>1.62</td>
</tr>
<tr>
<td>9.</td>
<td>Nitrates</td>
<td>0.54</td>
<td>0.54</td>
<td>0.58</td>
<td>15.9</td>
</tr>
<tr>
<td>10.</td>
<td>Phosphates</td>
<td>14.64</td>
<td>11.64</td>
<td>11.0</td>
<td>7.04</td>
</tr>
<tr>
<td>11.</td>
<td>Chlorides</td>
<td>80.66</td>
<td>62.09</td>
<td>62.96</td>
<td>72.3</td>
</tr>
<tr>
<td>12.</td>
<td>Sulphates</td>
<td>39.6</td>
<td>42.55</td>
<td>43.39</td>
<td>50.3</td>
</tr>
<tr>
<td>13.</td>
<td>Copper</td>
<td>0.047</td>
<td>0.011</td>
<td>0.011</td>
<td>0.038</td>
</tr>
<tr>
<td>14.</td>
<td>Nickel</td>
<td>0.114</td>
<td>0.016</td>
<td>0.018</td>
<td>0.036</td>
</tr>
<tr>
<td>15.</td>
<td>Zinc</td>
<td>0.041</td>
<td>0.005</td>
<td>0.005</td>
<td>0.016</td>
</tr>
<tr>
<td>16.</td>
<td>Chromium (total)</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>0.024</td>
</tr>
<tr>
<td>17.</td>
<td>Nickel</td>
<td>0.041</td>
<td>0.005</td>
<td>0.005</td>
<td>0.024</td>
</tr>
<tr>
<td>18.</td>
<td>Ether-soluble compounds</td>
<td>14.5</td>
<td>n/d</td>
<td>n/d</td>
<td>0.2</td>
</tr>
<tr>
<td>19.</td>
<td>Caprolactam</td>
<td>8.34</td>
<td>n/d</td>
<td>n/d</td>
<td>0.40</td>
</tr>
<tr>
<td>20.</td>
<td>Surfactants</td>
<td>0.28</td>
<td>0.033</td>
<td>0.03</td>
<td>0.036</td>
</tr>
</tbody>
</table>

Due to inefficient performance of biological treatment process, the municipal WwTP is considered to be a major contributor to the total pollution load entering a receiving water body (the Desna River). Priority contaminants present in the treated effluent discharges at elevated concentrations are organic compounds, ammonium nitrogen and suspended solids, that effect the water quality in the Desna River. The utility's financial performance is significantly affected by environmental fines levied upon the utility for non-compliance with effluent treatment standards.

2.1.2.2. Site Geology

The municipal wastewater treatment plant site is located in the south-western part of the city, on the left bank of the Bilous River (the right tributary of the Desna River). Surface elevations range between 108.00 to 130.00 m.

Geomorphologically, the study area lies within the Chernihiv Polissya Zone and consists of morainic plain, overlying Neogene and Palaeogene deposits. The Dnipro-Desna accumulative depression is a characteristic feature of local landscape. The landform of the area is one of a lowland, gently dipping to the west.

Structurally, the area is associated with the Pripyat/Dnipro-Donetsk Graben, located in the western part of the Dnipro-Donetsk Lowland.

At the Water Treatment Plant site, the groundwater table is ranging between 5.7 to 9.2 m, at the levels of 106.70 to 108.90 mABD. The hydrogeological unit IGE-12g, lying at depths of between 32.50 to 34.50 m (79.75-81.20 mABD), provides a confining bed for this aquifer. Groundwater quality characteristics are suitable for the W4 concrete.
At the final biological clarifier site, groundwater is present at depths of 1.0 to 6.3 m, at the levels of 105.70 to 107.05 m ABD. This aquifer is associated with the hydrogeological unit IGE-12g, lying at a depth of 32.50 m (79.75 m ABD). The aquifer is not confined, and there is a hydraulic continuity with the Bilous River. Groundwater levels are affected by atmospheric precipitation, with about 1 m variation range.

Along the sewer main route, groundwater is present at depths of between 15.40 to 15.70 m (104.40 to 108.80 m ABD). The aquifer is confined under pressure.

2.1.3. Sewage Pumping Stations

Municipal wastewater collection in Chernihiv is operated by the Chernihiv Vodokanal Municipal Utility, which provides service to 217,877 people and over 200 local industries. The City's sewer system comprises gravity pipelines, sewage pumping station, high-pressure pipelines, and wastewater treatment plant (WwTP). Centralized sewer system covers 57% of City's area, or 4,501 ha.

The layout of the City's sewer system is presented in Figure 2.1. Gravity-operated sewers transport wastewater flow to 8 sewage pumping stations (SPS). Six SPS's (No. 2, 3, 4, 6, 7, 8) pump wastewater flow via high-pressure pipelines into gravity sewers, while 2 SPS's (No. 1, 5) pump sewage to the distribution chamber, wherefrom the flow gravitates to the City's wastewater treatment plant via two sewer mains (D=1,200 mm and D=1,500 mm). The total number of sewage pumping stations, including those that are owned/operated by other industries, is 39. After treatment, wastewater is discharged into the Bilous River.

The sewer system capacity is 126,000 m$^3$/day. In 2004, the system transported daily flows at a rate of 70,200 m$^3$/day. For the past 2 years, annual energy consumption for the provision of wastewater collection service was at 14.73 and 16.1 million kWh/year, respectively.

The worn-out equipment, both pumping and ancillary, represents a particular challenge and seriously affects the overall performance of municipal sewer system in Chernihiv. Pumping equipment has reached the end of its operational life and its capacity is insufficient to handle current sewage flows.

Currently, about 70% of sanitary sewage from households and industries is delivered to the main sewage pumping station (SPS-1), which pumps collected wastewater to the municipal WwTP. SPS-1 was constructed in 1972. Its pumping equipment is very old and no longer efficient in terms of handling current sewage flows.

Actual sewage throughput at SPS-1 is 59,900 m$^3$/day. This pumping station operates on a continuous 24 h basis, as opposed to other SPS's whose operational hours vary between 1.3 to 16.8 hours per day.

The station has 4 pumping units (three of SD 2400-75 type and one of DF 1100-63 type), with total capacity of 2,545 kW. Specific energy consumption of SPS-1 pumping units is at 0.26 kWh/m$^3$, being significantly higher than the average for other pumping stations.

The SPS-1 is a key element of existing municipal wastewater management system in Chernihiv.
Similarly to SPS-1, the City’s Sewage Pumping Station No. 5 (SPS-5) delivers sewage flow to the municipal WwTP via the distribution chamber.

SPS-2 operates to transport sewage flows to the gravity sewers via the rising mains.

Any disruption in the pumping equipment operation is considered as an environmental emergency, which has to be handled by ceasing the reception of sewage flows transported by gravity sewers. This results in the untreated effluent overflows into the Stryzhen River and further to the Desna River, which is the main source of water supply to Kyiv.

In order to prevent or minimize the adverse environmental impact of sewage overflows, the utility has to reduce or cease water supply service in the City.

Untreated effluent releases pose a serious health risk for local population and significantly affects the ecological situation in the Desna River Basin as a whole.
2.2. Proposed Investment Projects

2.2.1. Rehabilitation of Municipal Sewer Network

The following sections describe the proposed rehabilitation projects for the municipal sewer network in Chernihiv.

2.2.1.1. Construction of a New High-Pressure Sewer Pipeline

The proposed new high-pressure pipeline will provide a connection between the SPS-1 and gravity sewer main lying along the Ushinsky Street (Construction Phase II), from the Transfer Sewer 25+90, located on the Liskovitsky Street, to the junction with a high-pressure pipeline, lying near a water quarry.

The proposed project involves the construction of high-pressure 800 mm pipeline of 6.8 km, connecting a sewage pumping station and gravity sewer on the Ushinsky Street, that takes flow to the WwTP. This pipeline would provide new flow transport capacity to replace existing dilapidated sewers. The existing design features three phases of construction.

The first phase, completed in 2004, involved laying a 2.5 km sewer section from the SPS-1 to Liskovitsky Street. This section is now operational.

The second phase involves the construction of the 1.3 km pipeline section to provide a connection between a local sewer on the Kyivsky Highway and existing high-pressure pipeline near the water quarry. The rising main route lies in the southern part of the City, which comprises private housing areas, recreational areas and warehouse facilities, crossing the Archaeological Protected Zone 2. It is anticipated that the sewer main will be laid along the road base on the Liskovitsky Street, and roadside widening will be required to accommodate it, along with the extension of two 1,500 mm concrete pipes, installed under the road.

The next section of the sewer main will be routed from the Liskovtsky Street to the Varsar Street, where it will follow the route of existing 500 mm rising sewer main towards the Ushakova Lane. On the Varsar Street, one section of the proposed sewer main will lie along the asphalt road, while the second section will cross the park area to reach the filled-up terrain of the Leskovitsa residential area.

It is planned to construct the diversion chamber connecting the designed sewer main with the existing one at the junction of the Varsar Street with the Ushakova Lane. The sewer design also features release valves for water and air. Where the proposed sewer line crosses existing gas and water pipework, the plan is to replace/relay this pipework prior to the start of sewer line construction.

The designed pipe emplacement depths range between 1.8 to 3.0 m, depending on the groundwater table.

The design features the use of imported 800 mm fibreglass reinforced plastic pipes. The guaranteed operational life of this piping is 50 years (vs. 25 years for steel piping and 20 years for reinforced concrete piping). This would significantly improve the sustainability of sanitation service in Chernihiv and prevent environmental pollution due to accidental releases.
The objective of proposed sewer construction project is to ensure smooth and reliable delivery of wastewater flows from the main sewage pumping station to the City's WwTP; prevent environmental pollution due to accidental releases of untreated effluent; and improve service quality.

The design documents for the Rising Main Construction Phase II are available, and construction activities are intended to be undertaken by the Chernihiv Vodokanal Water Utility.

2.2.1.2. Replacement of Gravity Sewer Main

It is proposed to replace the existing gravity-operated, reinforced-concrete sewer main (Figure 2.2) section with a new main, made of imported fibreglass reinforced plastic.

The proposed project involves the replacement of existing sewer main section, lying on the Mstislavsky and Kotsyubinsky Streets and delivering sewage flow to the SPS-1. The length of sewer section to be replaced is 1.9 km, including 740 m section with the diameter of 800 mm, 850 m section with the diameter of 1,000 mm, followed by a 310 m section with the diameter of 1,200 mm.

Other replacement target relates to the gravity sewer main, lying on the Selyuk Street, from Mir Avenue to SPS-3. The length of 600 mm sewer main to be replaced is 950 m.

The route of these sewer main sections crosses residential and industrial areas, and private housing area.

Old pipes will be replaced with imported fibreglass reinforced plastic piping, SN 2500.

Where the proposed sewer line crosses existing gas and water pipework, the plan is to replace/relay this pipework prior to the start of sewer line construction. The objective of proposed sewer replacement project is to ensure smooth and reliable delivery of wastewater flows to the City's WwTP; prevent environmental pollution due to accidental releases of untreated effluent; and improve service quality.

The design documents for the sewer main replacement are available, and construction activities are intended to be undertaken by the Chernihiv Vodokanal Water Utility.

2.2.2. Rehabilitation of Municipal Wastewater Treatment Plant

The proposed investment project involves the reconstruction of wastewater treatment facilities (Figure 2.3) and improvement of sludge management process.

Key elements of the proposed project are:

1. Replacement of inefficient treatment equipment and facilities;
2. Reconstruction of final biological clarifiers;
3. Restoration of biological clarifier site;
4. Reconstruction of sludge lagoons;
5. Improved sludge management.

The following improvements to the primary (mechanical) treatment process are anticipated under the project:
1. Replacement of existing MG-12 bar screens with RS-21-150-3 screens (2 screens);
2. Replacement of existing 2NF pumps with new Zenit pumps (2 pumps).

Other proposed improvement relates to the replacement of old raw sludge pump with the GRANDFOS pumping equipment at the raw sludge pumping station.

Existing return activated sludge pumps (24 DND model) are proposed to be replaced with the GRANDFOS pumping equipment.

The proposed project also involves the installation of three BP-155 air blowers.

For the final biological clarifier site, it is proposed to rehabilitate the facilities and replace inlet and release chambers and associated equipment.

Vertical filter equipment is planned to be installed at the sludge lagoon site to improve the efficiency of sludge dewatering process.

The project involves a suite of measures designed to improve the biological treatment performance through improved control of process characteristics. These include:

- Installation of oxygen meters in the aeration tanks;
- Installation of sludge level meters in the secondary clarifiers;
- Installation of automatic sampling equipment at the inlet chamber;
- Installation of automatic valves for air flow and activated sludge control;
- Installation of remote control system for air blowers;

Meter readings will be displayed on the central control panel, where the operator will be able to adjust flows when needed.

To improve the operational efficiency of sludge lagoons, it is proposed to include the aerobic stabilization process for sludge.

The operation of biological clarifiers will continue to provide final treatment of effluent.

Reduction in physical volume and water content of sludge disposed of at the sludge lagoons will be achieved by returning the surplus activated sludge to the primary aerators (Figure 2.4) with subsequent sedimentation of raw sludge and surplus activated sludge in the primary clarifiers. Water content in this sludge material will be at about 97%.

Uncontrolled inputs of contaminants into wastewater treatment process may affect the overall efficiency of biological treatment. Microorganisms present in the activated sludge are extremely sensitive to toxic effects of phenols, hydrogen sulphide, and ammonium compounds. Changes in the activated sludge characteristics reduce the efficiency of downstream processes and adversely affect the overall plant performance. The following measures are anticipated to address these issues: automatic sampling and control of raw effluent received at the WwTP; return activated sludge and air consumption control in the aeration tanks; remote control system for air blowers.

The implementation of the proposed project will facilitate the improved efficiency and manageability of biological treatment process at the municipal WwTP, and reduce energy costs.
2.2.3. Rehabilitation of Sewage Pumping Stations

The proposed project features the dismantling of two existing pumping units at the SPS-1 (SD 2400-75 units with 630 kW power engine) and installation of two subsurface Wilo pumps with 450 kW engine. The proposed installation technique features dry pit horizontal process. The proposed new pump capacity is justified by the need in improving overall efficiency at least cost. It is also anticipated to replace 800 mm pipe valves in the distribution chamber at SPS-1.

According to the proposed project design, the sewage pumping station will remain in operation during pump replacement with existing equipment operating in parallel (SD 2400-75 and DF 1100-53 pumps). The implementation of this project will eliminate the requirement for engineered protection measures designed to prevent sewage overflow into the pump room.

It is also planned to replace 2 pumping units at the SPS-2 and 2 pumping units at the SPS-5 (Figure 2.5).

The proposed pump replacement aims to achieve a significant reduction in energy usage, improve reliability and safety of sewage flow transport to the municipal WwTP, and minimize the potential for environmental emergency due to pump failure. It is expected that the project will contribute to the improvement of sanitation service quality in Chernihiv.

It is planned that pump replacement works will be undertaken by the Chernihiv Water Utility.
2.3. Analysis of Potential Environmental Impacts

2.3.1. Rehabilitation of Municipal Sewer Network

For the purpose of the WB Operational Policy on Environmental Assessment, the proposed project can be rated as an environmental category B².

Available project design documents have been prepared in compliance with the following regulations:

- Construction Standard DBN 360-92** "Planning and Development of Urban and Rural Settlements";
- Construction Standard DBN A.2.2-3-2004 "The Content and Development/Consent/Approval Procedure for Construction Design Documents";
- Construction Standard SNiP 2.02.02-82 "Engineering Climatology and Geophysics";
- Construction Standard SNiP 1.02.07-87 "Engineering Survey in Construction Projects";
- Construction Standard A.2.2-1-2003 "The EIA Content and Composition for Construction Projects";
- Environmental Impact Assessment Preparation Manual (to support the Construction Standard DBN A.2.2-1-2002);
- "Municipal Water Supply and Sewer System Operation Rules", approved by the State Housing and Municipal Service Committee of Ukraine Order No. 30 of 05.07.95.

2.3.1.1. Physical Impact

The potential physical impacts of the proposed project will be limited to the impacts of construction phase, which would involve a certain amount of excavation effort. To mitigate these impacts in accordance with existing environmental regulations, the project design identifies a number of measures intended to reduce the project-related stress on ambient air, water resources, land resources and tree plantations in the locations of proposed construction/rehabilitation activities.

The potential environmental impacts that may arise during different stages of construction projects are considered below in relation to the proposed project development:

- **Impact on local geology:** The impact of the proposed project development phase on the geological environment is unlikely. Rehabilitated/replaced sewer collection mains will provide adequate containment for untreated effluent;
- **Impact on local climate** is unlikely;
- **Impact on local fauna** is unlikely;
- **Impact on air quality** is likely to arise during the operation of mobile plant, but will be only short-term, with air pollution being at or below existing mandatory limits;
- **Impact on water quality:** During construction, lower groundwater levels will be maintained by pumping where land slopes downhill. Pumping activity would be limited to the construction phase, therefore the impact on local hydrogeology would be short-term. Impact on surface waters is unlikely.
- **Impact on soil:** The construction would involve top soil stripping with subsequent restoration. New piping would provide adequate containment for untreated sewage, soil contamination is therefore unlikely during the guaranteed operational life of fibreglass reinforced plastic pipes. Construction waste will be managed in accordance with existing regulations.

² OP 4.01 Environmental Assessment
• **Damage to trees and vegetation cover:** Construction operations will be compliant with the requirements set out in the Construction Standard DBN 360-92** “Planning and Development of Urban and Rural Settlements”. These include a 1 m limit upon the proximity of earthwork operations to a plantation; and requirement for a temporary protective fence if loading/unloading equipment is operated at a distance of less than 0.5 m from a tree stem or crown.

• **Impact to existing utilities/infrastructure:** The proposed rehabilitation project will contribute to the improvement of City’s service infrastructure.

### 2.3.1.2. Social Impacts

Given that the first proposed rising main, providing a connection between the SPS-1 and gravity sewer main on the Ushinsky Street, will receive 70% of effluents generated in Chernihiv, the implementation of proposed rehabilitation project will improve the quality of sanitation service provided to about 217,000 people and a number of large local industries, including the Strila Confectionery, the Chesara Company, the Siveryanka Industrial Enterprise, distillery plant, the Chernihiv Detal Machinery Component Plant, Yasen Food Processing Industry, Chernihiv Dairy Plant, Chernihiv Meat Processing Plant.

Similarly, two other proposed sewer main sections will deliver a significant proportion of sewage flow to the SPS-1 and SPS-3, therefore the sanitation service of better quality will be provided to about 90,000 people and a number of large local industries, including the Desna Brewery, Mlibor Company, the Chernihiv Detal Machinery Component Plant, etc.

No human resettlement would be involved in the proposed project.

### 2.3.2. Rehabilitation of Municipal Wastewater Treatment Plant

For the purpose of the WB Operational Policy on Environmental Assessment, the proposed project can be rated as an environmental category A³.

Available project design documents have been prepared in compliance with the following regulations:

- Construction Standard DBN A.2.2-3-97 "The Content and Development/Consent/Approval Procedure for Construction Design Documents";
- Construction Standard DBN 360-92** “Planning and Development of Urban and Rural Settlements”;
- Construction Standard A.2.2-1-2003 "The EIA Content and Composition for Construction Projects";
- Construction Standard DBN A.2.2-3-2004 "The Content and Development/Consent/Approval Procedure for Construction Design Documents";
- Construction Standard SNiP 2.02.02-82 “Engineering Climatology and Geophysics”;  
- Construction Standard SNiP 1.02.07-87 “Engineering Survey in Construction Projects”;
- Environmental Impact Assessment Preparation Manual (to support the Construction Standard DBN A.2.2-1-2002);
- "Municipal Water Supply and Sewer System Operation Rules", approved by the State Housing and Municipal Service Committee of Ukraine Order No. 30 of 05.07.95.

³ CP 4.01 Environmental Assessment
2.3.2.1. Physical Impact

The proposed rehabilitation project does not involve any increase in biological treatment plant capacity, or alteration of effluent quality, or modification of treatment technology.

Air Emissions

The long-term observation data collected at the Post-2 Ambient Air Monitoring Stations near the municipal WwTP site indicate that the average yearly ambient concentrations of key pollutants are as follows:

1. Nitrogen dioxide: 0.136 mg/m³;
2. Carbon oxide: 1.95 mg/m³;
3. Sulphur dioxide: 0.049 mg/m³;
4. Dust: 0.064 mg/m³.

The ambient air quality data were provided by the Chernihiv Oblast Hydrometeorological Centre (No. 8/307 of 11.02.05). Table 2.3 presents official emission limit values and loads, specified in the Plant's Air Emission Permit (No. 740108 of 17.12.04, valid till 31.12.2005).

Table 2.3. Air Emissions and Loads

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Emissions</th>
<th>g/s</th>
<th>t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Manganese and compounds</td>
<td></td>
<td>0.001</td>
<td>0.002</td>
</tr>
<tr>
<td>2.</td>
<td>Iron oxide</td>
<td></td>
<td>0.021</td>
<td>0.06</td>
</tr>
<tr>
<td>3.</td>
<td>Nitrogen dioxide</td>
<td></td>
<td>0.012</td>
<td>0.036</td>
</tr>
<tr>
<td>4.</td>
<td>Carbon oxide</td>
<td></td>
<td>0.030</td>
<td>0.115</td>
</tr>
<tr>
<td>5.</td>
<td>Fly ash</td>
<td></td>
<td>0.008</td>
<td>0.036</td>
</tr>
<tr>
<td>6.</td>
<td>Sulphurous anhydride</td>
<td></td>
<td>0.034</td>
<td>0.162</td>
</tr>
<tr>
<td>7.</td>
<td>Grit</td>
<td></td>
<td>0.002</td>
<td>0.004</td>
</tr>
<tr>
<td>8.</td>
<td>Wood dust</td>
<td></td>
<td>0.006</td>
<td>0.011</td>
</tr>
<tr>
<td>9.</td>
<td>Petrol</td>
<td></td>
<td>0.026</td>
<td>0.1372</td>
</tr>
<tr>
<td>10.</td>
<td>Diesel fuel</td>
<td></td>
<td>0.00000045</td>
<td>0.0034</td>
</tr>
<tr>
<td></td>
<td>Plant’s Total</td>
<td></td>
<td>0.14</td>
<td>0.563</td>
</tr>
</tbody>
</table>

There has been no evidence of exceedance of specified emission limit values, therefore it can be assumed that the impact of WwTP on air quality at and near the site is not significant.

Land Resource

Adequate provisions for the conservation of top soil, slope profiling, and groundwater table control were included in the initial WwTP design. Consequently, the proposed rehabilitation project does not entail any additional land requirement, the impact on land resource is therefore unlikely.

Water Resource

Adequate provisions for surface water protection were included in the initial WwTP design, and no additional measures are required for the proposed rehabilitation project.
The Chernihiv Vodokanal Water Utility operates on the basis of Effluent Discharge Permit, approved on 30.06.2003 and valid till 30.06.2006. The Permit specifies discharge limit values for 2 discharge outfalls.

It is expected that after the project completion the quality of treated effluent will be complaint with the existing discharge regulations. Proposed sludge management improvements will help minimize the effects of sludge lagoon operation on groundwater quality, and achieve a reduction in groundwater contamination.

**Waste**

The proposed rehabilitation project would not cause any change in the composition of waste generated at the Plant's site.

Proposed technical measures on improving the management of sludge generated in wastewater treatment process would facilitate the reduction in sludge disposal requirement, improvement in operational performance of sludge lagoons and reject sludge water management. Improvements in sludge quality will make it suitable for agricultural application, thus contributing to a reduction in sludge disposal requirement.

Current waste management operations at the Plant's site are compliant with existing standards and permit requirements.

2.3.2.2. Social Impact

While not entailing a modification of initial design specifications with regard to the treatment capacity, space and resource requirement, the proposed rehabilitation project will facilitate significant improvements in the overall Plant performance and treated effluent quality, to be fully compliant with the requirements specified in the Rules for Surface Water Protection against Contamination Carried with Effluent Discharges, approved by the Cabinet of Ministers of Ukraine No 465 of 25.03.99.

The proposed project will neither produce any significant social impact, nor pose a threat to human health and living conditions.

The results of the environmental assessment indicate that the project implementation will not cause any adverse impact to local industries, agricultural activities, residential areas, surface and subsurface infrastructure, recreational areas and cultural assets.

The project will not entail involuntary resettlement activity.

2.3.3. Rehabilitation of Sewage Pumping Stations

For the purpose of the WB Operational Policy on Environmental Assessment, the proposed project can be rated as an environmental category B^4. Available project design documents have been prepared in compliance with the following regulations:

- Construction Standard DBN 360-92** “Planning and Development of Urban and Rural Settlements”;
- Construction Standard DBN A.2.2-3-2004 "The Content and Development/Consent/Approval Procedure for Construction Design Documents";
- Construction Standard SNI;P 2.02.02-82 “Engineering Climatology and Geophysics”;

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^4 OP 4.01 Environmental Assessment
2.3.3.1. Physical Impacts

Physical impact on the environment is likely to arise during the dismantling of old pumping equipment and installation of new pumps. In essence, the proposed project activity is limited to pumping equipment replacement without disruption in the operation of SPS-1, SPS-2, and SPS-5.

The proposed project design comprises a suite of mitigation measures, identified in accordance with existing legislation and designed to minimize the impact on air quality, water resources, soils and tree plantations in the process of equipment replacement and commissioning.

The potential impacts of proposed activity (pump replacement and operation) are discussed below:

- **Impact on local geology**: is unlikely as the project does not include operations that may affect the geological environment;
- **Impact on local climate**: is unlikely;
- **Impact on fauna**: is unlikely;
- **Impact on ambient air quality**: will be limited to the replacement phase due to the mobile plant operation, though actual emission levels are likely to be at or below existing emission standards;
- **Impact on water bodies**: adverse impact is unlikely, while the expected environmental benefits include improved environmental safety as a result of minimized risk of environmental emergencies, affecting surface waters and groundwater sources;
- **Impact on soil**: is unlikely, as all dismantling/construction waste will be disposed of in accordance with existing regulations;
- **Impact on tree plantations**: is unlikely;
- **Impact on existing utilities and infrastructure**: clearly positive, as the proposed project involves the replacement of major pumping equipment at the largest pumping station, receiving the major proportion of sewage flows. The expected environmental benefits include improved operational performance, minimized risk of accidents, and significant energy saving.

2.3.3.2. Social Impact

Given that the SPS-1 and SPS-5 respectively receive about 70% and 20% of effluents generated in Chernihiv, the implementation of proposed rehabilitation project will improve the quality of sanitation service provided to about 220,000 people and a number of large local industries, including the Strila Confectionery, the Chesara Company, the Siveryanka Industrial Enterprise, distillery plant, the Chernihiv Detal Machinery Component Plant, Yasen Food Processing Industry, Chernihiv Dairy Plant, Chernihiv Meat Processing Plant. The project is aiming to improve human safety, reduce risks to health and environment, and improve energy performance in municipal sector. The project does not entail the human resettlement requirement.
2.4. Review of Alternative Options

2.4.1. Rehabilitation of Municipal Sewer Network

No alternative options have been considered for the proposed sewer rehabilitation projects, presented in Section 2.2.1. The stepwise rehabilitation programme for existing sewer network in Chernihiv, which covers the whole area of the City and provides service to a large number of residential and institutional customers, appears to be the only viable option in view of significant funding constraints.

The analysis of the ‘status quo’ scenario indicates that existing situation is not sustainable, and service disruption is possible if proposed improvements were not implemented. It should be borne in mind that Chernihiv is a significant source of impact on downstream water supplies, reliant on the Desna River as a major source, including the City of Kyiv with its population of about 3 million people.

Any accidental release of untreated effluent into the Desna River would significantly affect the downstream supplies, and the only option to avoid this in the event of accident or sewer piping break would be to ration or disrupt water supply in Chernihiv in order to reduce sewage generation, as was the case in the City of Kharkiv following the collapse of the City’s wastewater treatment plant in 1995.

No alternative technical solutions have been considered in the Environmental Assessment for the proposed rehabilitation of rising main on the Ushinsky Street, construction of connecting rising main to connect the SPS-1 and gravity sewer line on the Ushinsky Street (Construction Phase II), and replacement of gravity sewer mains on the Mstislavsky and Kotsyubinsky Street to deliver flows to SPS-1 and SPS-3.

2.4.2. Rehabilitation of Municipal Wastewater Treatment Plant

The proposed project is aiming to improve reliability and energy performance of the municipal WWTP. The analysis of the ‘status quo’ scenario indicates that existing situation is not sustainable, and efficiency/reliability of wastewater treatment service would deteriorate further if proposed improvements were not implemented. It should be borne in mind that Chernihiv is a significant source of impact on downstream water supplies, reliant on the Desna River as a major source, including the City of Kyiv with its population of about 3 million people.

Any accidental release of untreated effluent into the Desna River would significantly affect the downstream supplies, and the only option to avoid this in the event of accident or sewer piping break would be to ration or disrupt water supply in Chernihiv in order to reduce sewage generation, as was the case in the City of Kharkiv following the collapse of the City’s wastewater treatment plant in 1995.

The proposed technical solutions are based on proven technology, widely applied in the NIS and other countries. Detailed assessment of project elements indicates that the implementation of proposed rehabilitation project would produce significant environmental benefits.
2.4.3. Rehabilitation of Sewage Pumping Stations

The analysis of the 'status quo' scenario indicates that existing situation is not sustainable, and service disruption is possible if proposed improvements were not implemented. This may result in untreated sewage overflow and release into the Desna River.

The proposed focus on SPS-1, SPS-2 and SPS-5 is justified by their extreme significance for the whole City's sanitation system, unacceptable state of existing pumping capacity, and inefficient energy consumption and plant operation.

No alternative options for the proposed pumping equipment have been considered as part of the Environmental Assessment.
2.5. Environmental Management Plan

2.5.1. Rehabilitation of Municipal Sewer Network

2.5.1.1. Brief Description of Key Environmental Issues

The proposed project is aiming to improve existing municipal sewer network, thus improving the quality and reliability of sanitation service. Key potential environmental impacts of the project are associated with excavation activities and connection of new/rehabilitated piping to the existing sewer network. Key potential receptors of these impacts are soil and vegetation cover in the locations of construction activity.

Top soil layer will be disturbed as a result of preparatory earthworks. There is the potential for soil contamination where the new piping will be connected to the existing sewer network.

The impact on vegetation cover will be short-term, localized and limited to construction phase. It can be mitigated by adopting proper measures.

In subproject 3.1, the proposed sewer main route crosses the Archaeological Protection Zone 2. The replacement of sewer main on the Mstislavsky and Kotsyubinsky Streets (delivering flow to SPS-1), and sewer main on the Selyuk Street and Mir Avenue (delivering flow to SPS-3) would involve the regulation of groundwater levels by pumping where land slopes downhill. Pumping activity would be limited to the construction phase, therefore the impact on local hydrogeology would be short-term.

Given that the proposed project relates to the rehabilitation of existing municipal sewer system, these potential environmental impacts can be mitigated by adopting good construction practices and ensuring compliance with existing environmental regulations.

2.5.1.2. Mitigation Plan

Proposed mitigation measures are presented in Annex A.2.

2.5.1.3. Monitoring Plan

Key environmental objective of the proposed investment project is to minimize the potential for soil and groundwater contamination through improved control and elimination of leaks from sewer network.

The key performance indicator to measure the success in achieving this objective is the percentage reduction in leakage from the rehabilitated sewer mains.

Intermediate performance indicators relate to key potential environmental impacts, identified in the environmental assessment, which need to be monitored in order to ensure compliance with existing environmental and health legislation of Ukraine.

Intermediate performance indicators should address the following impacts or concerns: impacts on vegetation cover, soil and groundwater during construction; and the levels of soil and groundwater contamination during operation.

Other environmental performance indicators relate to the impact of noise and vibration, waste generation and management during construction.
2.5.2. Rehabilitation of Municipal Wastewater Treatment Plant

2.5.2.1. Brief Description of Key Environmental Issues

Extremely poor treatment performance of the plant is adversely affecting the receiving water body (the Desna River), especially in terms of organic compounds, ammonium nitrogen and suspended solids.

The proposed investment project involves the reconstruction of wastewater treatment facilities and improvement of sludge management process. It will not entail any increase in flow throughput/quality, or modification of treatment technology and capacity.

Key elements of the proposed project are:

- Replacement of inefficient treatment equipment and facilities;
- Reconstruction of final biological clarifiers;
- Restoration of biological clarifier site;
- Reconstruction of sludge lagoons;
- Improved sludge management.

The implementation of proposed investment project is not likely to cause any adverse environmental impact, while contributing to the improvement of overall social situation and existing municipal infrastructure. All construction works will be undertaken in accordance with existing regulations and standards.

2.5.2.2. Mitigation Plan

The proposed mitigation measures are listed in Annex A.3.

2.5.2.3. Monitoring Plan

Key objective of proposed environmental improvement is to reduce the pollution load on a receiving water body. Other environmental benefits include the reduction in groundwater and soil contamination through improved management of wastewater treatment sludge.

From the above, the target performance indicators for the proposed project are those that relate to the quality of treated effluent, measured in the locations of discharge outfalls, and percentage of water losses in sewer mains due to leaks and infiltration.

Intermediate performance indicators for the municipal WwTP rehabilitation project include those that relate to the management of sludge generated in the biological treatment process, including the surplus activated sludge. Other environmental performance indicators relate to the pollution levels, impact of noise and vibration, waste generation and management during construction.

To support the proposed monitoring programme, it will be required to purchase portable monitoring equipment to control odours and air emissions.

The proposed monitoring plan is presented in Annex B.3.
2.5.3. Rehabilitation of Sewage Pumping Stations

2.5.3.1. Brief Description of Key Environmental Issues

The project is aiming to improve existing municipal service infrastructure and energy performance in municipal sector. This is proposed to be achieved through rehabilitation of the main sewage pumping station (SPS-1) and sewage pumping stations No. 2 and 5 (SPS-2 and SPS-5), and replacement of old inefficient pumping equipment with new, efficient, pumps that are able to meet current operational needs.

The implementation of proposed project is not expected to produce adverse impacts on the environment.

Given that the proposed project relates to the rehabilitation of existing service infrastructure, all potentially significant impacts will be minimized by adopting adequate construction practices and procedures to ensure full compliance with existing environmental regulations.

Adequate preparation and maintenance for remaining pumps at the sewage pumping stations will be required prior to the commencement of replacement activity in order to ensure continuous and smooth operation for the whole duration of the project, including old pump dismantling, new pump installation and commissioning.

2.5.3.2. Mitigation Plan

The proposed mitigation measures are listed in Annex A.4.

2.5.3.3. Monitoring Plan

Key objective of the proposed environmental investment project is to eliminate the risk of accidental pollution of surface waters, soil and groundwater due to disruption in the SPS operation and release of untreated effluent to the environment.

Target performance indicators for the proposed project include the reliable operation of the sewage pumping station during the implementation of dismantling, installation and commissioning operations.

Project-specific intermediate performance indicators relate to the control of soil and groundwater contamination during the dismantling and removal of old equipment and other materials, and installation/commissioning of new pumping units.

Other intermediate performance indicators include the levels of noise and vibration during the project implementation.

Proposed monitoring plan for the project is presented in Annex B.4.
Figure 2.5. - Vehicle Fleet Used by Chernihiv Water Utility
3. INSTITUTIONAL ISSUES

The Chernihiv Vodokanal Water Utility has adequate capacity and resources required to ensure compliance with existing environmental standards and regulations during the implementation of proposed investment projects, with the assistance and supervision of all relevant authorities responsible for environment protection, sanitary and occupational safety.

There is no plan for the involvement of the public in monitoring activity for this project.

It is recommended to strengthen the analytical capability of the Utility’s laboratory and general performance control and monitoring capability through the purchase of the following types of analytical and monitoring equipment:

- Analysis of drinking water quality (atomic absorption spectrometer, radiochemical analysers);
- Analysis of effluent quality (atomic absorption spectrometer, infrared photometer);
- Sewage flow control, pressure control, leak detection, operational control (portable flow meter, well level meters, portable watt meters, portable depth-sounders, and correlator).

In order to facilitate proper and efficient implementation of planned construction and pipe replacement activities, it is anticipated to renovate vehicle fleet and mobile plant at the Utility (Figure 2.6). In particular, it is planned to purchase excavation equipment, trucks, specialized vehicles and loading equipment.
4. PUBLIC CONSULTATION

The public consultation process involved two consultation stages.

The first consultation was held in May 2005 to discuss the Terms of Reference for the Environmental Assessment component, EA report structure and preparation schedule. Relevant project information was distributed among the participants present at the meeting. The Minutes of Consultation Meeting are attached.

The second consultation was held on 8 September 2005 to discuss the progress and results of environmental assessment. The participants to the meeting were provided with a set of information materials relating to the Environmental Assessment. The Minutes of Consultation Meeting are attached.

The following key stakeholder groups were involved in the consultation process: statutory/political authorities, NGOs and public group representatives.

Generally, the consultation process was extremely productive and useful, and valuable comments were provided with regard to the project implementation. The public representatives expressed support for the project.

All comments and recommendations have been taken into account in preparation of the present report. Details of the public consultation process are provided in Annex C.
5. CONCLUSIONS

Rehabilitation of Water Supply System

Based on the analysis of existing situation and issues, it can be concluded that the rehabilitation of the City's water supply system is urgently needed. The proposed rehabilitation project includes the following key elements:

- Construction of booster pump stations;
- Replacement of pumping equipment at water abstraction sites and pump stations;
- Automatic control of pump station operation;
- Rehabilitation of water distribution system (replacement of distribution pipework).

The implementation of proposed project elements will contribute to the improvement of service quality, energy efficiency and environmental performance of the City's water utility.

Based on the results of Environmental Assessment, it can be concluded that the proposed projects can be promoted to the next stage of project preparation cycle.

Rehabilitation of Wastewater Collection/Treatment System

Based on the analysis of existing situation and issues, it can be concluded that the City's wastewater collection and treatment system needs to be improved. The proposed rehabilitation project includes the following key elements:

- Construction of rising sewer main;
- Replacement of sewer pipework;
- Rehabilitation of municipal wastewater treatment plant;
- Rehabilitation of sewage pumping stations.

Based on the results of Environmental Assessment, it can be concluded that the proposed projects can be promoted to the next stage of project preparation cycle.
Annex A  Mitigation Plan
## Annex A.1. Mitigation Plan: Rehabilitation of Water Supply System

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
| Construction           | Traffic increase in the course of construction activity              | • Provision of appropriate warning signs around the construction site.  
                        |                                                                      | • Reasonable daytime working hours (from 8.00 a.m. to 5.00 p.m.).  
                        |                                                                      | • Identification of acceptable alternative routes for construction traffic.                                                                                                                                   | Allowance made in the project budget                                  | Contractor                   |
|                        | Potential impact of construction activity on the pedestrian safety in the location of construction site | • Provision of safety fence around the construction site.  
                        |                                                                      | • Restricted access to the construction site on the basis of passes                                                                                                                                           | Allowance made in the project budget                                  | Contractor                   |
| Dust emissions during construction | • Implement dust avoidance measures:  
                        |                                                                      | • Provision of proper package for loose materials.  
                        |                                                                      | • Watering of access roads and excavation zones, implementation of good construction practice, site cleaning at the end of working hours.                                                                   | Allowance made in the project budget                                  | Contractor                   |
|                        |                                                                      | • Use of protective covers and screens to contain fugitive dust emissions wherever possible.                                                                                                                  |                                                                      |                              |
| Noise and vibration    | • Restricting noisy construction activities to normal daily working hours.  
                        |                                                                      | • Adopting a reasonable work schedule.  
                        |                                                                      | • Use of acoustical enclosures or noise suppressors for noisy equipment where appropriate.                                                                                                                     | Allowance made in the project budget                                  | Contractor                   |
| Interim stockpiling of the stripped soils and construction waste can be a potentially significant effect unless properly managed | • All waste materials, generated during construction, including hazardous waste, should be delivered to the official sanitary landfill(s).                                                                        | Allowance made in the project budget                                  | Contractor                   |
| Surface water and soil contamination from leaks or spills of process chemicals such as fuel oils/lubricants, paints, cooling agents etc. | • Regular inspection and proper maintenance of vehicles and equipment.  
                        |                                                                      | • Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc. in accordance with the Operation Rules for Centralised Water Supply and Sewerage Systems (approved by the State Municipal Utility Management Committee of Ukraine Order No. 30 of 05.07.95)  
                        |                                                                      | • Prompt elimination and control of leaks and spills.  
                        |                                                                      | • Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases.  
<pre><code>                    |                                                                      | • Limiting vehicle maintenance operations to specially designated sites.                                                                                                                                        | Allowance made in the project budget                                  | Contractor                   |
</code></pre>
<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
|                       | Air emissions during equipment operation                             | • Ensure proper technical state of all equipment.  
• Regular inspection of motor vehicles, control of compliance with emissions guidelines, in accordance with the Guideline Document RD 52.04.186-89 “Air Pollution Control Manual” and the Technique for Determination of Emission Loads from Mobile Sources (the RF Ministry of Transport, 1993)  
• Restricting construction activities to reasonable working hours (from 8.00 a.m. to 5.00 p.m.). | Allowance made in the project budget | Contractor                     |
|                       | Potential for soil erosion and degradation as a result of earthworks or during storage | • Height and profiling of stockpiles to minimise degradation of soil components in accordance with the State Construction Standard DBN 360-92** “Urban Development. Planning and Development of Urban and Rural Settlements” | Allowance made in the project budget | Contractor                     |
|                       | Soil disturbance/landslipping due to construction activity            | • Comprehensive geoengineering survey prior to construction, survey results to be accounted for in the final design.  
• Strict compliance with safety rules in accordance with the Operation Rules for Centralised Water Supply and Sewerage Systems (approved by the State Municipal Utility Management Committee of Ukraine Order No. 30 of 05.07.95) | Allowance made in the project budget | Contractor                     |
|                       | Damage to trees and other vegetation during construction               | • Minimise the potential for damage in accordance with the State Construction Standard DBN 360-92** “Urban Development. Planning and Development of Urban and Rural Settlements”  
• Replant/restore affected vegetation cover. | Allowance made in the project budget | Contractor                     |
| Operation              | Leaks in the distribution mains.                                      | • Proper control/prompt elimination of leaks in accordance with the Operation Rules for Centralised Water Supply and Sewerage Systems (approved by the State Municipal Utility Management Committee of Ukraine Order No. 30 of 05.07.95) | Operating costs                | Service operator              |
# Annex A.2. Mitigation Plan: Rehabilitation of Municipal Sewer Network

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigation Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
| Construction          | Potential impact of construction activity on the pedestrian safety in the location of construction site | - Provision of safety fence around the construction site.  
                        |                                                                       | - Restricted access to the construction site on the basis of passes               | Allowance made in the project budget | Contractor                  |
| Dust emissions during construction |                                                                       | - Implement dust avoidance measures: Provision of proper package for loose materials during transportation.  
                        |                                                                       | - Covering of earth/building material transporting vehicles.  
                        |                                                                       | - Watering of access roads and excavation zones, implementation of good construction practice, site cleaning at the end of working hours.  
                        |                                                                       | - Use of protective covers and screens to contain fugitive dust emissions wherever possible. | Allowance made in the project budget | Contractor                  |
| Noise and vibration   |                                                                       | - Restricting noisy construction activities to normal daily working hours (from 8.00 a.m. to 5.00 p.m.).  
                        |                                                                       | - Adopting a reasonable work schedule.                                               | Allowance made in the project budget | Contractor                  |
| Short-term surface water and soil contamination from leaks or spills of process chemicals such as fuel oils/lubricants, paints, cooling agents etc. |                                                                       | - Regular inspection and proper maintenance of vehicles and equipment.  
                        |                                                                       | - Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc.  
                        |                                                                       | - Prompt elimination and control of leaks and spills.  
                        |                                                                       | - Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases.  
                        |                                                                       | - Limiting vehicle maintenance operations to specially designated sites.          | Allowance made in the project budget | Contractor                  |
| Short-term groundwater and soil contamination from spills during the connection of new piping to the existing sewer network |                                                                       | - Strict compliance with construction standards and design specifications          | Allowance made in the project budget     | Contractor                  |
| Air emissions during equipment operation |                                                                       | - Ensure proper technical state of all equipment.  
                        |                                                                       | - Restricting construction activities to reasonable working hours.               | Allowance made in the project budget | Contractor                  |
| Top soil stripping may affect soil properties |                                                                       | - Provide adequate temporary storage for top soil material and subsequent restoration of disturbed site | Allowance made in the project budget     | Contractor                  |
| Interference with natural drainage |                                                                       | - Short-term impact. No special mitigation measures are required                   | Allowance made in the project budget     | Contractor                  |
| Damage to trees and other vegetation during construction |                                                                       | - Minimise the potential for damage.  
<pre><code>                    |                                                                       | - Replant/restore affected vegetation cover.                                      | Allowance made in the project budget | Contractor                  |
</code></pre>
<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigation Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction waste and old piping can be a potentially significant effect unless properly managed</td>
<td>• All waste materials, generated during construction, including hazardous waste, should be delivered to the official sanitary landfill(s).</td>
<td>Allowance made in the project budget</td>
<td>Contractor</td>
<td></td>
</tr>
</tbody>
</table>
| Operation | Odours and noise generated by sewage pumping station can cause considerable nuisance to local residents | • Air emissions from sewer mains should be minimised in accordance with the Operation Rules for Centralised Water Supply and Sewerage Systems (approved by the State Municipal Utility Management Committee of Ukraine Order No. 30 of 05.07.95).  
• Pumping stations should be appropriately located at a sufficient distance from residential areas, in adequately insulated buildings. | Allowance made in the operating cost estimate | Operator                                       |
| Soil and groundwater contamination due to leaks from sewer system | • Adequate leak control.  
• Comprehensive quality assurance/control programme during construction, with subsequent technical inspection and maintenance programme | Allowance made in the operating cost estimate | Operator. The control of soil contamination in the surrounding area is the responsibility of local Sanitary Epidemiological Service (bacteriological contamination) and analytical quality control unit of local Department of Environment and Natural Resources |
### Annex A.3. Mitigation Plan: Rehabilitation of Municipal Wastewater Treatment Plant

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigation Measure</th>
<th>Cost</th>
<th>Institutional Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation</td>
<td>Noise and vibration</td>
<td>• Restricting noisy construction activities to normal daily working hours.</td>
<td>Allowance made in the project budget</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use of special protection means.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil and surface contamination due to spills</td>
<td>• Adequate containment for oils and lubricants.</td>
<td>Allowance made in the project budget</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Good housekeeping practice.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>Odour and noise generated in wastewater treatment or sludge management process</td>
<td>• Proper technology choice;</td>
<td>Operating cost</td>
<td>Operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adequate odour control provisions in the design;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Odour and noise generated at a pumping plant site may be a nuisance for local residents</td>
<td>• Process control and staff training.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor performance may result in inadequate treatment of effluent</td>
<td>• Spill/leak control and minimisation;</td>
<td>Operating cost</td>
<td>Operator</td>
</tr>
<tr>
<td></td>
<td>Wastewater treatment sludge unsuitable for agricultural application due to contamination</td>
<td>• Quality control during construction and operation, technical maintenance programme.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plant odours can cause considerable nuisance to staff and local residents.</td>
<td>• Continuous process monitoring;</td>
<td>Operating cost</td>
<td>Operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Raw effluent quality monitoring;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Treated effluent quality monitoring;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Regular technical inspection of Plant's equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sludge quality control, including bacterial content, to withdraw contaminated batches</td>
<td>Operating cost</td>
<td>Operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adequate design provisions and good operational practice.</td>
<td>Operating cost</td>
<td>Operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provision of vents in the Plant's buildings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Annex A.4. Mitigation Plan: Rehabilitation of Sewage Pumping Capacity

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Issue</th>
<th>Mitigation Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory Phase</td>
<td>Remaining operational capacity should be sufficient to ensure continuous operation of pumping station for the whole duration of dismantling/installation/commissioning process</td>
<td>• Technical inspection, maintenance and repair of all remaining pumping units</td>
<td>Cost to be covered by Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Pumps installation and commissioning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Short-term dust emissions during installation and commissioning</td>
<td>• Adequate dust control and suppression; Water sprinkling, use of preventive covers; Control of air emissions from transport and mobile plant</td>
<td>Cost to be covered by Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Regular technical inspection of mobile plant and equipment; Compliance with existing regulations and operation rules for mobile plant and equipment; Use of protective screens/noise suppression means where necessary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noise and vibration during pump installation and commissioning</td>
<td>• Regular inspection and proper maintenance of vehicles and equipment; Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc. Prompt elimination and control of leaks and spills. Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases. Limiting vehicle maintenance operations to specially designated sites.</td>
<td>Cost to be covered by Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>Short-term surface water and soil contamination from leaks or spills of process chemicals such as fuel oils/lubricants, paints, cooling agents etc.</td>
<td>• Regular inspection and proper maintenance of vehicles and equipment; Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc. Prompt elimination and control of leaks and spills. Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases. Limiting vehicle maintenance operations to specially designated sites.</td>
<td>Cost to be covered by Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>Short-term groundwater and soil contamination from spills during the connection of new piping to the existing sewer network</td>
<td>• Strict compliance with construction standards and design specifications</td>
<td>Cost to be covered by Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>Construction waste and dismantled equipment can be a potentially significant effect unless properly managed</td>
<td>• All waste materials, generated during construction, including hazardous waste, should be delivered to the official sanitary landfill(s).</td>
<td>Cost to be covered by Contractor</td>
<td>Contractor</td>
</tr>
</tbody>
</table>
Annex B  Monitoring Plan

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Monitoring Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and Supervision</td>
<td>Percentage of population connected to upgraded water supply service</td>
<td>Human settlement</td>
<td>Monitoring report by a municipal utility’s laboratory</td>
<td>Monthly</td>
<td>Contractor, Sanitary Epidemiological Service</td>
</tr>
<tr>
<td>Operation</td>
<td>Leaks in the distribution system</td>
<td>Within a water distribution system</td>
<td>Visual inspection, public complaints</td>
<td>As part of regular maintenance</td>
<td>Operating Agency</td>
</tr>
</tbody>
</table>

### Target Performance Indicators
- **Construction**
  - Drinking water quality parameters, set out in the State Sanitary Standard DSanPIN 383-96
  - Within a water supply system, in accordance with the Water Quality Control Plan
  - Instrumented measurements (physical, chemical, bacteriological, radiological) in accordance with the DSanPIN 383-96
  - Daily or weekly during construction
  - Contractor, Sanitary Epidemiological Service, Environmental Inspectorate

### Intermediate Performance Indicators
- **Construction**
  - Noise and vibration
  - Construction site and surroundings
  - Acoustic measurements in accordance with the State Standard GOST 20444-85 "Noise. Traffic Flows in Populated Areas. Technique for Determination of Noise Levels"; public/personnel complaints
  - Daily or weekly during construction
  - Contractor, Sanitary Epidemiological Service, Environmental Inspectorate

- **Construction**
  - Waste generation and management
  - Construction site and surroundings
  - Visual inspection, waste inventory, evidence from landfill operator
  - Continuous daily control
  - Construction contractor, supervisor

- **Construction**
  - Water leaks from the distribution system
  - Within a water distribution system
  - Water meters to meter production/distribution input and customer metering
  - Weekly
  - Contractor, supervisor, customers

- **Construction**
  - Landslipping and erosion
  - Construction site
  - Geotechnical survey, visual inspection components in accordance with the State Construction Standard DBN 360-92** "Urban Development. Planning and Development of Urban and Rural Settlements"
  - Pre-construction geotechnical survey, daily visual inspection
  - Contractor, supervisor

- **Construction**
  - Tree replanting, restoration of vegetation cover
  - Construction site and surroundings
  - Visual inspection, pre-construction photographs
  - Prior to and after construction
  - Contractor, supervisor
### Annex B.2. Monitoring Plan: Rehabilitation of Municipal Sewer Network

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Monitoring Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and Operation</td>
<td>% of losses in sewer network</td>
<td>Centralized sewer system</td>
<td>Instrumented measurements</td>
<td>Daily during construction, monthly during operation</td>
<td>Contractor, local environmental and water management authorities, sanitary service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate Performance Indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Groundwater contamination by oil products, sewage grease, bacteriological contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements (physical, chemical, bacteriological, radiological parameters) in accordance with the Unified Inter-Ministerial Regulation on the Organisation and Implementation of State Water Monitoring (approved by the Ministry of Environment and Natural Resources of Ukraine Order No. 485 of 24.12.2001)</td>
<td>Daily during construction</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
</tr>
<tr>
<td></td>
<td>Soil contamination by oil products and sewage grease in the locations of sewer collectors</td>
<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements in accordance with the Regulation on Land Monitoring (approved by the Cabinet of Ministers of Ukraine Resolution No. 561 of 20.06.1993)</td>
<td>Monthly during construction</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
</tr>
<tr>
<td></td>
<td>Air emissions (dust, nitrogen dioxide, carbon oxide, carbon dioxide, iron oxide, manganese, nickel oxide, chromium (6+), fluorides, xylene, phenol, glycol, butyl acetate, ethyl acetate, ethyl-cellulose, acetone, cyclohexanone, solvent, white spirit)</td>
<td>Construction site and surroundings</td>
<td>Instrumented measurements in accordance with the Guideline Document RD 52.04.186-89 “Air Pollution Control Manual” and the Technique for Determination of Emission Loads from Mobile Sources (the RF Ministry of Transport, 1993)</td>
<td>In accordance with the State Sanitary Rules (DSP 201-97) for Air Protection in the Populated Areas</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
</tr>
<tr>
<td></td>
<td>Noise and vibration</td>
<td>Construction site and surroundings</td>
<td>Acoustic measurements in accordance with the State Standard GOST 20444-85 “Noise. Traffic Flows in Populated Areas. Technique for Determination of Noise Levels”, public/personnel complaints</td>
<td>Daily or as deemed necessary during construction</td>
<td>Contractor, sanitary service, supervisor</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Construction site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, supervisor</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Monitoring Parameter</td>
<td>Monitoring Location</td>
<td>Monitoring Technique</td>
<td>Monitoring Frequency</td>
<td>Institutional Responsibility</td>
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<td>------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Operation</td>
<td>Groundwater contamination by oil products, sewage grease, bacteriological contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements (physical, chemical, bacteriological, radiological parameters) in accordance with the Unified Inter-Ministerial Regulation on the Organisation and Implementation of State Water Monitoring (approved by the Ministry of Environment and Natural Resources of Ukraine Order No. 485 of 24.12.2001)</td>
<td>Weekly during operation</td>
<td>Contractor, local environmental authorities, sanitary service</td>
</tr>
<tr>
<td>Soil contamination by oil products and sewage grease in the locations of sewer collectors</td>
<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements in accordance with the Regulation on Land Monitoring (approved by the Cabinet of Ministers of Ukraine Resolution No. 661 of 20.06.1993)</td>
<td>Monthly during operation</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td></td>
</tr>
<tr>
<td>Air emissions (dust, nitrogen dioxide, carbon oxide, carbon dioxide, iron oxide, manganese, nickel oxide, chromium (6+), fluorides, xylene, phenol, glycol, butyl acetate, ethyl acetate, ethyl-cellulose, acetone, cyclohexanone, solvent, white spirit)</td>
<td>Along the sewer main route</td>
<td>Instrumented measurements in accordance with the Guideline Document RD 52.04.186-89 &quot;Air Pollution Control Manual&quot; and the Technique for Determination of Emission Loads from Mobile Sources (the RF Ministry of Transport, 1993)</td>
<td>In accordance with the State Sanitary Rules (DSP 201-97) for Air Protection in the Populated Areas</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td></td>
</tr>
<tr>
<td>Waste generation and management</td>
<td>Along the sewer main route</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Monthly</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td></td>
</tr>
</tbody>
</table>
### Annex B.3. Monitoring Plan: Rehabilitation of Municipal Wastewater Treatment Plant

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Monitoring Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Contaminant loadings in treated effluent (based on the list of regulated contaminants, specified for Chernihiv Water Utility)</td>
<td>Discharge outfall</td>
<td>Instrumented measurements (physical, chemical, bacteriological, radiological parameters)</td>
<td>Daily</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
</tr>
<tr>
<td>Groundwater contamination by oil products and other regulated contaminants</td>
<td>Monitoring boreholes along the sewer main route</td>
<td>Instrumented measurements in accordance with the Unified Inter-Ministerial Regulation on the Organisation and Implementation of State Water Monitoring (approved by the Ministry of Environment and Natural Resources of Ukraine Order No. 466 of 24.12.2001)</td>
<td>Daily during construction</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Air emissions (dust, nitrogen dioxide, carbon oxide, carbon dioxide, iron oxide, manganese, nickel oxide, chromium (6+), fluorides, xylenes, phenol, glycol, butyl acetate, ethyl acetate, ethyl-cellulose, acetone, cyclohexanone, solvent, white spirit</td>
<td>Plant site and surroundings</td>
<td>Instrumented measurements in accordance with the Guideline Document RD 52.04.186-89 &quot;Air Pollution Control Manual&quot; and the Technique for Determination of Emission Loads from Mobile Sources (the RF Ministry of Transport, 1993)</td>
<td>Daily during construction</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Plant site and surroundings</td>
<td>Acoustic measurements in accordance with the State Standard GOST 20444-85 &quot;Noise. Traffic Flows in Populated Areas. Technique for Determination of Noise Levels&quot;; public/personnel complaints</td>
<td>Daily during construction</td>
<td>Contractor, sanitary service, supervisor</td>
<td></td>
</tr>
<tr>
<td>Waste generation and management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, supervisor</td>
<td></td>
</tr>
<tr>
<td>Surplus activated sludge generation and management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, supervisor</td>
<td></td>
</tr>
<tr>
<td>Process waste management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>Percentage of water losses in sewer mains</td>
<td>Sewer network</td>
<td>Instrumented measurements</td>
<td>Monthly</td>
<td>Contractor</td>
</tr>
<tr>
<td>Surplus activated sludge generation and management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, supervisor</td>
<td></td>
</tr>
<tr>
<td>Project Phase</td>
<td>Monitoring Parameter</td>
<td>Monitoring Location</td>
<td>Monitoring Technique</td>
<td>Monitoring Frequency</td>
<td>Institutional Responsibility</td>
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<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Operation</td>
<td>Groundwater contamination by oil products and other regulated contaminants</td>
<td>Monitoring boreholes along sewer main route</td>
<td>Instrumented measurements in accordance with the Unified Inter-Ministerial Regulation on the Organisation and Implementation of State Water Monitoring (approved by the Ministry of Environment and Natural Resources of Ukraine Order No. 485 of 24.12.2001).</td>
<td>Weekly during operation</td>
<td>Contractor, local environmental authorities, sanitary service</td>
</tr>
<tr>
<td></td>
<td>Soil contamination regulated contaminants along the sewer main route</td>
<td>Sampling locations along sewer main route</td>
<td>Instrumented measurements in accordance with the Regulation on Land Monitoring (approved by the Cabinet of Ministers of Ukraine Resolution No. 661 of 20.06.1993)</td>
<td>Monthly during operation</td>
<td>Contractor, local environmental authorities, sanitary service</td>
</tr>
<tr>
<td></td>
<td>Air emissions (H₂S, CH₄)</td>
<td>Plant site and surroundings</td>
<td>Instrumented measurements in accordance with the Guideline Document RD 52.04.186-89 “Air Pollution Control Manual”</td>
<td>Daily during operation</td>
<td>Contractor, local environmental authorities, sanitary service</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, local environmental authorities, sanitary service</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Monitoring Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation and Commissioning</td>
<td>Continuous operation of SPS</td>
<td>SPS sites</td>
<td>Instrumented measurements</td>
<td>Continuous</td>
<td>Contractor, local environmental and water management authorities, sanitary service, City’s municipal service management department, supervisor</td>
</tr>
<tr>
<td>Installation and Commissioning</td>
<td>Air emissions (dust, nitrogen dioxide, carbon oxide, carbon dioxide, iron oxide, manganese, nickel oxide, chromium (6+), fluorides, xylene, phenol, glycol, butyl acetate, ethyl acetate, ethyl-cellulose, acetone, cyclohexanone, solvent, white spirit)</td>
<td>Plant site and surroundings</td>
<td>Instrumented measurements in accordance with the Guideline Document RD 52.04.186-89 “Air Pollution Control Manual” and the Technique for Determination of Emission Loads from Mobile Sources (the RF Ministry of Transport, 1993)</td>
<td>Daily during construction</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
</tr>
<tr>
<td>Installation and Commissioning</td>
<td>Waste generation and management</td>
<td>SPS sites and landfill site</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Contractor, supervisor</td>
</tr>
<tr>
<td>Pump Operation</td>
<td>Continuous operation of SPS</td>
<td>SPS sites</td>
<td>Instrumented measurements</td>
<td>Continuous</td>
<td>Contractor</td>
</tr>
<tr>
<td>Pump Operation</td>
<td>Air emissions (H₂S, CH₄)</td>
<td>SPS sites</td>
<td>Instrumented measurements in accordance with the Guideline Document RD 52.04.186-89 “Air Pollution Control Manual”</td>
<td>Daily or as deemed necessary</td>
<td>Contractor, local environmental authorities, sanitary service</td>
</tr>
<tr>
<td>Pump Operation</td>
<td>Noise and vibration</td>
<td>SPS sites</td>
<td>Acoustic measurements in accordance with the State Standard GOST 20444-85 “Noise. Traffic Flows in Populated Areas. Technique for Determination of Noise Levels”; public/personnel complaints</td>
<td>Daily or as deemed necessary</td>
<td>Contractor, sanitary service, supervisor</td>
</tr>
</tbody>
</table>
Annex C  Materials on Public Consultations
The Need for Public Consultation

According to the requirements of the World Bank and Ukrainian legislation, it is necessary to consult project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and to take their views into account when performing Environmental Assessment (EA) of investment project on municipal infrastructure. Thus, generation of positive attitude on all stages of projects is the necessary requirement for the project performance.

Organisation of Public Consultations

According to Terms of Reference, the Consultant (IWMC) has organized the public consultation process in the following way:

1. Two public consultations for each project location were carried out:
   - **The first public consultation** - the purpose of this consultation was to present the planned project, review the EA outline and schedule, Terms of Reference, and to solicit from affected groups and local NGOs any environmental issues they consider to be a priority and they wish to see addressed in the EA report.
   - **The second public consultation** - the purpose of this consultation was to present the results of EA work, discuss positive and negative impacts of planned project, to review the draft EA document to ensure that the issues identified in the first public consultation have been properly addressed and resolved to the satisfaction of locally affected groups and NGOs.

   The main objectives of public consultations were as follows:
   - To make the EA project transparent and open for the public;
   - To discuss various issues and concerns with project-affected groups, to familiarize public with potential negative impacts and problems during realization of investment projects;
   - To have feedback from competent bodies and local project-affected groups during the EA process on potential positive and negative impacts.

2. To invite local stakeholders, the places and dates of two public consultations were announced in local/oblast newspapers, followed by the telephone and fax communications. Key participants are:
   - Loan Recipients (Municipal Utilities);
   - Key field institutions;
   - Key research organizations and organizations performing Environmental Impact Assessment (EIA);
   - Local state administrations;
   - State authorities (environmental authorities and sanitary epidemiological service);
   - NGOs;
   - TV, radio stations, newspapers.

3. Responsible persons (from IWMC and Grant Recipients) were appointed for each location.

4. The following information materials were prepared for each consultation:
   - Agenda;
   - Information on the project – distribution material;
5. Records of consultations were carefully documented, including the lists of attending persons, pictures/photos, and minutes of each consultation meeting.

6. All comments and opinions of participants were taken into account during the preparation of EA reports.

Public consultations in Chernihiv city were conducted according to the approved programme.

Public Consultations in Chernihiv City

The First Public Consultation

1. A working meeting with the potential loan recipient (Chernihiv Vodokanal Municipal Utility) to discuss key organizational issues was held, where the date and venue were discussed and the 1st Consultation Meeting Preparation Plan was agreed. It was decided to hold the first public consultation meeting on 12 May, 2005, at the conference hall of the local Palace of Culture.

2. The announcement of the meeting was published in the oblast newspaper “Chernihivski Vidomosti” on 1 April 2005, No. 13 (Attachment 1).

3. The meeting agenda (Attachment 2) was prepared.

4. The minutes of the 1st consultation meeting were maintained (Attachment 3).

5. Mass-media have reflected the event in their news programmes and publications (Attachment 4).

The Second Public Consultation

1. A working meeting to discuss key issues relating to the organization of the second consultation meeting was conducted, where the meeting date and venue were discussed, and the 2nd Consultation Meeting Preparation Plan was agreed. It was decided to hold the second public consultation meeting on 8 September, 2005, at the conference hall of the local Palace of Culture.

2. The meeting date and venue were announced in the oblast newspaper “Chernihivski Vidomosti” on 31 August 2005, No. 35 (Attachment 5).

3. The Meeting Agenda (Attachment 6), distribution material (Attachment 7) and press-release (Attachment 8) were prepared.

4. The minutes of the 2nd consultation meeting were maintained (Attachment 9), and pictures (Attachment 10) were made.

5. Mass-media have reflected the event in their news programmes and publications.
Conclusions

A set of very important and interesting issues/comments/opinions were identified/received as a feedback from interested and project-affected groups, in particular, potential loan recipients, NGOs and general public. All comments have been taken into account and properly addressed during the preparation of EA reports.

The feedback received from the public consultations has proved invaluable in assessing the following aspects of the proposed projects:

- Compliance of planned investment projects with the Ukrainian environmental legislation and regulations;
- Completeness of available information on the current environmental situation;
- Current environmental permitting status of each proposed project;
- Completeness of available information on the potential environmental impacts associated with the proposed investment project implementation;
- Adequacy of proposed mitigation measures in terms of ensuring the environmental safety and sustainability;
- Acceptability of potential environmental impacts and environmental feasibility of each proposed project;
- Need for additional environmental information or clarification of available environmental data.

The positive response received from various stakeholder groups shows the high level of importance and urgency, associated with the implementation of proposed projects in Chernihiv. These investment projects are expected to significantly improve existing situation in water supply (rehabilitation of water pipelines, construction of booster stations, etc.), waste water collection/treatment (rehabilitation of municipal sewer network, municipal wastewater treatment plant and sewage pumping stations) sectors. Due to purchase of laboratory equipment for analysis and control, the institutional capacity of an implementing agency will be strengthened. The proposed projects would contribute to the improvement of municipal infrastructure, quality of life and environmental situation in the region.

The projects will not cause involuntary resettlement of population.

The potential physical impacts of proposed projects on local geology, climate, air quality, fauna, water bodies, soil, vegetation cover, and existing utilities/infrastructure, are likely to be insignificant and will be limited to the construction phase.
The first public consultation – 12 May, 2005

Announcement in the Newspaper

Source: the Oblast newspaper “Chernihivski Vidomosti”, 1 April 2005, No. 13

An unprecedented event in Chernihiv! Public consultation!
Do you want to live in comfort? Aren’t you concerned about water and heat supply in your apartment?
Let’s discuss these issues and Strategic Action Plan for the Chernihiv Vodokanal Municipal Utility and the Oblteplokomunenergo Joint Stock Company! We are waiting for you on the 12-th of May at 5 p.m. at the Conference Hall, Palace of Culture.
Agenda
The First Public Consultation Meeting

1. Sokolov O.V., City Head, Chairman of the public consultation
   Opening. Timing and agenda.

2. Romanuyk O.O., President of Community Development Institute
   About Strategic Action Plan for the Chernihiv Vodokanal Municipal Utility
   and Close Corporation Oblteplokomunenergo

3. Skin A.M., Director of Chernihiv Vodokanal Municipal Utility
   Explanation of situation with water supply and key problems, about most
   priority problems and proposed projects.

4. Makarovskiy E.L., IWMC expert
   About the Terms of References and schedule for EA assignment.

5. Discussion
Minutes (No. 1) of the First Public Consultation

Summary

Chernihiv 12 May 2005

Agenda:
2. Public consultation on environmental issues of WB Urban Infrastructure Project.

Potential Loan Recipient: Chernihiv Vodokanal Municipal Utility.

Chairman – Sokolov O.V., City Mayor

Secretariat:
Head of secretariat – Ananko V.M., member of Advisory Committee, Deputy of City Council, member of Social Party of Ukraine, Deputy Head of Commission on Architecture and Construction;
Maksimenko L.V. - member of Advisory Committee, Deputy Head of Department of Economics of City Council;
Chaikovskiy G.M. - member of Advisory Committee, Deputy Head of Department of Architecture and Construction.

About 412 persons were present.

1. Sokolov O.V., City Head – familiarized with agenda and schedule. He told about the Strategic Action Plan for the Chernihiv Vodokanal Municipal Utility, its objectives. He underlined that the Strategic Action Plan was approved by the City Council session.

2. Romanuyk O.O., President of Community Development Institute – told about the Strategic Action Plan for the Chernihiv Vodokanal Municipal Utility in details and underlined its importance for the city development and improvement of municipal services. The Strategic Action Plan for the Chernihiv Vodokanal Municipal Utility was prepared in the framework of Programme of Tariff Reform and Restructuring of Municipal Utilities in Ukraine". The Programme is financed by USAID, and implemented by the PADKO Consulting Company and Community Development Institute (since October 2004). He underlined that the developed Strategic Action Plan is up to the international standards and “clears the way” for investors.

3. Skin A.M., Director of Chernihiv Vodokanal Municipal Utility – told about the Utility and problems in water supply and wastewater sectors in details. He told about priority measures in the framework of Strategic Action Plan. He told that the Utility had communicated with the WB to discuss the possibility of implementing several investment projects in the framework of Urban Infrastructure Project. He told in details about developed projects and
The First Step is Most Difficult to Make

The article is devoted to the public consultation. General situation with water supply is described. Comparison with situation in other cities is made. Water tariffs are discussed. Special attention is given to the quality of services. Possible options are discussed. Conclusion – public consultation is very important for society and population should take part in decision-making.
Перший крок — найважчий

Людина, яка так докіг та чекала в жоді, вже відчула перший вихід в Українському космосі. Також її успішний старт здійснило "Оновлення" та "БАТ". Це змусило країну повернутися до червоних кроків, які виконували в зазнах.

ЦІНА ВОДИ

Пам'ятання про тривожну ситуацію в річному водозаборі, яка спрацювала в Україні, зазнала визначних змін. Наразі водозабір відбувається швидко, але вже зазначено, що вода є небезпечною. Яка ускладнена ситуація в річному водозаборі.

ІМІННІСТЬ ВОДИ

Горяча тема

ДАЛІ БУДЕ

Викладач Станіслав Грабар зазначив, що оновлення системи водопостачання в Україні є необхідним, та вважається, що ця ситуація потребує срочної роботи. Але не дивись, якщо вода відбувається відповідно до плану.

ГАЛОМУШКІ

Горяча тема

ДАЛІ БУДЕ

Викладач Станіслав Грабар зазначив, що оновлення системи водопостачання в Україні є необхідним, та вважається, що ця ситуація потребує срочної роботи. Але не дивись, якщо вода відбувається відповідно до плану.

ГАЛОМУШКІ

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ГАЛОМУШКІ

Горяча тема

ДАЛІ БУДЕ

Викладач Станіслав Грабар зазначив, що оновлення системи водопостачання в Україні є необхідним, та вважається, що ця ситуація потребує срочної роботи. Але не дивись, якщо вода відбувається відповідно до плану.
The second public consultation – 8 September, 2005

Announcement in the Newspaper

Source: the Oblast newspaper “Chernihivski Vidomosti”, 31 August 2005, No. 35

The second public consultation on investment projects on rehabilitation of water supply, wastewater and solid waste management systems in Chernihiv for presentation and discussion of the Draft EA Report will be conducted at 11.00 on the 8-th of September, 2005, in the conference hall, Palace of Culture. Interested persons are welcome.
Терези (24.08-23.10)

Цього тижня вітаємо!
Agenda
The Second Public Consultation Meeting
in the Framework of EA Process for Proposed Investment Projects
on the Urban Infrastructure Development

1. Registration of participants, distribution of materials
   Chairman of the public consultation meeting – Kobzar V.G., Deputy Head of
   Novozavodskoy District Executive Council

2. Opening - Kobzar V.G., Deputy Head of Novozavodskoy District Executive
   Council
   Introduction to the public consultation meeting objectives, timing and
   agenda.

3. Skin A.M., Director of Chernihiv Vodokanal Municipal Utility
   Assessment of existing situation and objectives of investment
   projects

4. Khalosha V.I., representative of the Civil Engineering Design Institute, Leader of
   Sanitary Engineering Group, Chernihivgrazdanprojektrekonstruktsia Institute
   Explanation and characterization of key features of proposed
   projects from technical point of view

5. Makarovskiy E.L., IWMC expert
   General description of the WB Urban Infrastructure Project. Draft
   EA Reports for wastewater sector. Potential positive and negative
   impacts.

6. Utkina E.B., IWMC expert
   Draft EA Reports for water supply sector. Potential positive and
   negative impacts.

7. Discussion
   Pinskiy M.L., Senior Inspector of State Department of Ecology and
   Natural Resources in Chernihiv Oblast
   Bulakh A.G., Head of State Ecological Inspection in Chernihiv

8. Results, conclusions.
WORLD BANK URBAN INFRASTRUCTURE PROJECT

Public Consultation

In the framework of EA process of investment projects on development of urban infrastructure aimed at improvement of hygiene and health of the population and improvement of environmental conditions, sustainable water supply and sanitation delivery services, energy-saving.

KEY ACTIVITY AREAS:

- Rehabilitation of water supply system;
- Rehabilitation of wastewater collection/treatment system.

In Chernihiv, the following projects are proposed:

Rehabilitation of water supply system:

- Construction of Booster Pump Stations;
- Replacement of Pumping Equipment at Water Abstraction Sites and Pump Stations;
- Automatic Control Equipment at Water Pump Stations;
- Rehabilitation of Water Distribution System

Rehabilitation of wastewater collection/treatment system:

- Rehabilitation of Municipal Sewer Network;
- Rehabilitation of Municipal Wastewater Treatment Plant;
- Rehabilitation of Sewage Pumping Stations

and purchase of modern laboratory equipment and renovation of vehicle fleet for institutional strengthening of the Chernihiv Vodokanal Municipal Utility.

The analysis of proposed projects demonstrates their significant social benefits, resulting from the improvements in existing water supply and wastewater collection/treatment systems. These projects will contribute to the improvement of environmental situation in the region, provide access to better quality services, and result in reduced energy costs of these services.

The proposed projects will not cause involuntary resettlement. Their potential physical impacts on local geology, climate, air quality, fauna, water bodies, soil, vegetation cover, and existing utilities/infrastructure are considered to be minor and limited to the construction phase.

PUBLIC CONSULTATION

September 2005 - review the draft EA document

Head: Scientific Direction IWM
Kuzin Alexander
Contact person: Utkina Kateryna
Tel./fax: (057) 702 15 78
E-mail: akousine@mail.ru
Press Release

Today, on 8 September 2005, in the Palace of Culture, the public consultation on WB investment projects on urban infrastructure was held. Key areas of investment are the rehabilitation of water supply and wastewater collection/treatment systems.

Lending Agency: the World Bank, loans are anticipated to be provided in the framework of the Urban Infrastructure Project.

The proposed investment projects are aimed at improvement of hygiene and health of the population and improvement of environmental conditions, sustainable water supply and sanitation delivery services, energy saving. The following projects are planned:

**Rehabilitation of water supply system:**
- Construction of Booster Pump Stations;
- Replacement of Pumping Equipment at Water Abstraction Sites and Pump Stations;
- Automatic Control Equipment at Water Pump Stations;
- Rehabilitation of Water Distribution System

**Rehabilitation of wastewater collection/treatment system:**
- Rehabilitation of Municipal Sewer Network;
- Rehabilitation of Municipal Wastewater Treatment Plant;
- Rehabilitation of Sewage Pumping Stations

and purchase of modern laboratory equipment and renovation of vehicle fleet for institutional strengthening of the Chernihiv Vodokanal Municipal Utility.

According to the WB requirements, the EA is required for the proposed project, to be prepared according to the WB procedures and Ukrainian legislation requirements.

Draft EA Reports have been prepared for all proposed projects.

The analysis of proposed projects demonstrates their significant social benefits, resulting from the improvements in existing water supply and wastewater collection/treatment systems. These projects will contribute to the improvement of environmental situation in the region, provide access to better quality services, and result in reduced energy costs of these services.

The proposed projects will not cause involuntary resettlement. Their potential physical impacts on local geology, climate, air quality, fauna, water bodies, soil, vegetation cover, and existing utilities/infrastructure are considered to be minor and limited to the construction phase.

Since the generation of positive public attitude on all stages is a key requirement for proposed projects, the EA results are presented to general public.

The consultation process has been initiated by the Industrial Waste Management Centre Association (the EA Consultant) and Chernihiv Vodokanal Municipal Utility (potential loan recipient).
Minutes (No. 2) of the Second Public Consultation Meeting

Chernihiv 8 September 2005

Place - conference hall, Palace of Culture.

Organizers - Association Industrial Waste Management Centre, Chernihiv Vodokanal Municipal Utility.

Chairman - Kobzar V.G. Deputy Head of Novozavodskoy District Executive Council.

Secretariat:
Maley O.V., IWMC expert;
Kovtun S.G., Deputy Chief Engineer of Chernihiv Vodokanal Municipal Utility.

Coordinator on public relations - Kolomiychuk G.V., Deputy Head on Personnel and Safety of Chernihiv Vodokanal Municipal Utility.

Presidium Members:
Kobzar V.G. Deputy Head of Novozavodskoy District Executive Council;
Skin A.M., Director of Chernihiv Vodokanal Municipal Utility;
Makarovskiy E.L., IWMC expert

64 persons were present. Registration sheets are available at the IWMC office.

Agenda:
2. Discussion.

Documents to be discussed:

1. Kobzar V.G. Deputy Head of Novozavodskoy District Executive Council - told about the aim of consultation, familiarized with agenda.

2. Skin A.M., Director of Chernihiv Vodokanal Municipal Utility - told about the Utility and problems in water supply and wastewater sectors in details. He told about poor technical state of equipment. He underlined that a currently reasonable quality of services would deteriorate unless the proposed improvements were implemented. He said about priority measures in the framework of Strategic Action Plan, told in details about developed projects.

3. Khalosha V.I., representative of the Civil Engineering Design institute, Leader of Sanitary Engineering Group, Chernihivgrazdanprojektrekonstruktksia Institute - described the technical details and aspects of proposed projects aimed at improvement and reliable operation of water supply system.

5. Utkina E.B., IWMC expert – presented Draft EA Report for water supply sector. She characterized potential positive and negative impacts and emphasized great social significance of proposed projects.

Discussion:
- Pinskiy M.L., Senior Inspector of State Department of Ecology and Natural Resources in Chernihiv Oblast – characterized anthropogenic load on the Desna river, resulting from effluent discharges. He classified the treated wastewater as a “insufficiently treated” effluent. The projects are agreed and approved with/by State Department of Ecology and Natural Resources in Chernihiv Oblast. The implementation of proposed projects will improve environmental situation in the region.

- Bukreev A., private entrepreneur – Kiev takes water from the Desna river for water supply, so Kiev is especially interested in improving the quality of effluent discharges. Why should we take care about additional funding and investments?

- Answer: Skin A.M., Director of Chernihiv Vodokanal Municipal Utility – The Utility must work according to Ukrainian legislation. The non-compliance with existing regulations is a legal offence, sanctioned by penalties, which are reflected in tariffs.

- Additional comment: Pinskiy M.L., Senior Inspector of State Department of Ecology and Natural Resources in Chernihiv Oblast – The previously proposed approach would result in progressive deterioration of water quality in the Desna river and eventual disruption in water supply service. Speaking about replacement of pumping equipment and reconstruction of sewage pipelines, it should be noted that population is interested in seeing these improvements implemented.

To summarise the meeting outcomes:
- Skin A.M., Director of Chernihiv Vodokanal Municipal Utility – underlined the importance of investment projects for population and Chernihiv. He thanked everybody for attention and invited to cooperate and discuss results in the future.

- Makarovskiy E.L., IWMC expert – underlined the necessity to ensure compliance with legislation requirements, which is a prerequisite to democracy.

The Chairman thanked all participants for attention. He said that he was very pleased to see such interest from public. He promised to address all identified issues in the Final EA report. He said that further information would be given on the next stages of project preparation.

Signatures:
Chairman
Secretary
Coordinator on public relations
Kobzar V.G., Chairman

Skin A.M., Director of Chernihiv Vodokanal Municipal Utility
Khalosha V.I., Representative of Civil Engineering Design Institute, Leader of Sanitary Engineering Group, Chernihivogradanprojektrekonstruktsia Institute

Makarovskiy E I. "WMC Expert"