1 General

1.1 Project introduction

1.1.1 Government development strategy and project origin

Shanghai Municipality is located at the west coast of the Pacific Ocean and estuary of Yangtze River, the largest river in China, flows into the sea in Shanghai. The special location that connects the ocean and main land brings unique feature of Shanghai. In accordance with Shanghai Urban Master Plan (1999 to 2020), by 2020 Shanghai will become one of the international economic, finance, trade and shipping centers.

Currently, almost no water body can meet national water quality Class I and II standards in Shanghai due to heavy pollution of surface waters, except for Yangtze River estuary. Consequently, Shanghai has been classified as one of the 36 cities in China that suffer water shortage in terms of water quality. Shanghai has been making efforts for water quality improvement and water source development and upstream Huangpu River water diversion works and Chenhang Reservoir water diversion works were built since 1980s, but water supply demand keeps growing over time due to rapid economic development and urbanization, as well as improvement of living conditions. Gap between raw water supply and demand is becoming more significant in Shanghai and has severely impeded harmonious economic and social development. The statistics indicate that total raw water supply of Shanghai in 2004 was 10.64 million m$^3$/day. In updated Shanghai Urban Master Plan and plans of districts/counties total water supply of 14.28 million m$^3$/day is planned for 2020, which means big gap exists in raw water supply. In order to narrow gap between raw water supply capacity and demands in Shanghai, Qingcaosha water source has been included in Shanghai Urban Master Plan (1999 - 2020) approved by the State Council and Shanghai Water Supply Master Plan and Shanghai Aquatic Environmental Functional Zoning (Revision) approved by the Shanghai Municipal Government (SMG). Development of Qingcaosha water source
was officially listed in Outline of the 11th Five-Year Plan for National Economic and Social Development of Shanghai on January 20, 2006. Currently, construction of this water source has been listed as one of the key projects of Shanghai for the 11th Five Year, and Qingcaosha Reservoir raw water transmission works will be completed and put into operation in the first half year of 2010.

Based on Qingcaosha Water Source Raw Water Project Plan, Nanhui Conveyor works will provide raw water from Yangtze River to Chuansha Water Treatment Plant (WTP), North Nanhui WTP, Hangtou WTP, Huinan WTP, and New Nanhui WTP, with total transmission capacity of 1.28 million m$^3$/day or 18% of the total water supply and the service area covering a portion of Shanghai Pudong New District and Nanhui District. Currently, raw water of the above WTPs is from raw water system of upstream Huangpu River. However, raw water quality of upstream Huangpu River is poor and unstable, which cannot fully meet water source quality requirements in Surface Water Environment Quality Standard for centralized city and town drinking water source. Implementation of this Project will have fundamental significances of many aspects in terms of: alleviating of raw water shortage of Shanghai, increasing water supply capacity in the city and towns, improving water supply quality, improving of urban environment quality, securing public health, promoting harmonious development of social economy, and maintaining social stability.

In accordance with the Law of Environmental Impact Assessment of People’s Republic of China and Regulations on the Administration of Construction Project Environmental Protection, environmental impact assessment is required for new, upgrade and expansion projects that have environmental impacts, and an environmental impact assessment report or form shall be prepared to describe local environmental quality condition of the project location and environmental impacts associated with project construction and operation. In accordance with Notice of Strengthening EIA Management of Construction Project Financed by International Financing Organization issued by the Ministry of Environmental Protection (MEP) and based on nature of this
Project, EIA report shall be prepared. Therefore, this EIA report was prepared based on information collection and preliminary site reconnaissance, as trusted by Shanghai Qingcaosha Investment and Construction Development Ltd.

1.1.2 Importance of project construction

This project will deliver raw water from Yangtze River to Pudong New District and Nanhui District by constructing new booster pumping station and water transmission pipelines, which will greatly improve the drinking water quality for residents (farmers), increase the percentage of drinking hygiene water, and help to improve the public health of local residents (farmer) in the project area. Secondly, increase of water supply capacity will help to improve investment environment and create a sound environment for industrial and agriculture development in the project area. Moreover, this Project will bring some indirect benefits, such as acceleration of urbanization, optimization of production structures and urban planning layout, and improvement of citizen diathesis.

1.1.3 Project objective

(1) Improve raw water quality of Shanghai so as to improve drinking water quality for Shanghai residents. Construction of this Project will further improve public health and life quality of the residents. After completion of Qingcaosha water source, Shanghai water system will connect with Chenhang Reservoir to the north and connect with Huangpu River transmission system to the south. These water systems will supplement to each other and will generally improve drinking water quality of Shanghai residents.

(2) Safeguard raw water supply to Shanghai and benefit local economic development. Implementation of this Project will eliminate the gap between raw water supply and water supply demand in project service area, improve investment environment of the affected areas, and benefit local economic development. Implementation of this Project will increase raw water transmission capacity in Pudong
and Nanhui districts to achieve water supply objective of 14.28 million m$^3$/d in Shanghai by 2020 so as to ensure sustainable development of Shanghai. Nanhui District is an agriculture protection area of Shanghai, and Pudong District has the most rapid population growth, therefore, increasing raw water supply capacity financed by the government in project areas will further encourage local industrial and agricultural development and benefit for achieving the objective of becoming modernized new style agriculture.

(3) Improve local planning and accelerate urbanization of Shanghai. Pollution control of Dazhi River in Nanhui District has been ongoing for many years, and currently embankment improvement is under construction. Implementation of this Project will coordinate with Dazhi River pollution control and other development projects to further improve water quality of Dazhi River and water environment and air quality in the surrounding areas.

1.1.4 Project organization

Led by Shanghai Development and Reform Committee, Shanghai Construction Committee, Shanghai Finance Bureau and Shanghai WB Loan (APL) PMO, and supervised by Shanghai Water Authority, Shanghai Municipal Construction, Investment and Development Company (Shanghai Chengtou General) and Shanghai Qingcaosha Investment, Construction and Development Ltd. take responsibilities for project implementation.

1.2 Objective of environmental management plan (EMP)

Aiming at inevitable environmental impacts of this Project, an EMP is prepared to stipulate a set of operable environmental countermeasures with technical feasibility and financial sustainability, nail down measures of environmental alleviation, environmental management and institutional arrangement of contractors, construction supervisions, operators, and environmental administrative agencies during construction and operation, and eliminate or compensate adverse impact on society and environment of this Project.
as much as possible to an acceptable level. The specific objectives of EMP include:

(1) Nail down responsibilities of environmental management for contractors and operators

Shanghai EPB, EIA institute and design institute of this Project conducted a detailed check and verification of environmental protection targets on site and recommended effective mitigation measures which are included into engineering design and will be the contract obligations of contractors and operators.

(2) Guideline of environmental management

The environmental monitoring plan during construction and operation in this EMP can ensure effective implementation of mitigation measures. The monitoring plan will be provided to construction supervision unit, environmental monitoring unit and other relevant units as an environmental protection document during construction and operation which nails down roles and responsibilities of relevant administrative and functional agencies and the channel and method of communication among agencies.

(3) Ensure funds of environmental protection activities

The cost estimation and source of fund for ensuring implementation of environmental management, environmental supervision, and capacity building are specified in this EMP. The management fee includes staff salary, administration fee, and transportation fee. The functions of EMP are avoiding and controlling environmental impacts during construction and operation, thereby recommending necessary mitigation measures, monitoring measures, regulatory methods, safeguard provisions of above measures. Meanwhile, EMP is a tie connecting the environmental impacts with the mitigation measures and alternatives which are specified in EIA. EMP stipulates the technical contents, cost estimates, implementation plan, functions of government agencies, source of fund, and monitoring plan for each environmental management measure. In order to reach reduction objectives, the methods involved with EIA report and EMP shall be carried out.

1.3 Preparation of EMP
The EMP of Nanhui Conveyor is prepared by the project implementing agency and EIA institute, which emphasizes the cost estimation and organization of EMP of this Project. The EMP submitted to the World Bank approval is jointly prepared by SH PMO and Shanghai Investigation, Design & Research Institute. This EMP is strictly accordance with the laws and regulations of environmental management issued by the State and Shanghai Municipality. This EMP meets EIA requirements of China, as well as requirements of the safeguard policies of the World Bank, i.e. Operational Policy: OP4.01.

EMP information in the general report is from:

(1) Project EIA
(2) Project RAP
(3) Project feasibility study
(4) Project preliminary design

1.4 Design of EMP

The EMP covering the environmental management, environmental supervision and environmental monitoring is a directive document of environmental management of project implementation. The activity plan includes the following three parts:

Environmental impacts and mitigation measures: main environmental impacts during project construction and implementation, engineering measures and management measures adopted to avoid or alleviate adverse impacts;

Environmental management and supervision plan: the environmental supervision plan to ensure environmental protection measures to be taken synchronously with the engineering construction;

Environmental monitoring plan: environmental monitoring activities to eliminate environmental pollutions during construction and operation and ensure safe operation of the project and improvement of environment of project area;

Capacity building (trainings): trainings on knowledge and skills for management
persons, environmental supervision persons, and full-time or part-time management persons of project implementation to ensure the implementation of EMP.

1.5 Technical details of EMP

This EMP covers all environmental management activities carried out during construction and operation, providing action guidance and working framework for implementation of mitigation measures, environmental supervision and environmental monitoring during construction and operation.
2 Laws, Regulations, Policies and Regulatory Frameworks

2.1 Environmental laws and regulations

2.1.1 Introduction

Considering project scale, site, environmental sensitivity, and characteristics and extents of the potential environmental impacts, EIA of this Project will base and involve the following laws, regulations, policies, and standards:

(1) Environmental protection laws and regulations
(2) Pollution prevention and control technical policies
(3) Socioeconomic development and environmental protection plans
(4) Urban master plan
(5) EIA technical guidelines
(6) Environmental quality standards
(7) Pollutant discharge/emission control standards
(8) WB safeguard policies

These laws, regulations and policies form legal and regulatory frameworks for providing guidance to environmental impact assessment. Additionally, this EIA also use the project feasibility study report, preliminary design report and approval documents from government authorities, which reflect and apply these laws, regulations and standards, as the bases for EIA.

2.1.2 Environmental protection laws and regulations

(1) Law of Environmental Protection of PRC, December 1989
(2) Law of Environmental Impact Assessment of PRC, October 2002
(3) Law of Water Pollution Prevention and Control of PRC, February, 2008
(4) Law of Air Pollution Prevention and Control of PRC, April 2000
(5) Law of Environmental Noise Pollution Prevention of PRC, October 1996
(6) Law of Solid Waste Environmental Pollution Control of PRC, December 2004
(7) Law of Water of PRC, January 1988
(9) Regulations on the Administration of Construction Project Environmental Protection, August 1992
(10) Interim Methods for Public Consultation of EIA, February 2006
(12) Implementation Method of Shanghai for the Law of EIA of PRC, May 2004
(13) Regulation of Environmental Protection of Shanghai, October, 2005
(14) Management Methods for Construction Project Environmental Protection of Shanghai, December 1997
(15) Aquatic Environmental Functional Zoning of Shanghai
(16) Ambient Air Quality Functional Zoning of Shanghai
(17) Acoustic Environmental Quality Functional Zoning of Shanghai
(18) Management Methods of Dust Suspension Pollution Control of Shanghai, May 2004
(20) Notice of Stringent Control of Construction Activities during Night to Prevent Environmental Noise Pollution, August, 1995
(21) Requirements on Road and Pipeline Construction and Dust Suspension Prevention of Elevated Road Cleaning of Shanghai, September 2004
(22) Protection Methods for Raw Water Diversion Pipe and Canal of Shanghai, January 1995

2.1.3 Pollution prevention and control technical policies

Guidelines for Industrial Restructuring (2005 version), 2 December, 2005
2.1.4 Socioeconomic development and environmental protection plans

(1) Shanghai Urban Master Plan (1999 to 2020)
(2) Outline of the 11th Five-Year Plan for National Economic and Social Development of Shanghai
(3) Shanghai Land Utilization Master Plan
(4) Shanghai Water Supply Master Plan
(5) Shanghai Environmental Protection and Development Three-Year Action Plan for 2006 to 2008
(6) Shanghai Environmental Protection 11th Five-Year Plan

2.1.5 EIA technical guidelines and criteria

(1) HJ/T2.1-93 EIA Technical Guidelines - General
(2) HJ/T2.2-93 EIA Technical Guidelines – Air Environment
(3) HJ/T2.3-93 EIA Technical Guidelines – Surface Water Environment
(4) HJ/T2.4-1995 EIA Technical Guidelines – Acoustic Environment
(5) HJ/T19-1997 EIA Technical Guidelines – Non-Pollution Ecological Impact

2.1.6 Environmental quality standard

(1) Water environment

In accordance with the Aquatic Environmental Functional Zoning of Shanghai issued by Shanghai EPB in 2004, water bodies to be affected by this Project are Category IV and V waters, and values of relevant standards are listed as in Table 2.1-1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water Temperature (℃)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Man-made water temperature change should be limited to: weekly average increase ≤1 and decrease ≤2</td>
</tr>
</tbody>
</table>

(Unit: mg/L)
2 pH (No unit) 6～9
3 Dissolved Oxygen ≥ 7.5 6 5 3 2
4 Permanganate Index (as CODMn) ≤ 2 4 6 10 15
5 BOD5 ≤ 3 3 4 6 10
6 Ammonia Nitrogen (as NH3-N) ≤ 0.15 0.5 1.0 1.5 2.0
7 Total Phosphorus (as P) ≤ 0.02 0.1 0.2 0.3 0.4
8 Total Nitrogen (for reservoir and lake, as N) ≤ 0.2 0.5 1.0 1.5 2.0
9 Copper ≤ 0.01 1.0 1.0 1.0 1.0
10 Zinc ≤ 0.05 1.0 1.0 2.0 2.0
11 Mercury ≤ 0.00005 0.00005 0.0001 0.001 0.001
12 Lead ≤ 0.01 0.01 0.05 0.05 0.1
13 Volatile Phenol ≤ 0.002 0.002 0.005 0.01 0.1
14 Petroleum Oil ≤ 0.05 0.05 0.05 0.5 1.0
15 Fecal Corliform (Number/L) ≤ 200 2000 10000 20000 40000

(2) Air Environment

In accordance with the Ambient Air Quality Functional Zoning of Shanghai, Class 2 of Ambient Air Quality Standard (GB3095-96) is applied, and the specific limits are given in Table 2.1-2.

Table 2.1-2 Ambient air quality limits (Unit: mg/m³)

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Class 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SO₂</td>
<td>0.06, Annual Average</td>
</tr>
<tr>
<td>2</td>
<td>NO₂</td>
<td>0.08, Annual Average</td>
</tr>
<tr>
<td>3</td>
<td>TSP</td>
<td>0.2, Annual Average</td>
</tr>
<tr>
<td>4</td>
<td>PM₁₀</td>
<td>0.1, Annual Average</td>
</tr>
</tbody>
</table>

(3) Acoustic Environment
In accordance with the regional acoustic environmental functional zoning, areas along pipelines are Category II areas, and which is applicable to the proposed Nanhui North pumping station site. Urban Regional Environmental Noise Zoning Technical Guidelines stipulates that Category IV standards are applied to 50m within road boundary and Category I standards are applied to 50m beyond road boundary when there is road or railway (including light railway) crossing Category I area; Category IV standards are applied to 35m within road boundary and Category II standards are applied to 35m beyond road boundary when there is road or railway (including tramway) crossing Category II area.

In accordance with the above regulations and regional acoustic environmental functional zoning, Category I, II, and IV standards of Urban Regional Environmental Noise Standards (GB3096-93) are applicable to project areas.

<table>
<thead>
<tr>
<th>Category</th>
<th>Daytime</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

### 2.1.7 Pollutant discharge control standards

(1) Wastewater

Class 2 of Shanghai Integrated Wastewater Discharge Standard (DB31/199-1997) is applied to construction period, and Class 3 is applied to operational period.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SS</th>
<th>BOD(_5)</th>
<th>COD</th>
<th>NH(_3)-N</th>
<th>Petroleum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2</td>
<td>150</td>
<td>30</td>
<td>100</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Class 3</td>
<td>350</td>
<td>150</td>
<td>300</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>

(2) Air
Limits to unorganized emission in Integrated Air Pollutant Emission Standard (GB16297-96) are enforced.

**Table 2.1-5 Air pollutant emission limits for new pollution source (Unit: mg/m³) (concentration limits to unorganized emission monitoring)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SO₂</th>
<th>NOₓ</th>
<th>Particulates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Point with Highest Concentration outside Boundary</td>
<td>Point with Highest Concentration outside Boundary</td>
<td>Point with Highest Concentration outside Boundary</td>
</tr>
<tr>
<td>Concentration</td>
<td>0.4</td>
<td>0.12</td>
<td>1.0</td>
</tr>
</tbody>
</table>

(3) Noise

Limits to Noise Level at Construction Site Boundary (GB12523-90) and Standards for Noise Control at Industrial Plant Boundary (GB12348-90) are applied.

**Table 2.1-6 Limits to noise level at construction site boundary (Leq) (Unit: dB(A))**

<table>
<thead>
<tr>
<th>Construction Time</th>
<th>Earthwork</th>
<th>Piling</th>
<th>Structural Engineering</th>
<th>Decoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>75</td>
<td>85</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>Night</td>
<td>55</td>
<td>Prohibited</td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>

**Table 2.1-7 Standards for noise control at industrial plant boundary (Leq) (Unit: dB(A))**

<table>
<thead>
<tr>
<th>Category</th>
<th>Daytime</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>II</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>III</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>IV</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

**2.1.8 WB safeguard policies**

(1) OP/BP 4.01 Environmental Assessment
(2) OP/BP 4.12 Involuntary Resettlement
(3) BP17.50 Information Disclosure
(4) OP 4.11 Physical Cultural Resources
(5) OP/BP 4.04 Natural Habitats
(6) OP 4.37 Safety of Dams
2.1.9 Project related documents

(1) Qingcaosha Water Source Raw Water Project Nanhui Conveyor Works Proposal or Feasibility Study Report, prepared by Shanghai Qingcaosha Raw Water Engineering Company Ltd. and Shanghai Municipal Engineering Design and Research Institute, August 2007

(2) Preliminary Design Report for WB Financed Shanghai APL Phase III Subproject Nanhui Conveyor Works, prepared by Shanghai Qingcaosha Raw Water Engineering Company Ltd. and Shanghai Municipal Engineering Design and Research Institute, April 2008; and

(3) Resettlement Action Plan (RAP) for WB Financed Shanghai Qingcaosha Water Source Raw Water Project Nanhui Conveyor Works and Associated projects, prepared by Shanghai Qingcaosha Investment, Construction and Development Ltd. and Shanghai Institute of Social Sciences, February 2008.

2.2 Environmental agencies and responsibilities

In China the Central Government, provinces, cities and counties have legally established environmental agencies, which are performing relevant environmental regulatory responsibilities. Environmental authorities related to this Project include Ministry of Environmental Protection, Shanghai Environmental Protection Bureau, and EPBs of Districts.

(1) Ministry of Environmental Protection (MEP)

In March 2008, the State Environmental Protection Administration (SEPA) was upgraded to the Ministry of Environmental Protection, responsible for country-wide environmental protection administration and regulatory enforcement. Major responsibilities of MEP include: developing national environmental protection guidelines, policies, regulations and planning, and administrative regulations; supervising on natural resource development and utilization activities that have ecological environmental impacts, major ecological environment building and
ecological damage restoration; supervise and inspect environmental protection performance of various types of natural reserves and scenic spots, and forest park; monitor and inspect biodiversity protection, wild animal and plant life protection, wetland environment protection, and desert prevention; supervising over national-level natural reserves; guiding and coordinating to address major environmental issues involving multiple jurisdictions and river basins; developing and organizing implementation of various environmental regulations; reviewing and approving EIAs of construction projects; providing guidance to urban and rural environmental rehabilitation; taking responsibilities for rural ecological environmental protection; managing international cooperation and communication in environmental protection; participating and coordinating important international environmental protection activities; managing and coordinating performance in following international environmental protection treaties, and liaising with external agencies; managing external economic cooperation of environmental protection system; coordinating foreign fund utilization associated with performing international treaties; taking responsibility for international environmental affairs as trusted by the State Council; and being responsible for liaison with international environmental organizations.

EIA Department is established under MEP, dedicatedly responsible for administration of environmental impact assessment. Major responsibilities of EIA Department include: developing environmental policies and regulations for EIA and “Three Synchronies” and organizing implementation; undertaking EIAs of major economic and technical policies, development planning and economic development plan; developing regulatory classification for EIA; and reviewing and approving EIA reports of major development and construction projects.

(2) Shanghai Environmental Protection Bureau (SEPB)
Shanghai EPB is responsible for environmental administration and regulatory enforcement. Major responsibilities of SEPB include: (a) enforcing environmental
protection guidelines, policies, laws, and regulations; reviewing and developing relevant local environmental laws and regulations and policies, and organizing enforcement; (b) reviewing and developing environmental development strategy of the city; preparing medium and long term environmental protection planning and annual plan, and organizing implementation; participating in developing national economic and social development planning, land planning, regional/county planning, and urban master plan; organizing preparation of environmental functional zoning; preparing city-wide total pollutant mass control plan and abatement plan; coordinating settlement of major environmental issues; (c) supervising over prevention and control of air, water, soil, noise, radioactivity, solid waste, toxic chemical and vehicle pollution; assisting with improvement of energy utilization restructuring; and controlling of sea pollution from land pollutants and coastal construction projects; (d) supervising over natural resource development and utilization activities, major ecological environmental building and damage restoration activities, which have impacts to ecological environment; monitoring environmental protection performance in natural reserves, scenic spots, and forest parks; monitoring protection of biodiversity, wild animal and plant, and wetland; managing environmental safety of biological technologies; responsible for rural ecological environmental protection, and providing guidance to ecological demonstration zone and ecological agriculture building; (e) investigating and settling major environmental pollution accidents and ecological damage incidents; assisting with settlement of trans-regional environmental pollution disputes and relevant external environmental disputes; environmental supervision and administrative inspection; work jointly with concerned agencies in management of pollution source treatment fund; organizing environmental regulatory inspection in the entire city; (f) developing city environmental quality standards, pollutant discharge standards, and total mass control standards; organizing preparation of city environmental quality report; issuing city environmental condition report and quality forecast of air environment; (g) organizing enforcement of pollutant discharge application and registration, industrial
permitting, pollution charges and environmental impact assessment for supervision of various pollutant discharge; reviewing and approving EIAs, as authorized, of citywide development and construction project, technical innovation project, coastal construction project, and river-basin and regional development project; (h) in charge of environmental monitoring, statistics, and information; developing environmental monitoring requirements and criteria; organizing establishment and management of city environmental monitoring networks and environmental information networks; organizing environmental quality monitoring and pollution source monitoring for supervision purpose; reviewing of EIA qualification; (i) working together with other concerned agencies to organize environmental technology innovation, scientific research and technical demonstration project; working jointly with other concerned agencies in management of environmental certification implementation; guiding and promote development of environmental protection industry; (j) taking responsibility for citywide international and regional cooperation and communication in environmental protection; organizing and coordinating compliance with international environmental treaties in the entire city; participating and coordinating international economic cooperation and foreign fund project in environmental protection; encouraging public and NGO to participate in environmental protection; handling international environmental protection affairs as trusted by the municipal government; (k) supervising and managing radiation environment, radioactive waste and nuclear radiation safety; emergency response to radiation environment and nuclear accident; integrated supervision and management of pollution prevention associated with electromagnetic radiation and nuclear technology application; and (l) settlement of administrative reconsideration and litigation.

The Supervision and Management Department is established within SEPB, responsible for environmental management associated with citywide planning, plan, construction projects, and pollution treatment of industrial zone lower than city-level, supervision over EIA agencies, responsible for review and approval of EIA reports of
construction projects within municipal jurisdiction and as trusted by the Central Government and “Three Synchronies” completion acceptance and review, investigation and settlement of radiation environment emergency response, and also responsible for provision of supervision and guidance to district/county EPBs in project review and approval.

International Cooperation Department is also set up under SEPB, responsibilities of which include preparation of international cooperation plan and implementation organization, coordination of international environmental cooperation projects, coordination of compliance with international environmental treaties in the entire city, international communication, and cooperation and communication with friendly cities in environmental protection.

(3) District EPBs

District (Pudong New District and Nanhui District) EPB is responsible for district environmental protection administration and administrative enforcement. Major responsibilities of district EPB include: (a) enforcing national and city environmental guidelines, policies, laws and regulations; reviewing and developing internal environmental projection regulations and policies, developing district pollution control methodology and methods and organizing and supervising on implementation; (b) preparing medium and long term environmental protection planning and annual plan, and organizing implementation; management of environmental statistics and information within jurisdiction; participating in developing economic and social development planning, land development and rehabilitation planning, and regional economic development planning; participating in review of environmental protection associated with new urban area building, development zone and urban area improvement; (c) supervising on waste gas, wastewater, noise, radiation, solid waste, toxic and hazardous chemical and vehicle pollution control in jurisdiction; supervising on compliance with List of Prohibited (or strictly control) Polluting Project and List of
Toxic and Hazardous Chemical for Priority Control issued by the Government; management of chemicals; environmental protection associated with wastewater collection and discharge to sea and pollution; (d) natural environment protection, supervision on resource development activities that have ecological environmental impacts; rural ecological environmental protection, and guidance to ecological demonstration zone and ecological agriculture building; (e) enforcement of pollutant discharge application and registration, discharge permitting, pollution charges, EIA, Three Synchronies, and time-bound pollution treatment; review of EIA reports or forms of district development and construction projects, technical innovation, and regional development and construction projects; (f) coordination of accountability for environmental protection targets and quantitative evaluation of urban environmental rehabilitation; (g) environmental monitoring; supervise on implementation of environmental monitoring regulations; providing guidance to environmental monitoring networks; providing guidance to quality certification of environmental monitoring station and quality assurance; (h) organizing regional environmental quality survey, investigating and settling major environmental pollution accidents and ecological damage incidents; handling environmental protection proposal raised by district People’s Congress and Political Consultative Conference and relevant mails and visits of the public; organizing regulatory enforcement inspection of environmental protection in the district; (i) supervising over enforcement of national and local environmental standards and technical criteria; working with other concerned agencies in organizing environmental protection technical innovation and demonstration projects; guiding and promoting development of environmental industry; (j) cooperation and communication on environmental protection; participate in coordination of foreign fund projects; introduction of new environmental protection technologies and processes; organization of quality monitoring of environmental protection equipment; (k) environmental protection publication, education and training of environmental laws and regulations; assistance with concerned agencies in environmental education and dissemination; and
(1) presence when there is administrative litigation.

A supervision department is also set in district EPB, dedicatedly responsible for environmental supervision on pollution control of reserved industrial zones within jurisdiction, review and approval of EIAs of construction projects within district jurisdiction and as trusted by the City, review and acceptance of “Three Synchronies” and participation in engineering acceptance of construction projects, and consultation of environmental laws, regulations and policies.
3 Project Description and Analysis

3.1 Project name

WB financed Nanhui Conveyor Project.

3.2 The proposed project location

The proposed Nanhui Conveyor Project will be located in Pudong New District and Nanhui District of Shanghai.

The proposed project works consist of water transmission pipelines and booster pumping stations. The water transmission pipelines are aligned along Jinhai pumping station – Huadong Road – Chuansha pumping station; Jinhai pumping station – Huadong Road – Longdong Road – Binzhou Road – A20 Road – A2 Highway – Zouzhu Road – Nanhui North pumping station – Hangtou Water Treatment Plant (Huinan New WTP). The booster pumping station is Nanhui North pumping station.

The project location map is shown in Figure 3.2-1.
3.3 Project implementation agency

Implementation Agency of this Project is Shanghai Qingcaosha Investment, Construction and Development Ltd.

3.4 Project scale and objective

3.4.1 Scale and objective of the whole project

According to the approved Qingcaosha Raw Water Projects Overall Plan, water supply capacity of this proposed project will be 7.19 million m³/day by 2020, of which 0.11 m³/d for Changxing WTP located at Changxing Island and 7.08 for several inland WTPs via Yangtze River crossing pipelines.
3.4.2 Scale and objective of Nanhui Conveyor works

According to Inland System Plan for Qingcaosha Water Source Raw Water Project and its approval, Nanhui Conveyor is located downstream of inland transmission system towards Jinhai, Chuansha and Nanhui transmission systems. Water supply capacity of Nanhui Conveyor is 1.28 million m³/d, and service scope covers Chuansha WTP in Pudong New District and all WTPs in Nanhui District and Lingang New Town. The raw water is conveyed from Wuhaogou pumping station to Jinhai pumping station and then 0.2 million m³/d is lifted to Chuansha WTP, and 1.08 million m³/d is pumped to downstream Nanhui North pumping station. 0.2 million m³/d is transferred from Nanhui North pumping station to Nanhui North New WTP, and the remaining 0.88 million m³/day to downstream Hangtou WTP, Huinan WTP, and Huinan New WTP.

Nanhui Conveyor is mostly utilized for water transmission to Chuansha and Nanhui direction, and the receiving WTPs are Chuansha, Nanhui North, Hangtou, Huinan, and Huinan New WTPs. The targeted water supply is:

<table>
<thead>
<tr>
<th>Name of WTP</th>
<th>Design Capacity (10,000 m³/d)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuansha WTP</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Nanhui North New WTP</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Hangtou WTP</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Huinan WTP</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Huinan New WTP</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>128</strong></td>
<td></td>
</tr>
</tbody>
</table>

3.5 Project scope and function

In accordance with Qingcaosha Water Source Raw Water Project Overall Plan and Qingcaosha Water Source Raw Water Project packaging approved by Shanghai Water Authority in August 2006, Nanhui Conveyor is a section of inland water transmission system, downstream of Jinhai, Chuansha and Nanhui sub-systems, starting from Jinhai pumping station at end of Jinhai Conveyor.
As one of the major components of Qingcaosha Water Source Raw Water works, Nanhui Conveyor undertakes raw water transmission to Chuansha, Nanhui North New, Huinan, Hangtou, and Huinan New WTPs. Project scope covers transmission pipelines and booster pumping stations from Jinhai pumping station to the existing Chuansha WTP, Hangtou WTP, Huinan WTP, and the proposed Nanhui North New WTP and Huinan New WTP.

The overall alignment plan of Qingcaosha Water Source Raw Water Works and the location and scope of Nanhui Conveyor are shown in Figure 3.5-1.
Figure 3.5-1 Overall Plan of Qingcaosha Water Source Raw Water Works and Location of Nanhui Conveyor Works
3.6 Major project components

This project includes construction of water transmission pipelines and one booster pumping station.

(1) Transmission pipelines (in five parts): from Jinhai pumping station to Nanhui North pumping station, two DN2000 steel pipes laid by pipe-jacking of 18.35km in length; from Gaoke East Road to Chuansha WTP (Chuansha branch): two ductile iron pipelines are laid in parallel for 1.43km long by opening excavation method, and then changed to two parallel DN1000 steel pipelines laid by pipe-jacking method 0.49km long to Chuansha WTP; from Nanhui North pumping station to the intersection of A2 road and Dazhi River north bank: two parallel DN1800 steel pipelines to be laid by pipe-jacking method, 10.8km long; from the intersection of A2 road and Dazhi River north bank to Huinan WTP: two parallel DN1800 steel pipelines, laid by pipe-jacking method, 7.34km long; from the intersection of A2 road and Dazhi River north bank to Hangtou WTP: one DN1600 steel pipeline, laid by pipe-jacking, 7.24km long. Total length of the transmission route is 45.7km, and total pipeline length is 88.4km

(2) Nanhui North booster pumping station with design capacity of 1.08 million m³/day and 2.4ha land occupation.

3.7 Main construction plan

Open excavation and pipe jacking methods are applied for pipeline laying of this Project.

(1) Open excavation

For Chuansha Conveyor section of this Project (East Gaoke Road to Chuansha WTP), construction along Huadong Road (south to East Gaoke Road) is ongoing and the green belt is remaining. Two parallel ductile iron pipelines (1.43km) will be laid by open excavation. In populated areas south to Beijie River, pipe jacking method is
applied to lay two parallel DN1000 steel pipelines of 0.49km to Chuansha WTP.

(2) Pipe jacking

Open excavation is adopted only for 1.43km pipelines of Chuansha Conveyor, and pipe jacking is used for all the other pipelines.

3.7.1 Open excavation

About 1.4km of Jinhai pumping station to Chuansha WTP pipelines (East Zhonghua Road East Gaoke Road to south of Beijie River) will be laid by open excavation.

(1) Construction working face is at one side of the pipelines. Pipeline construction is conducted by segment construction. All excessive soil should be hauled outside the site. The soil for backfill purpose can be temporarily stored by the finished pipelines, but the earth pile should not be higher 2.0m, and the soil cannot be piled above the laid pipelines.

(2) Spigot and socket cast iron pipe is used.

(3) Pipe bottom is generally located in the 2nd silty clay blanket or 3rd slime and silty clay blanket.

(4) Where depth of open excavation is within 4m, sloping surface with gradient of 1:1.2 is adopted and well point dewatering is used. Where excavation depth ranges from 4m to 6m, combination of sloping surface, steel sheet pile and inside spider as supporting structure is adopted with well point dewatering. Where excavation depth is more than 6m or environmental condition requires not use of steel sheet pile or outside dewatering, shaped steel Soil-cement Mixed Wall (SMW) retaining structure plus inside spider are adopted.

(5) The pipe size is DN1000 and the earth covering is 1.6 to 6.5 m. In considering the poor bearing capacity of the foundation and water and soil loss due to penetration and leakage of adjacent pipelines, reinforced concrete foundation is adopted to reduce uneven settlement of the pipelines.
(6) Generally foundation treatment is not considered. In case of local mud or blind ditch, graded sand is backfilled after mud or blind ditch is removed. Large area or thick soft soil should be treated by rubble filling to remove mud.

### 3.7.2 Piping jacking

Generally pipe jacking is adopted for all the pipelines, and total pipe jacking length is approximately 44.3km.

(1) Pipe jacking methods

There are two pipe jacking methods, mud water impelling method, cutting-edge impelling method. Mud water impelling method is adopted for this project.

Mud water impelling method: cutting head and impelling speed is utilized to balance frontal soil pressure, and circulating water pressure is adjusted to balance groundwater pressure. Liquid is utilized to transport soil cut and loaded into silo. Continuous impelling process means high speed of construction. Territoriality improvement or dewatering treatment is not needed and there is little surface settlement after construction. The construction process is shown in Figure 3.7-1.

![Figure 3.7-1 Muddy water impelling method](image-url)
(2) Working shaft and receiving shaft

Exterior protected construction is adopted for working shaft and receiving shaft in pipe jacking. Shaped steel SMW retaining structure or drill caisson pile plus pressure injection pile is adopted based on depth of foundation ditch. Process manholes are built in the foundation ditch after pipe jacking is finished.

(3) Depth of pipe jacking

Usually soil covering for pipe jacking is not less than twice of the pipe size and not less than 1.5m; soil covering in case of river crossing should meet needs for anti-floatation, and generally not less than 1.25 times of pipe size and not less than 3m. The depth should be properly increased when pipe jacking crosses major structures. Depth of pipe jacking should be considered to avoid area with significant change of soil hardness.

(4) Pipe jacking spacing

The existing buildings and structures should be avoided for pipe jacking and the net distance with the existing structures should be not less than the pipe size (external diameter). Where more than one pipes are impelled in parallel, the longitudinal separation of the adjacent pipes should be more than 50m to eliminate interference during construction.

(5) Once impelling distance of pipe jacking

Once impelling distance of DN2000 steel pipe is controlled under 950m, DN1800 steel pipe under 800m, DN1600 steel pipe under 700m, and DN1000 under 180m. This requirement can be adjusted based on actual construction condition.

3.8 Quantities

Quantities of this Project are those for Nanhui Conveyor and pumping station.

(1) Water Transmission Pipelines
Table 3.8-1 Quantities of water transmission pipelines

<table>
<thead>
<tr>
<th>Section</th>
<th>Pipe Size (mm)</th>
<th>Material</th>
<th>Pipe-Jacking (km)</th>
<th>Manhole (Unit)</th>
<th>Collection Tank (Unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jinhai –Nanhui North</td>
<td>2000</td>
<td>Steel</td>
<td>18.35×2</td>
<td>26</td>
<td>17</td>
</tr>
<tr>
<td>Nanhui North-Huinan</td>
<td>1800</td>
<td>Steel</td>
<td>18.14×2</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>North Nanhui-Hangtou</td>
<td>1600</td>
<td>Steel</td>
<td></td>
<td>11.59</td>
<td></td>
</tr>
<tr>
<td>Chuansha Conveyor</td>
<td>1000</td>
<td>Steel</td>
<td>0.49×2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>Ductile Iron</td>
<td>1.43×2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>88.4</td>
<td></td>
<td></td>
<td>49</td>
<td>37</td>
</tr>
</tbody>
</table>

(2) Booster pumping station

Table 3.8-2 Quantities of pumping station

<table>
<thead>
<tr>
<th>Name</th>
<th>Capacity (10,000m³/d )</th>
<th>Land Area (ha)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nanhui North Pumping station</td>
<td>20</td>
<td>2.42</td>
<td>To North Nanhui New WTP</td>
</tr>
</tbody>
</table>

3.9 Cost estimate and implementation plan

Based on preliminary design report, the total investment of this Project is about 24.9015 billion RMB. This project will commence in October 2008, and complete in March 2010. Meanwhile, this Project will move into commissioning and operation stage in coordination with overall progress of the Qingcaosha raw water works.
4 Summary of Environmental Impact and Environmental Protection Measures

4.1 Environmental Impacts and mitigation measures during construction

4.1.1 Acoustic environmental impact and mitigation measures

4.1.1.1 Acoustic environmental impacts during construction

(1) Pipeline construction

Noise sources during pipeline construction are construction machinery and transportation vehicles. According to the requirements of noise control at construction sites, the average noise level dB(A) 100m away from construction equipment can meet the standards of Limits to Noise Level at Construction Site Boundary (GB12523-90) during daytime for all the equipment, while 300m is required between construction equipment and the site boundary to meet standard limit.

(2) Pumping station construction

According to the requirements of noise control at construction sites, distance of 60 meters away from construction equipment is needed during daytime to meet noise level limit (dB (A)) specified in Limits to Noise Level at Construction Site Boundary (GB12523-90), and 300 meters between construction equipment and site boundary is needed to meet noise limit during night. The proposed Nanhu North pumping station is located at Qigan Village of Zhoupur Town in Nanhu District, acoustic sensitive points around which are residential areas east and north to the pumping station, residential areas in the south of the station opposite to Zhouzhu Road. These points are close to the construction site, so construction activities during daytime and night will have certain impacts to acoustic environment of this area and life of the residents.
(3) Impacts on acoustical environmental sensitive points

Acoustical environmental sensitive points in project area are mostly residential areas along the pipelines and around pump station. Currently, due to impacts of traffic noise to these sensitive points, local acoustical environmental quality cannot meet Urban Local Environmental Noise Standard for Class II area. Given impact of traffic noise, incremental noise level contributed by pipeline construction during daytime is insignificant. However, impact of construction noise is significant during night due to reduction of traffic, therefore, effective mitigation measures should be taken to decrease construction noise. The front row buildings of sensitive point is affected most by construction noise, while impact of construction noise to other buildings will be significantly reduced after blocking by the front row buildings and decrease with the distance.

4.1.1.2 Mitigation measures of acoustical environmental impacts

In accordance with the Law of Environmental Noise Pollution Prevention of PRC, this Project shall meet Limits to Noise Level at Construction Site Boundary. Information including project name, construction location and period, potential environmental noise level and prevention and mitigation measures to be taken should be reported to Pudong District and Nanhui District EPBs five days before construction commencement.

Construction noise is the major impact to surrounding environment during construction. Therefore, attention should be paid during construction. Since this Project has many acoustically sensitive points that are adjacent to construction site, the following measures shall be taken to minimize potential impacts:

(1) During construction, noisy machines like excavator, air pick and churn drill should be located far away from residential areas and should be well maintained periodically and properly operated. In sensitive residential areas such as No. 3 Xijiazhai, No.8 Dingfei New Village, No.11 Tangrenyuan, No. 13 Haojiazhai, No. 16 Gejiazhai,
No. 17 Lingjiazhai, No.20 Panjiazhai, No. 21 Chujiazhai, No. 22 Chenjiazhai, No.25 Qigancun Lingjiazai, enclosures must be used for closed construction. When construction is carried out at No. 16 Gejiazhai, No. 20 Panjiazhai and No. 25 Qigancun Lingjiazhai, temporary sound insulated screen barriers should be used around noisy machines like excavator, air pick and churn drill. Construction activities during night should be prohibited at above noise sensitive points to mitigate impacts of construction to residential areas.

(2) Construction time should be reasonably scheduled and scientific construction plan should be developed. Use of lots of noisy machines near sensitive points like residential area at the same time should be avoided, and use of equipment that has high noise level, strong impact and vibration should be arranged in daytime. Around all 25 noise sensitive points, construction activities that generate noise pollution should be strictly prohibited during night. Construction activities during 22:00pm-6:00am should be applied to local EPB and get prior approval, meanwhile public notice should be made to nearby residents to strengthen consultation and communication with these residents and mitigate noise impact to residents.

(3) Contractor should strictly follow requirements specified in Limits to Noise Level at Construction Site Boundary (GB 12523-90) and Regulations on Construction Machinery Management of Shanghai to ensure proper maintenance of construction equipment, timely repair in case of failure, proper lubrication and fastening of parts in order to reduce operational vibration and noise. Construction machinery should be improved. Whole equipment should be firmly placed and well fit to the ground, and damping stand should be used where available. Construction management should be strengthened and proper construction procedures should be followed to avoid other noises caused by improper maintenance of construction machines during operation.

(4) Construction vehicle noise is one of the major environmental impacts introduced by this Project. Transportation route and schedule should be reasonably
arranged for construction vehicles. Vehicles in compliance with Allowable Noise Standard for Vehicles (GB1495-79) should be selected and machinery and vehicles that are not in compliance with national noise control standards should not be allowed to enter construction site. Construction vehicles should be strictly controlled including prohibition of horn, driving within speed limit and following of good practice to reduce traffic during night (22:00 to 6:00) so as to reduce local traffic noise.

(5) Construction plan should be optimized to develop reasonable implementation schedule to minimize impacts of construction noise. During tendering process, measures for environmental noise pollution reduction should be included in design documents and should be specified in the contract.

(6) Use of commercial concrete is recommended and concrete mixer is not installed on construction site.

(7) Personal protection should be strengthened. Noise protection equipment like earplug, earpiece and helmet can be provided to construction workers working by noisy equipment.

(8) In accordance with Notice of Environmental Noise Pollution Supervision and Management during University Entrance Exam issued by SEPA on 26 April 1998, construction noise sources should be under stringent control during exam period and half month before the entrance exam in accordance with relevant national environmental noise standards to prohibit construction activities that violate noise standards and have impacts to residents.

(9) Construction supervisor should enhance daily supervision and monitoring on construction site. Contractor should equip with noise monitoring instrument (about 4 sets) to monitor the acoustic environmental quality in residential sensitive points. If the construction noise still have great impact on environmental sensitive points like residential areas, investigations should be carried out and relevant measures should be taken accordingly. Temporary sound insulated screen barriers should be installed when
necessary to ensure construction noise to meet standards.

4.1.2 Water environmental impacts and mitigation measures

4.1.2.1 Water environmental impacts

(1) Pipeline construction

Pipe jacking is adopted through the pipeline route. Wet impelling method is used for pipe jacking, which will generate large amount of muddy wastewater with high SS concentration. Uncontrolled discharge of untreated wastewater to water body or nearby municipal sewers will pollute water body or block municipal sewers and consequently affect function of other parts of municipal sewers.

(2) Pumping station construction

During construction, site cleaning, concrete mixing and installation will generate certain amount of wastewater. Additionally, large amount construction workers during construction will generate domestic sewage. Discharge of construction wastewater is small in quantities and major pollutants are suspended solids and oil. Wastewater sedimentation tank will be built at the construction site to collect various production discharges. Wastewater will be reused for cleaning purpose after treatment. No wastewater will be discharged to surface water body.

Additionally, large amount construction workers during construction will generate domestic sewage. Uncontrolled wastewater and sewage discharge will pollute water body around construction site to different extents.

(3) Pressure test and pipe cleaning

Based on operation performance of existing Shanghai raw water works, it is estimated that wastewater from pressure test and pipe cleaning will be approximately 400,000m³. Raw water of the proposed Qingcaosha Reservoir will be used for pressure test and pipe cleaning without use of any additives. After completion of Qingcaosha Reservoir, the hydraulic model indicates that retention time in the reservoir during
normal operation will be around 16 to 20 days. After natural sedimentation of the silts, water quality will be further improved and can meet Category II standard. Monitoring information of Chenhang Reservoir and associated WTPs indicates that SS concentration of Yangtze River raw water can decrease to 70 to 80mg/L after 5 to 6 days of retention in the reservoir, and can further decrease over time. Given large quantities of pressure test and pipe cleaning water, generally the remaining soil on the pipe wall will not have significant impact to pipe cleaning water due to dilution, therefore, direct discharge of pressure test and pipe cleaning wastewater will not have significant impact to water environment of the receiving waters.

4.1.2.2 Mitigation measures of water environmental impact

(1) Mitigation measures of construction wastewater from pipe jacking

Based on locations of construction sites and wastewater discharges, total 86 wastewater collection and treatment systems will be built near pipe-jacking construction sites. Treated wastewater will be conveyed to nearby rivers or municipal sewers after treated to meet Class II discharge standards.

(2) Mitigation measures of construction wastewater from pumping station

The main pollutants of construction wastewater from pumping station are suspended solid and petroleum oil. The wastewater cannot be discharged into river course or municipal sewers before treated treatment. The treatment processes of wastewater from pumping station and pipe jacking are same.

On-site wastewater treatment facility should be built at the locations with massive wastewater. Wastewater is collected through pipes or ditches and discharged to nearby rivers or municipal sewers after treated.

(3) mitigation measures of sewerage from construction workers

Workers for pipeline construction should use existing domestic facilities near the construction site as much as possible. In places without sanitary facilities, mobile toilets or closed toilets are used to collect domestic sewage and transported periodically by environmental sanitation department. Oil separation tank is necessary for treatment of
oily wastewater from construction worker canteen, and the treated wastewater will be discharged to municipal sewers.

4. Management measures

(i) Muddy water or other kinds of wastewater cannot be discharged without sedimentation treatment. Management requirements should be specified for control of large amount of muddy water generated during construction, and direct discharge to water body is prohibited. Washing water and storm water runoff should be collected in open ditches and discharged after treated.

(ii) Groundwater seepage caused by excavation should be collected and discharged in a timely manner to avoid impacts to construction activities and surrounding environment.

(iii) In order to avoid loss of temporarily stored construction material due to storm water flushing, 50cm high retaining wall shall be built with bricks around the storage site as temporary protection measures.

(iv) Attention should be paid to site cleaning, timely maintenance and repair of construction machines to avoid leakage of engine oil. In case of leakage, measures should be taken in a timely manner for collection in separate container and proper treatment.

(v) Construction materials, such as oil and chemicals, are not allowed to be stored adjacent to river. Storage of such material should be far away from rivers and canvas should be available for temporary covering to avoid entering into water body caused by heavy rain.

(vi) More stringent management of wastewater treatment system is required to periodically monitor wastewater quality at the outlet. Sediments and oil from separation tank should be transported for disposal and cannot be dumped.

(vii) Education of construction staff should be strengthened to ensure implementation of operation procedures so as to avoid or reduce pollution accidents.
4.1.3 Air environmental impacts and mitigation measures

4.1.3.1 Air environmental impacts

Dust suspension on construction site is mostly from transportation vehicles, which approximately contributes 60% of the total dust suspension. Generally, affected scope of dust suspension caused by natural wind on construction site and along construction road is within 100 meters. The quantity of dust will increase and scope affected will expand to some extend in windy days. Improper covering of wasted soil, sand and lime on the storage site or spill during loading, unloading and transportation will also cause dust suspension, affected scope of which is within 100 meters.

Based on identification of environmental protection targets and screening results, distance between the proposed construction site and residential area is 10 to 100 meters. Therefore, dust suspension during construction will have environmental impact.

4.1.3.2 Mitigation measures of air environmental impacts

Dust suspension and waste gas are major impacts to surrounding environment and environmental sensitive points during construction, which will cause some local adverse impacts to nearby areas and life of residents. In order to reduce impacts to environmental sensitive points and regional ambient air quality during construction, the following measures should be taken to meet Shanghai Management Methods for Dust Suspension Pollution Control and Requirements for Dust Control during Pipeline Construction and Elevated Road Cleaning in Shanghai.

(1) As stipulated in items 8, 9, 10 and 11 of Shanghai Management Methods for Dust Suspension Pollution Control, the contractor shall develop dust suspension control plan, establish responsibility allocation system and records, assign dedicated persons for management of construction site dust suspension control. Dust suspension pollution control plan should be submitted to Pudong District Municipal Administration for record three days before construction commencement and this plan should be posted on a place that can be easily seen before construction commencement until end of the
construction.

(2) In conjunction with noise prevention measures, simple sound barriers should be installed around construction site to separate construction site and surrounding environment so as to reduce adverse impacts of waste gas to surrounding environment. Usually height of the barrier is 2.5 to 3 meters.

(3) Management of construction site should be strengthened by the contractor. Construction material (mostly yellow sand and crushed stone) should be stored on designated location and appropriate dust prevention measures should be taken. Excavated soil should be stored together to minimize affected scope, and should be backfilled or transported in a timely manner to shorten period affected. Soil generated during construction should be hauled for disposal in a timely manner. In case soil storage on site is longer than 48 hours or stored for later backfill purpose, temporary storage site should be built within construction site, for which barrier should be set and other dust control measures, such as water spraying and covering, should be taken to reduce water loss and soil erosion.

(4) Full time workers should be assigned at construction site for site cleaning. One person should be arranged for each shift to spray water to clean the construction site and surface of transportation road. Times of water spraying should be determined based on weather condition. Usually one time should be done for rush hours of 7:30am - 9:00am and 16:30 - 19:00, and noon time 12:00-13:00, and once every two hours should be done in clear summer days and when wind speed is higher than Class 5. Measures such as water spraying should be taken during earth excavation, loading and dumping to prevent dust suspension. The contractor should spray water to surface of backfilled working shaft and implement planting shortly after construction to prevent dust pollution.

(5) Construction management should be strengthened. Transportation route should be appropriately arranged to avoid residential area, and speed of transportation vehicles should be controlled, especially in residential area. Solid waste, wasted soil, and sand
and stone transportation vehicles should obtain Shanghai Wasted Soil and Sand/Stone Transportation Permit, and should be closed to prevent spill and leakage along the transportation route. Good transportation management and loading/unloading practices should be adopted.

(6) Vehicle cleaning facilities and associated wastewater and muddy water sedimentation facilities should be built on construction site. Transportation vehicles should be cleaned before leave construction site. After unloading, carriage of transportation vehicle should be washed. Types of transportation and other kinds of vehicles should be washed before leave the construction site. Loading quality of transportation vehicles should be checked.

(7) Maintenance of construction machines and transportation vehicles should be improved. Construction machinery and vehicles that are not in compliance with national waste gas emission standard are prohibited to enter the construction site and overloaded operation of construction machines that use diesel fuel is forbidden to reduce fume intensity and particulate emission. Assistance with concerned agencies should be provided for traffic management of surrounding roads during construction to avoid traffic congestion caused by construction activities and reduce resulting idling waste gas emission.

(8) Dust and pollutants from fuel oil combustion are harmful to health, therefore, labor protection measures should be taken for affected construction workers, for example wearing dust prevention mask and helmet.

(9) Environmental education for construction workers should be strengthened to increase environmental awareness of all construction staff to reduce air pollution during construction by good construction performance.

4.1.4 Solid waste environmental impact and mitigation measures

4.1.4.1 Environmental impacts of solid waste

Solid wastes generated during construction include soil and crushed stone from
excavation, settled grits of muddy water generated during pipe jacking, spill of sand and stone and concrete during transportation.

Impacts of solid wastes during construction include:

(a) Overloaded vehicles may cause soil spill along transportation route. Dirty wheels may pollute transportation road. Dust suspension in clear days and muddy road in rainy days will affect access of people and vehicles and environmental quality.

(b) Lack of designated waste soil disposal site or uncontrolled dumping will affect land use and river flow and will damage natural and ecological environment.

(c) Waste soil transportation requires lots of vehicles, so transportation during daytime will affect local traffic and result in traffic congestion.

4.1.4.2 Mitigation measures of environmental impacts of solid waste

Shanghai Management Regulations on Construction Solid Wastes and Waste Soil Disposal (Amended) stipulates “implementation agency or contractor that generates construction solid wastes and/or debris should, five days before construction commencement, submit information of generation of construction solid waste and debris and disposal plan to municipal solid waste administration or district/county environmental sanitation agency. This plan should include actual categories of construction solid wastes, quantities, transportation routes and disposal location. Implementation agency or contractor should sign a performance agreement with solid waste administration”. Considering construction characteristics of this Project, the following control measures are recommended:

(1) Once the contractor is determined, the contractor will sign agreement with the solid waste administration. Information of solid waste generation and disposal plan should be submitted to Pudong District and Nanhui District solid waste administrations, five days before construction starts. This information should include categories of construction solid wastes, quantities, transportation routes and disposal location. The contractor should sign performance agreement with solid waste administration.

(2) Wasted soil should be reused as much as possible and properly treated to be
reduced in quantity and/or volume and non-hazardous. If there are other construction sites in the city, municipal construction agency and environmental sanitation agency should be consulted for priority reuse of the wasted soil for foundation backfill on other municipal infrastructure sites. When on-site disposal is inadequate for all the wasted soil, the excessive wasted soil should be hauled outside the urban area for proper storage.

(3) The implementation agency and contractor should obtain disposal permit issued by solid waste administration and then trust solid waste transportation to professional service provider.

(4) Solid wastes on construction site should be collected in a timely manner by the contractor or transportation service provider. It is not allowed to occupy the road for storage of wasted soil and construction debris. Timely collection and transportation of sludge generated by construction wastewater treatment system is also required. Construction site cleaning and solid waste treatment and disposal should be well done and it is required no solid wastes be left on construction site before end of construction.

(5) When construction site is close to river course, dumping of various solid wastes to river should be prohibited, and meanwhile uncontrolled entering of various solid wastes into the river should be avoided. For solid wastes entered into the river, especially floating material that cannot settle in short period, the contractor should do their best to collect.

(6) With respect to domestic solid waste management, garbage bins should be placed in different units of the construction site, and solid wastes should be collected by category to avoid mixture of garbage and construction solid wastes. Domestic garbage should be periodically transported by environmental sanitation agency to prevent entering into nearby river with surface runoff caused by storm water flushing.

(7) Education and management for temporarily employed workers should be strengthened to avoid littering of garbage and ensure centralized disposal of night soil and domestic garbage.
4.1.5 Impacts on ecological environment and mitigation measures

4.1.5.1 Impacts on ecological environment

(1) Impacts of soil erosion

Project construction may damage original vegetation, change hydraulic condition of existing surface water, weaken erosion-resisting capacity of surface soil, and increase surface runoff and flushing intensity. Soil erosion due to construction will cause certain damage if no timely and reasonable prevention and protection measures are taken.

(2) Impacts of land occupation

Pipeline construction will need temporary land acquisition. Stringent measures should be taken during construction on temporarily occupied land to protect surface soil and avoid irrecoverable impact.

Pumping station construction requires permanent land acquisition. First, removing of crops and sod will decrease vegetation coverage, which may cause small quantities of soil loss. Second, excavation and backfill will change soil structure, decrease soil curing degree, affect soil productivity in secondary reclamation, but will not affect land use pattern. Since the land permanently acquired for pump station construction is mostly farmland, farmland allocated to farmers will be reduced.

4.1.5.2 Measures of ecological environmental protection

(1) Principles of focusing on prevention and priority of protection will be used to guide design, construction and environmental management and to incorporate ecological environmental protection to project design, in order to minimize adverse impacts of project construction to vegetation and ecological environment along the pipelines.

(2) Project design and alignment of pipelines should be optimized for least temporary land acquisition and for less damage to vegetation. Sod or trees on the occupied land should be transplanted to other places and damage should be avoided.

(3) When constructing working shaft, surface soil (suggested thickness 30-50cm)
should be collected and stored separately. Soil erosion prevention measures should be taken. After construction, backfill the underground soil first and the cover the surface soil evenly, then level the construction site to reduce alleviate the impact on earth quality. The adverse impact can be controlled if attentions are paid on planning during construction, cleaning and greening the sites in time after construction.

(4) Greenbelt and vegetation damaged by project construction should be recovered in a timely manner in accordance with road and regional planting plan. Importance should be given to combination of trees, bush and grass planting to form a complete compound ecological system. Planting area should be no less than original area.

(5) Prepare compensation plan and readjust planting lands. The implementing agency pays the affected persons reasonable compensation according to the national regulation.

4.1.6 Impacts on health and safety and mitigation measures

4.1.6.1 Impacts on health and safety

Large quantities of works require lots of construction workers from different places, and these workers have a nature of mobility. Scattered construction sites, poor living and health condition, and high work load will possibly cause occurrence of epidemics. In addition, dust pollution during construction will have impacts on health. Inhalation of suspended particulates by construction workers and surrounding residents will cause various respiratory diseases and pathogenic bacteria carried by particulates will spread various diseases and consequently affect health of construction workers and nearby residents.

4.1.6.2 Mitigation measures

In order to protect health of construction workers and nearby residents and prevent epidemics, the following preventive measures will be taken:

(1) Attentions should be paid to epidemic prevention on construction site. Health check should be done by professional health agency for construction workers before
construction and periodical health check for construction workers and health supervision should be ensured during construction to ensure health of construction workers.

(2) Supply of clean drinking water should be ensured on construction site, which should meet health standard for drinking water. Management of food sanitation should be strengthened to prevent unclean food in order to prevent breakout and spreading of epidemics.

(3) Education and training on disease prevention and good health practice should be implemented on construction site to protect health of construction workers. Sanitation management guidelines should be developed and inspection on sanitation status of construction site should be strengthened.

(4) Management and disposal of domestic sewage and garbage on construction site should be strengthened to maintain environmental sanitation.

4.1.7 Social impacts and mitigation measures

4.1.7.1 Social impacts

(1) Impacts on residents and displace persons

During pipe jacking, improper pipe impelling may cause local surface lift and consequently damage underground pipelines and some buildings, affect water supply, gas supply and mail service for nearby residents, which will cause inconvenience to daily life of the residents.

Resettlement will involve residential buildings in Qigan Village of Zhoupu town within scope of Nanhui North pumping station. Appropriate compensation will be provided to farmers affected by land acquisition in accordance with national and local relevant policies and standards. Since this Project is located in highly commercialized Shanghai area, where there are various options for livelihood and there are mature laws and regulations as guarantee, therefore, this Project will not have significant impacts to people affected by land acquisition after reasonable compensation is provided.
(2) Impacts of construction on urban landscape

Land acquisition and demolition and excavation will damage roads and green belts along the roads, and consequently affect urban landscaping. Spill during waste soil transportation will pollute road surface, cause dust suspension and have adverse visual impacts on surrounding environment. Temporary storage of excavated soil on site will result in muddy road in rainy days in case of improper protection and will affect urban visual. Pollution of dust during construction to various buildings and trees will also have visual impacts.

(3) Impacts on transportation during construction

Temporary pile of earth may occupy roads during pipe construction, which may cause traffic impacts along pipelines. Transportation of raw materials (stone and sand, cement, etc.) and wasted soil may increase traffic in a short period of time, which may pose traffic pressure on surrounding roads, generate impacts to overall regional traffic and cause inconvenience to the public.

Transmission line of this Project will cross many existing large and major obstacles, mainly including magnetic suspension rail, A2 and A20 overpass, A2 Airport Road overpass, A2 Hunan Road overpass, flying bridge, and navigable river. Any inappropriate construction method may penetrate bed of navigable rive, cause settlement of pile foundation of overpasses, cause settlement of pile of magnetic suspension rail, which may have impact on safe operation.

4.1.7.2 Mitigation measures of social environmental impacts

(1) In order to ensure orderly construction and minimize impacts to local traffic, it is proposed construction period be shortened with the prerequisite of eligible construction quality. Additionally, based on construction progress the contractor should work with traffic administration and transportation agency in developing appropriate detailed transportation plan including categories of vehicles, number of vehicles, transportation routes, scheduling of transportation, and dedicated persons should be assigned to assist with traffic management to minimize impacts of project construction
on road traffic.

(2) Construction will involve large quantities of power and water consumption, therefore the contractor should communicate with relevant power and water agencies prior to construction to prepare connection plan and construct temporary connection. In areas with inadequate power or water capacity, prior pipeline improvement should be done to avoid temporary power or water supply suspension or impacts to normal water and power supply for nearby areas.

(3) Various preparations should be made prior to construction including detailed investigation of roads and underground power and communication cables and sewage pipelines in construction area. Preparations also include prior consultation with concerned agencies to prepare resettlement and relocation plan and prepare emergency responsive plan to avoid normal water, power, and gas supply and communication service along the pipelines in case of cable or pipeline cutting off to maintain normal living condition.

(4) Reasonable compensation should be provided to affected units and residents in accordance with national and Shanghai local laws, regulations and management methods. Transparency of resettlement plan should be improved. During land acquisition and resettlement, public consultation should be emphasized to allow affected people to have understanding of land acquisition, compensation rate for resettlement and implementation schedule. Agreements should be signed with affected units and residents, and project construction cannot begin until agreements have been reached.

(5) Prior notice should be provided to residents along pipeline route and around pump station before construction. Notice of vehicle diversion due to pipeline construction also should request for approval of concerned agencies and be given to affected residents in advance.

(6) Complaints from the public should be properly handled. Project construction will affect a large scope of area and will inevitably cause inconveniences to life of
nearby residents, therefore, appropriate settlement of public complaints will help successfully solve issues with construction impacts. When the contractor receives complaints from the public, persons should be assigned to coordinate with the public and solve the issues in a specified time limit, and efforts should be made to disseminate and explain project detail to the public to obtain their understanding and support.

(7) In order to ensure efficient municipal drainage during construction, water diversion and use of pumps will be necessary. Where site condition allows, diversion can be used, and pumping will be used in places where drainage diversion cannot be adopted given site condition.

(8) Road sections, along which there are environmental sensitive targets including schools and hospitals, should be given priority protection during construction and measures including water spraying to reduce dust suspension, noise control and traffic diversion and control should be taken.

(9) Protection of physical culture resources: if cultural heritages, culture relics or tumulus, etc. are found during construction, construction activities should be suspended immediately. Inform the local relic protection agency in time, and then the local relic protection agency will decide protection measures after field investigation, rescue or excavation.

(10) When pipe jacking of this Project crosses magnetic suspension rail, A2 and A20 overpass, A2 Airport Road overpass, A2 Hunan Road overpass, flying bridges, and navigable rivers, construction plan prepared by design institute shall be implemented strictly, construction management and construction safety shall be enhanced and improved. Especially when pipe jacking crosses magnetic suspension rail, monitoring points will be set up during construction to closely observe settlement of pile foundation and around environment. Measures shall be taken in time to ensure safety of magnetic suspension rail.
4.2 Environmental impacts and mitigation measures during operation

4.2.1 Acoustic environmental impacts and mitigation measures

4.2.1.1 Acoustic environmental impacts

After operation of this Project, booster pumping station will be the major noise source. Noise level at Nanhui North pumping station to all the directions during operation can meet Category II of Standard for Noise Control at Industrial Plant Boundary (GB12348-90), which means insignificant noise impacts to surrounding acoustic environment.

4.2.1.2 Mitigation of noise pollution control

(1) With respect to pump station design, semi-underground pump chamber is used. Pump chambers should be built separately, far away from office and residential areas, and soundproof double-glazing windows should be installed for office buildings to reduce noise impact on office staff.

(2) Since pumps generate strong noise during operation, the following control measures should be taken to abate noise impact: (a) sound insulation and sound absorption treatment should be adopted for pump chamber, for example, acoustic shield is installed for pump and sound absorption material is used for inner wall of pump chamber to reduce noise escape; (b) low-vibration and less noisy pumps should be selected, damping treatment should be done to pump foundation, and flexible rubber joints should be equipped for inlet and outlet of the pump to reduce noise; (c) machinery should be well maintained to keep low noise level.

(3) Based on pump station layout and needs for landscaping and planting, planting should be done as much as possible outside pump chamber and at pump station boundary to reduce noise impact by vegetation absorption.
4.2.2 Water environmental impacts and mitigation measures

4.2.2.1 Impacts on water environment

This project will generate certain quantities of domestic sewage, most of which is generated by staff of the pumping station. Major pollutants of domestic sewage are COD$_{cr}$, BOD$_5$, NH$_3$-N and oil & grease. Pollutant concentrations of domestic sewage are quite high prior to treatment, so improperly treated or direct discharge to water body will pollute surrounding water environment although the discharge is in small quantities.

4.2.2.2 Mitigation measures of water environmental impact

The sewerage generated during operation will be collected and discharged into municipal sewer system.

4.2.3 Environmental impacts of solid waste and mitigation measures

4.2.3.1 Environmental impacts of solid waste

Solid wastes generated during operation are mostly domestic solid wastes from working staff and grits from the screens. Although generation of domestic solid waste is not much given small amount of staff, littering or uncontrolled dumping will contaminate water body and soil and affect health.

4.2.3.2 Mitigation measures of solid waste impacts

Garbage bins are provided in pump station and garbage is collected by category to maintain clean environment of pump station. The garbage impact on environment can be eliminated by maintaining clear environment and sanitation in the pumping station.
4.2.4 Measures of ecological environment protection during operation

(1) Planting percentages of trees, bush and grass should be paid attention to maintain reasonable hierarchical structure.

(2) Local species should be used as much as possible as priority selection to reduce introduction of external species.

(3) Dedicated persons should be assigned for planting and management of the pump station. Regulations should be made to protect green area and ecological environment.

(4) Vegetation should be recovered as much as possible on naked surface caused by temporary land occupation. Dominating grass species in local area should be selected for planting. Meanwhile timely protection should be provided in major areas to prevent damages caused by various factors.

4.2.5 Protection measures of pipe safety

During operation, Shanghai Raw Water Transmission Pipelines and Canal Protection Method should be strictly enforced. Scope for transmission pipeline protection should be specified, which is 8 meter wide areas along both sides of pipeline center, and permanent identification marks should be set. Piling, well digging, pit digging and soil excavation are not allowed within protection area in accordance with Shanghai Raw Water Transmission Pipelines and Canal Protection Method.
5 Environmental Management Organization

5.1 Introduction

The Ministry of Environmental Protection (MEP) as the main body for administrative management and law execution of environmental protection will supervise the implementation of this Project. The EIA report will be approved by Shanghai Environmental Protection Bureau (EPB) according to provisions of supervisor privilege of the Law of Environmental Protection of the People’s Republic of China and the Regulations on the Administration of Construction Project Environmental Protection. Being the environment administrative agency of this Project, the main responsibilities of Shanghai EPB are to bring up requirements on environmental protection based on EIA report, to coordinate management of environmental protection among different agencies, and to organize the check and acceptance of environmental protection facilities. Under the organization framework, SH PMO is responsible for management of project implementation under the leadership of Shanghai Municipal Government (SMG). In order to ensure smooth implementation of project environmental management activities, the project office, the project implementing agency, contractors or operators shall recruit several fulltime or part time environmental management staff to carry out EMP. SH PMO is responsible for project planning and design, supervision of environmental protection, and technical trainings on environmental management staff in Shanghai. The district project offices and district EPB are mainly responsible for executing project implementation plan, implementing technical standards of this Project, and supervising daily environmental management. The city (district) environmental monitoring station entrusted by the project implementing agency is responsible for monitoring on environment quality in project area during construction and operation. The environmental supervision engineer entrusted by the project implementing agency is responsible for environment supervision during construction.

The project implementing agency is planning to recruit special environmental
management staff to be responsible for the environmental management of different phases, to carry out and implement laws and regulations of environmental protect and EMP, to inspect implementation of environmental protection measures, to promote advanced technology and experience of environmental protection, to organize trainings on environmental technologies for relevant staff, and to improve personnel qualifications. The scopes of environmental management during construction and operation are different. One is temporary, the other is permanent. Therefore the corresponding organizations for construction and operation are separate and different. The organization for construction will be cancelled after construction completed. Then the organization for operation will start playing its functions. However, the two organizations may cross for a period of time based on specific situations. The organization chart is showed in Figure 5.1-1.
Figure 5.1-1 Organization chart of environmental protection of this Project
The project environmental protection supervision plant is showed in Table 5.1-1.

**Table 5.1-1: Supervision plan of environmental protection of this Project**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Institutes</th>
<th>Contents of supervision</th>
<th>Purposes of supervision</th>
</tr>
</thead>
</table>
| Feasibility study    | WB                                | 1. Review EIA report 2. Review EMP                            | 1. Ensure EA contents are comprehensive, specific topics are well set, and key points are clear  
|                      |                                   |                                                              | 2. Ensure the significant potential issues of this Project have been discussed  
|                      |                                   |                                                              | 3. Ensure a feasible implementation plan for mitigation measures                        |
| Design and construction | MEP | 1. Review preliminary design of environmental protection and EMP  
|                      | SMG | 2. Inspect restorations of temporarily occupied land for construction, vegetation, and environment  
|                      | District governments            | 3. Inspect implementation of dust suspension and noise control and determine construction time  
|                      | City (district) EPB            | 4. Inspect air pollutant discharge                             |
|                      | City (district) Cultural Relics Bureau | 5. Inspect sewerage and waste engine oil discharge and treatment on construction site  
|                      |                                   | 6. Restoration and treatment of earth taking and dumping sites  
|                      |                                   | 7. Inspect bottom mud disposal                                 |
|                      |                                   | 8. Inspect if antique antiquities underground exist          | 1. Seriously carry out the Three Synchronies  
|                      |                                   |                                                              | 2. Ensure all sites meet environmental protection requirements  
|                      |                                   |                                                              | 3. Reduce the impacts on ambient environment from construction, enforce relevant laws and regulations of environmental protection  
|                      |                                   |                                                              | 4. Prevent inland river from pollution  
|                      |                                   |                                                              | 5. Prevent the scenic and land source from damage, avoid soil erosion  
|                      |                                   |                                                              | 6. Ensure bottom mud is disposed appropriately  
|                      |                                   |                                                              | 7. Protect antique antiquities from damage  |
| Operation            | City (district) EPB             | 1. Inspect EMP implementation during operation               | 1. Carry out EMP  
|                      | City (district) Water Authority Bureau | 2. Inspect monitoring plan implementation                     |
|                      | City (district) police and fire departments | 3. Check sensitive point (any unanticipated environment issues might happen) which needs further environmental protection measures  
|                      |                                   | 4. Inspect if environment quality of sensitive points meets corresponding quality standards  
|                      |                                   | 5. Enhance supervision, prevent abrupt accidents, prepare emergency responsive plan, eliminate dangers in time once accident happens  
|                      |                                   |                                                              | 2. Carry out monitoring plan  
|                      |                                   |                                                              | 3. Protect environment seriously  
|                      |                                   |                                                              | 4. Enhance environment management and protect human health seriously  
|                      |                                   |                                                              | 5. Ensure pollutants discharge meet the discharge standards  |
5.2 Environmental protection organization during construction

5.2.1 Organization

Technology: on the technical aspect of environmental management, the city project office will recruit 3 or 4 experts to assist the project management.

Project office: the city project office will appoint a project environmental manager to supervise the implementation of EMP, who will be responsible for all issues related to environment of the World Bank project. The district project office sets one environmental manager to be in charge of the implementation of EMP in its jurisdiction and coordination with the city project office on environmental issues.

Contractors: contractors will appoint one or two environment coordinators to be responsible for supervision of EMP implementation, liaison with residents to solve environmental issues, and communication with the project office and environmental supervision institutions.

Operator: operator will set up an environmental management division consisting of two environmental protection professionals. They will be responsible for environmental management during operation period with the help of other employees. The company will equip them with internet, telephone, etc. to keep in touch with environmental supervision institutions.

Environmental supervision engineer (ESE): the project implementing agency will recruit an environmental supervision engineer for this Project who will be responsible for environmental management supervision on construction site during construction.

Environmental Monitoring Agency: entrusted by contractor or operator to monitor their environmental activities and provide environmental monitoring report.

5.2.2 Positions and responsibilities

A. Environmental specialist
Environmental specialist will provide technical supports to SH PMO. He will ensure all obligatory requirements to be satisfied at the beginning of the projects, and make sure EMP to be effectively carried out in accordance with requirements of relevant laws and regulations and the World Bank safeguard polices.

1. Provide necessary trainings for the environmental management managers of project office, environmental management persons of contractor and operator, and ESE.

2. Provide expert consulting service to the project office, the project implementing agency, contractors, and operators.

3. Assist environmental management persons of enterprise to organize monitoring activities.

B. Project office: environmental manager

The SH PMO, Pudong PMO and Nanhui PMO each will appoint an environmental manager who is an expert to report to the World Bank and supervise the environment of this Project. Environmental managers in district PMO are responsible for supervising local project and reporting to SH PMO. Environmental managers will assist the land administrative institution, the resettlement institution to ensure the implementation of this Project. The main responsibilities include:

1. With the assistant’s support, provide trainings to environmental management directors (EMD);

2. With the assistant’s support, prepare monitoring plan;

3. Communicate with EMD and construction workers. The ways are as follows:
   - Submit monthly monitoring report to the project office and the World Bank
   - Submit special report on non-compliance if the second or third cases occur.
   - Orally communicate with contractor and operator to come up a plan if a solution is available.
   - Come up a corrective measure jointly with environmental management engineers and EMDs if a non-compliance appears
(4) Attend meeting jointly attended by project office environmental engineer, EMDs, contractors, and operators.

(5) Coordinate with environmental specialists to report to the World Bank

C. Project implementing agency: Specific environmental staff

The project implementing agency will appoint a specific environmental staff to be responsible for environmental monitoring and reporting the city (district) project offices and government agencies about the implementation of environmental protection carried out by contractor and operator. The main responsibilities include:

(1) At the project beginning phase, with technical assistant’s support, prepare detailed rules of environmental protection, monitoring and environmental protection procedures for contractors and operators, and collect outlines for project management and designers.

(2) Consign the monitoring items for which special equipment are required, such as air, acoustic, etc.

(3) Provide the project office with monthly monitoring report, implementation progress and remediation measures, etc. Hold a meeting every month with the project office to report monitoring status and compliance of this Project.

(4) Select specialists or consultants from universities or institutions to consult trainings methods and technology. Determine according to needs of the reality of the project.

(5) Organize special studies or common investigations on special architectural requirements or obligatory alterations needed by this Project.

(6) Report solutions of noncompliance situations and measures for emergencies to the project office environment manager and environment monitoring agencies.

(7) Disclose information though meeting and local media
D. Environmental supervision engineer (ESE)

Environmental supervision engineer mainly takes charge of supervising engineering construction on site and other activities, such as land occupation, resettlement, etc., ensuring the activities accord with the requirements, investments, and objectives of environmental protection, and coordinating with land administrative department, resettlement department, and environment monitoring department on site. The main responsibilities of ESE include:

1. Ensure all permits, requirements, and EMP of this Project to be in place before construction.
2. Verify that all members of contractors and operators to carry out environmental protection measures according to provisions of contact.
3. Prepare a standard qualification based table of monthly remuneration of contractors and operators according to the efforts and contributions that they make for environmental protection.
5. Identify the situations which need a special study or activity. Communicate with EMC and implement special measures regularly and effectively.
6. Communicate with construction persons to help them understand environmental requirements on sites. Give suggestions on remediation measures and provide remediation measures for noncompliance of original intention of this Project. Provide special formal guidelines to contractors and operators according to requirements.
7. Communicate with contractors, operators, and consultants to collect other views on some special issues. Through communications, report the problems during implementation to construction supervision engineers (CSE) quickly and help to solve the problems. If this Project has potential impacts on sensitive objectives or the project implementation is seriously unconformable
with design, then he should apply for stop.

(8) Communicate with CSE and construction workers; prepare regular monitoring weekly report, record noncompliance and suggest remediation measures with project designer if necessary.

E. Contractor: environmental manager coordinator (EMC)

Implement environmental protection according to bidding documents, contract, EIA report and design of environmental protect during construction. Accept the guidance and supervision of specific environmental staff of implementing agency, environmental supervision engineer and administrative governmental agencies, receive technical support of specialist.

5.3 Environmental protection organization during operation

During operation, the World Bank offices are responsible for supervision and initial evaluation on investment.

Project operator will set up an environment management department to be responsible for EMP implementation. The main responsibilities of environment management department include:

(1) Manage the execution of environmental protection measures.
(2) Coordinate with environmental monitoring agency and residents to settle environmental issues.
(3) Entrust the city/district environmental monitoring stations to carry out regular monitoring on three discharges and regional environment quality.
(4) Deal with environmental emergencies when environment accident occurs.
(5) Report information of environmental management of the company to Shanghai EPB and SH PMO.
(6) Record and file up the documents of environmental management of the company
5.4 Arrangement of environmental management organization of this Project

Arrangements of environmental management organization for this Project are listed in Table 5.4-1 and Table 5.4-2.

**Table 5.4-1 Staffing of environmental management of the project office**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Environmental manager</th>
<th>Environmental specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH PMO</td>
<td>1</td>
<td>3-4</td>
</tr>
<tr>
<td>Pudong New District PMO</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Nanhui District PMO</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
<td><strong>3-4</strong></td>
</tr>
</tbody>
</table>

**Table 5.4-2 Staffing of environmental management of contractors and operators**

<table>
<thead>
<tr>
<th>Project</th>
<th>Contractor</th>
<th>Operator</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EMC</td>
<td>ESE</td>
<td>Environmental management person</td>
</tr>
<tr>
<td>Nanhui Conveyor</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
6 Implementation of EMP

6.1 Detailed activities of EMP implementation

This project has impacts on environment during construction and operation. Aiming at different characters of environment impacts during construction and operation, corresponding measure of this Project will be taken to minimize the impacts to an acceptable degree. The project also prepared an environmental management and monitoring procedures in order to ensure the measures of environmental protection can effectively play functions. SH PMO will follow and report the monitoring of these environment measures, as well as play its administrative functions. General environmental protection measures and responsibilities of relevant units are introduced in this chapter. The project office will follow and report the implementation of environment measures. The activities of implementation and monitoring of environment measures are listed in Table 6.1-1.

Table 6.1-1 Detailed activities of environment management organizations

<table>
<thead>
<tr>
<th>Plan</th>
<th>Activity</th>
<th>Responsibilities</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Implementation</td>
<td>Supervision</td>
</tr>
<tr>
<td>Prophase of construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One year</td>
<td>Set up environmental management team and recruit team members</td>
<td>Company (Qingcaosha Company)</td>
<td>PMO</td>
</tr>
<tr>
<td>One year</td>
<td>Every CSE choose or appoints one ESE</td>
<td>EMD (Environmental Management Director)</td>
<td>CSE</td>
</tr>
<tr>
<td>One year</td>
<td>Every CSE implements environmental supervision trainings</td>
<td>EMD</td>
<td>CSE</td>
</tr>
<tr>
<td>One year</td>
<td>Prepare and implement trainings for environmental managers of EMD and PMD</td>
<td>Technical assistance(TA)</td>
<td>PMO</td>
</tr>
<tr>
<td>One year</td>
<td>Prepare working plans for EMD and ESE</td>
<td>TA</td>
<td>PMO/company</td>
</tr>
<tr>
<td>One year</td>
<td>Prepare working documents: standard,</td>
<td>EMD</td>
<td>PMO</td>
</tr>
<tr>
<td>Plan</td>
<td>Activities</td>
<td>Responsibilities</td>
<td>Implementation</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td>on-site inspection table, reporting format for different activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One year</td>
<td>Prepare detailed procedures of non-compliance discovered by supervision and reporting for EMD</td>
<td>TA</td>
<td>PMO</td>
</tr>
<tr>
<td>One year</td>
<td>Make appropriate assessment on environmental factors to contract</td>
<td>TA helps EMD</td>
<td>PMO/WB</td>
</tr>
<tr>
<td>One year</td>
<td>Prepare consign contract on monitoring activities (special equipment is required, for example, water and air quality monitoring) for EMD</td>
<td>EMD</td>
<td>Company</td>
</tr>
<tr>
<td>Plan</td>
<td>Construction period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One year (0-3 month)</td>
<td>ESE discusses with EMD about project adjustment and improvement</td>
<td>EMD/ESE</td>
<td>PMO</td>
</tr>
<tr>
<td>One year (0-3 month)</td>
<td>Each contractor shall appoint an environmental professional to work with ESE and EMD</td>
<td>Contractor</td>
<td>PMO</td>
</tr>
<tr>
<td>One year</td>
<td>Each implementing agency and operator shall organize trainings on environmental common sense and measures for the employees</td>
<td>Contractor</td>
<td>EMD/ESE</td>
</tr>
<tr>
<td>One year</td>
<td>Organize public communication and provide supporting documents</td>
<td>TA helps EMD</td>
<td>Company</td>
</tr>
<tr>
<td>One year</td>
<td>Standardize the cooperation with other provinces and cities</td>
<td>EMD</td>
<td>Company</td>
</tr>
<tr>
<td>Plan</td>
<td>Operation period</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confirm the reporting procedures of environmental issues during operation</td>
<td>Project implementing agency</td>
<td>Shanghai EPB</td>
</tr>
<tr>
<td></td>
<td>Confirm solid waste generated by this Project are centralized and disposed safely</td>
<td>Project implementing agency, environment</td>
<td>Shanghai EPB</td>
</tr>
</tbody>
</table>
6.2 Requirements of environmental management in contract

During construction, the contractor will play a key role in environmental management, pollution control and implementation of prevention and mitigation measures etc. Therefore, the contractor is required to meet the following requirements:

1. Contractors should be capable of making sure that the EMP be carried out effectively.
2. Contractors and CSE are required to be trained on environmental protection and management before construction.
3. The environmental impact mitigation measures mentioned above should be included in the bidding documents submitted by contractor and finally included in the contract as the requirements for contractor.
4. Contractor is required to monitor his environmental activities and submit records of environmental performance every day or weekly. The project office and construction supervision team will inspect and review these records.
5. Contractor should designate at least one full-time staff, who should be trained according training plan so that they are able to do their work.
6. During construction, contractors must communicate and negotiate with local residents in project area, and establish a board on each construction site, inform people of the specific activities and time of construction, while providing contractor’s name and telephone, so as to make people appeal or give suggestion conveniently.
7. Contractor should preserve a deposit for completion of environmental management according to annual budget and include the deposit in contract price.

6.3 Information communication and solutions of non-compliance
Information about environment monitoring needs be open to the on-site environment supervision engineers, enterprise environment management directors and the project office. In order to focus attention on the most important issues, non-compliance situations this Project are divided into 3 levels.

Level 1: Definition: the non-compliance situation doesn’t match the original requirements, but it will not have a short-time impact on the important resources. It may turn into level 2 if level 1 happens several times without attention. Measures: it can be resolved through suitable cooperation and regular communication. For example, discuss with contractors and operators, the remedy measures can be implemented quickly. The typical formal way is ESE report to company’s EMD and on-site CSE through weekly meetings.

Level 2: Definition: the non-compliance situation hasn’t brought obvious damage or irreversible impact on sensitive and important resources. But it must be remedied at once to prevent the above influences. It may turn into level 3 if level 2 happens several times without attention. Measures: the enterprise EMD should report to the environment manager of the project office and on-site construction manager on the date when the level 2 situation is discovered. Reach an agreement on the remedy measures ASAP. Usually, the remedy measures should be determined within one week.

Level 3: Definition: this level of non-compliance situation includes damages on specially focused sensitive targets or foreseeable and immediate damages. Internationally prohibited special activities are classified in Level 3. Measures: once the situation is discovered, the EMD should immediately report to the environment manager of the project office and on-site construction manager and reach an agreement on the remediation measures ASAP. Usually, the remedy should be determined within 3 days unless longer time needed under special conditions. If necessary, the enterprise EMD can ask construction manager to stop some special projects for resource-protections before implementing remediation measures.
6.4 Training- necessary capacity building and means building

6.4.1 Training requirements

Main target audiences of environment capacity building are environment management persons and environmental supervision persons. The training for them is a part of the technical support of this Project. Contractors and workers will also receive training during the implement process. Before project construction, all contractors, operators and construction supervision persons are required to take the compulsory trainings of environment, health and safety.

6.4.2 Training contents

(1) Environmental management persons and ESE

The trainings for environmental manager of the city and district project offices, EMCs of project and ESE will be organized by SH PMO. The environmental specialists will conduct the trainings. Table 6.4-1 listed the training contents.

<table>
<thead>
<tr>
<th>Areas</th>
<th>Contents of training</th>
<th>Duration</th>
</tr>
</thead>
</table>
| Operational capacity (environmental manager and ESE) | Browse and recognize the functions of hot keys of Word, Excel and PowerPoint  
Study the World Bank Safeguards policy  
Study detailed rules of environmental protection prescribed for contractors. Every detailed specification of environmental protection should have monitoring plans  
Study the environmental impacts of this Project and environmental items need monitoring. | 4 days   |
| Compliance monitoring (environmental manager and ESE) | Trainings on on-site supervision process, including organization, communication, roles and responsibilities, reporting, and standardized observation procedures.                                                                 | 1 day    |
| Emergency responsive team (environmental manager and ESE) | Knowledge of on-site dangerous materials  
Potential leakage and spillage  
Impacts on environment and human of leakage and spillage  
Emergency responsive process including priority response  
Location and use of responsive equipment  
Communication and reporting equipment | 1/2 day  |
| First aid and medical rescue (environmental) | Procedures of searching medical rescue under emergency condition and non-emergency condition, and other relevant methods of searching medical rescue (long distance call, medical | 1/2 day  |
(2) Contractor and construction workers

The trainings can be carried out by environmental specialist and enterprise EMD through the city (district) project offices and the project implementing agency in the location of this Project before project construction starts. The detailed contents and duration are listed in Table 6.4-2.

**Table 6.4-2 Trainings for construction persons**

<table>
<thead>
<tr>
<th>Model</th>
<th>Contents of training</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduce factors of environment impact and protection measures; Introduce the sensitive areas and problems of the construction site and around areas of the construction site; Roles and responsibilities of the environment management &amp; design engineer, ESE and CSE, and the key points of reporting of environment problems; Waste management in construction camp and site. Pollution control measures in construction site Cultural heritage issues Penalty for the violation of laws and regulations</td>
<td>Half day on every construction site</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Contents of training</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correct usage and storage process Correct operation processes including fuel-filling process, calculating the amount of usage and ensuring effective use of equipment. Correct disposition of the secondhand storage vessels Correct storage process for risk waste Borrowed soil management Non-hazardous waste management Medical problems when exposed in the hazardous waste Emergency treatment</td>
<td>1/2 day</td>
</tr>
<tr>
<td></td>
<td>Health and safety problems Health and safety requirements How to implement health and safety inspection Process of reporting and solving problems</td>
<td>1 day</td>
</tr>
<tr>
<td></td>
<td>Traffic rules Safe driving training Vehicle maintenance Fuel filling process Emergency responsive procedures</td>
<td>1/2 day</td>
</tr>
<tr>
<td></td>
<td>Use of the equipment including standards, testing, methods, sample transfer, data quality control Monitoring and reporting requirements</td>
<td>1/2 day</td>
</tr>
</tbody>
</table>
General health and safety for construction workers

| The ways of spreading and protecting, prevent HIV/AIDS and STD |
| Prohibition of liquor and drugs |
| Procedures of searching medical rescue under emergency condition and non-emergency condition, and other relevant methods of searching medical rescue (such as STD test and advisory). |
| General knowledge of health and safety including some basic process: traffic safety, electricity safety, explosion, fires, hazardous waste management. |
| Personal protection equipment |
| Penalty for the violation of laws and regulations |
| Half day on every construction site |

(3) Operators

Table 6.4-3 Training for environmental management persons of operators

<table>
<thead>
<tr>
<th>Audience</th>
<th>Contents of training</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental management persons</td>
<td>World Bank project management procedures Environment information publishing, open, communication and reporting mechanism Environment emergency response Health and safety inspection and declaration process Study tour on advanced technologies and environmental management</td>
<td>1 day study</td>
</tr>
<tr>
<td>Environmental management persons</td>
<td>Use of the equipment including standards, testing, methods, sample transfer, data quality control Monitoring and reporting requirements Environmental emergency response: potential leakage and spillage, impacts on environment and human of leakage and spillage, emergency responsive process including priority response, location and use of responsive equipment</td>
<td>2 day study</td>
</tr>
</tbody>
</table>

6.4.3 Budget for trainings

Table 6.4-4 listed the budget for project capacity building.

Table 6.4-4 Training plan for project environmental protection persons

<table>
<thead>
<tr>
<th>Period</th>
<th>Type</th>
<th>Number of persons (person)</th>
<th>Time</th>
<th>Budget (10,000RMB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Environmental manager</td>
<td>2</td>
<td>2008</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EMC</td>
<td>4</td>
<td>2008</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ESE</td>
<td>4</td>
<td>Before construction</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Construction workers</td>
<td>All worker of contractors</td>
<td>Before construction</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>Training for environmental management professionals of operator</td>
<td>2</td>
<td>Before operation</td>
<td>4</td>
</tr>
<tr>
<td>Training for environmental emergency responsive person of operator</td>
<td>4</td>
<td>Before operation</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Training on skills of environment persons of operator</td>
<td>20</td>
<td>Before operation</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>
7 Environmental monitoring plan

7.1 Purpose of monitoring

Environment monitoring consisting of project construction period and operation period aims to comprehensively understand the dynamic status of pollutions of this Project in time, understand the change of environment quality of project area, coverage of influence and the environment quality during the operation, report to the administrative department, and provide scientific foundations to environment management of this Project.

7.2 Environmental monitoring organizations

Environmental monitoring during construction and operation will be entrusted to the environmental monitoring station of the city by contractors and operators. The environmental monitoring station should be a certificated unit of national environmental quality monitoring with complete equipment and strong technologies. According to the environmental impact forecast results, select those locations where pollution may be obvious as the monitoring points, track the pollution during construction period and operation period. The main monitoring items include noise, air quality, and surface water quality. The monitoring factors will be determined based on pollution characters. The monitoring methods adopt the relevant methods listed in the Standard of Environment Monitoring Technology which is issued by the MEP. The detailed key procedures in the construction sites and activities are listed in Table 7.2-1.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Activity</th>
<th>Responsibilities</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Implementation</td>
<td>Supervision</td>
</tr>
<tr>
<td>Prophase of construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One year</td>
<td>Set up environmental management team and recruit team members</td>
<td>Company</td>
<td>PMO</td>
</tr>
<tr>
<td>One</td>
<td>Every CSE chooses or</td>
<td>EMD</td>
<td>CSE</td>
</tr>
<tr>
<td>Plan</td>
<td>Activities</td>
<td>Implementation</td>
<td>Supervision</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Construction period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One year</td>
<td>ESE discusses with EMD about project adjustment and improvement</td>
<td>EMD/ESE</td>
<td>PMO</td>
</tr>
<tr>
<td>One year (0-3 month)</td>
<td>Each contractor shall appoint an environmental professional to work with ESE and EMD</td>
<td>Contractor</td>
<td>PMO</td>
</tr>
<tr>
<td>One year (0-3 month)</td>
<td>Each implementing agency and operator shall organize trainings on environmental common sense and measures for the</td>
<td>Contractor</td>
<td>EMD/ESE</td>
</tr>
<tr>
<td>One year</td>
<td>Organize public communication and provide supporting documents</td>
<td>TA helps EMD</td>
<td>Company</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>One year</td>
<td>Standardize the cooperation with other provinces and cities</td>
<td>EMD</td>
<td>Company</td>
</tr>
<tr>
<td></td>
<td>Carry out environmental monitoring during construction</td>
<td>Environmental monitoring station</td>
<td>EMD/Environmental supervisor</td>
</tr>
</tbody>
</table>

**Operation period**

<table>
<thead>
<tr>
<th>Environmental monitoring during operation</th>
<th>Environmental monitoring station</th>
<th>Shanghai EPB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirm the reporting procedures of environmental issues during operation</td>
<td>Project implementing agency</td>
<td>Shanghai EPB</td>
</tr>
</tbody>
</table>

| Confirm solid waste generated by this Project are centralized and disposed safely | Project implementing agency, environment and sanitation department | Shanghai EPB |

### 7.3 Detailed requirements on environmental monitoring

Detailed environmental monitoring plan and budget of this Project is listed in Table 7.3-2.
## Table 7.3-2 Environmental monitoring plan and budget

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Environmental factors</th>
<th>Location of monitoring points (numbers)</th>
<th>Monitoring items</th>
<th>Monitoring frequency</th>
<th>Unit price (RMB)</th>
<th>Annual cost (RMB/year)</th>
<th>Phase cost (RMB)</th>
<th>Total (RMB)</th>
<th>Monitoring institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient air</td>
<td>1 at construction site of Nanhui North pumping station; 25 sensitive points along pipeline</td>
<td>TSP</td>
<td>1 term/quarter, 2 days/ term, 3 times/day</td>
<td>60/sample</td>
<td>1,440</td>
<td>2,160</td>
<td></td>
<td>20,160</td>
<td>City (district) environment monitoring stations</td>
</tr>
<tr>
<td>Noise</td>
<td>East and north boundaries of Nanhui North pumping station; 25 sensitive points along pipeline</td>
<td>Leq dB (A)</td>
<td>1 term/month, 1 day/term, 2 times at daytime and 2 times at night</td>
<td>50/point/time</td>
<td>4,800</td>
<td>7,200</td>
<td></td>
<td>22,200</td>
<td></td>
</tr>
<tr>
<td>Wastewater from construction</td>
<td>Outfalls of waste water treatment facility of pumping station construction site; Outfalls of 86 construction wastewater treatment facilities</td>
<td>SS, oil</td>
<td>1 term/quarter, 2 days/term, 3 times/term</td>
<td>85/sample</td>
<td>2,040</td>
<td>3,060</td>
<td></td>
<td>46,920</td>
<td></td>
</tr>
<tr>
<td>Operation (3 years)</td>
<td>Noise</td>
<td>1 each at east, south, west, north borders of Nanhui North pumping station</td>
<td>Leq dB(A)</td>
<td>1 term/quarter, 2 days/term, 2 times at daytime and 2 times at night</td>
<td>50/point/time</td>
<td>6,400</td>
<td>19,200</td>
<td>19,200</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>108,480</td>
<td></td>
</tr>
</tbody>
</table>
8 Cost estimation of environmental management and funding resources

8.1 Budget allocation

The implement of the EMP measures involved in many units, thus the sources of funding are different. And most environment protection activities are engineering measures. Therefore, the fund should be included into engineering cost and offered by project contractors and operators. The costs should be nailed down and listed in their tendering documents. The fund of EMP is mainly used in the environment management during construction period and operation period including environment monitoring, environment supervision, personnel training and operation of environment management organizations, as well as some the risk prevention cost. Activities of EMC will be covered by the international project management fee of SH PMO, air and noise monitoring. Monitoring and supervision activities of ESE are a part of activities of construction and supervision. Local monitoring stations are entrusted by the project implementing agency to monitor the water, air, and noise and are paid by the project implementing agency. If the regular monitoring of the local environmental protection department overlaps with this Project, the data of the regular monitoring can be used.

8.2 Source of funding and EMP budget

Table 8.2-1 listed the EMP expenses during construction and operation.
Table 8.2-1 Summary of EMP budget of this Project

<table>
<thead>
<tr>
<th>Average annual cost during construction (10,000RMB)</th>
<th>Duration Of construction</th>
<th>Total cost during construction (10,000RMB)</th>
<th>3 year operation period</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMU(operation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office expense</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainings on environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainings on environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10,000RMB)</td>
<td>1.5</td>
<td>88.5</td>
<td>18</td>
<td>100.8</td>
</tr>
<tr>
<td>20</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td>189.3</td>
</tr>
</tbody>
</table>

According to the project implement term, annual budget must be guaranteed for every construction period. A deposit should be included in the construction contract value (CCV) for completion of requested environment management of contractors and operators. Table 8.2-2 listed different deposit percentages of CCV of different activities.

Table 8.2-2 Deposit percentage of CCV for environmental management

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirements</th>
<th>Percentage of CCV</th>
<th>Source of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environmental protection management</td>
<td>0.5</td>
<td>CCV</td>
</tr>
<tr>
<td>2</td>
<td>Labor organization and occupation health management</td>
<td>0.5</td>
<td>CCV</td>
</tr>
<tr>
<td>3</td>
<td>Public safety management</td>
<td>1</td>
<td>CCV</td>
</tr>
<tr>
<td>4</td>
<td>Social management</td>
<td>1</td>
<td>CCV</td>
</tr>
</tbody>
</table>
9 Information management of EMP

9.1 Information communication

Environmental management requires establishing a necessary internal communication among different departments and positions of the project office, project implementing agency, contractors and operators and also requires disclosing relative information to outsiders (relevant stakeholders and public). The internal information communication can take many ways like meeting, internal newsletter, etc. A formal meeting should be held every month. All documents of information communication should be recorded and kept in archives. External information communication should be held once every year. The information communication with the cooperation units should be recorded and kept in archives.

9.2 Mechanism for recording

In order to guarantee effective implementation of environment management system, the organization shall establish a perfect recording system and keep following records:

(1) Requirements of laws and regulations
(2) Permits
(3) Environment factors and relevant impacts
(4) Training
(5) Inspection, check and maintenance activities
(6) Monitoring data
(7) Effectiveness of remediation and prevention measures
(8) Information of relevant parties
(9) Examination and verification
(10) Evaluation and appraisal
Moreover, it must make necessary controls on the above records including the recognition of the record, collection, catalogue, kept in archives, storage, management, maintenance, inquire, storage life and disposition.

9.3 Reporting mechanism

Contractors, operators, monitoring units, ESE and project office should record and report to the relevant departments about the project process, the implementation of EMP, record of the environment quality monitoring in time, including the following six parts:

(1) ESE of this Project should record the implementation of EMP by month and submit weekly and monthly report to the project implementing agency and the city project office in time. The weekly and monthly report should include implementation of environmental protection measures, progress of environmental monitoring, monitoring data, and etc.

(2) Contractors and operators should make detailed record on progress of the project and the implementation of EMP by quarter, report the project office in time, and copy the quarterly report to Shanghai EPB.

(3) Monitoring units shall submit monitoring report to contractors (operators) and ESE in time after complete their assignments.

(4) The city project office shall make a copy of project progress reports to Shanghai EPB. The project progress reports (monthly, quarterly, and annual) should include the information of EMP implementation, such as implementation progress and effectiveness of EMP, especially environmental monitoring results.

(5) ESE and the project office shall inform the local environmental protection administrative department or up level government department if necessary if non-compliance of environmental protection happens.

(6) EMP implementation report shall be finished and submitted to the World Bank
before March 31 of the following year. EMP implementation report should include:

(a) The implementation of training plan
(b) The process of the project, such as the construction of pumping station, progress of pipe-jacking, and green land restoration, etc.
(c) The implementation of environmental protection measures, environmental monitoring, and main monitoring results
(d) Record the main content of complain, the solutions and satisfaction degree if there are complains.
(e) The implementation plan of EMP for the next year
## 10 Summary of EMP

### Table 10-1 Summary of EMP of Nanhui Conveyor works

<table>
<thead>
<tr>
<th>Potential impacts/issues</th>
<th>Mitigation Measures</th>
<th>Budget in RMB</th>
<th>Implementation Agency</th>
<th>Supervision Agency</th>
<th>Monitoring Indicators/Parameters for EMP Implementation</th>
<th>Monitoring Locations and Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust suspension</td>
<td>1) Take measures of setting retaining walls, cover and water spraying; 2) Dispose wasted soil and debris at designated sites, and take dust suspension control measures of spraying water or solid waste covering agent at the pile of wasted soil (debris); 3) Stipulate reasonable construction plan and shorten construction period; 4) Measures of vaporous water spraying and greening in time should be taken at backfilled working shaft; 5) Reasonably arrange transportation routes, reduce driving speed when passing by residential areas; 6) Enhance transportation management, and insist good practices of loading and unloading; 7) Enhance the maintenance of construction machinery and vehicles.</td>
<td>3,305,000 (including 2,420,000 for mitigation measures and 150,000 for monitoring expense)</td>
<td>Contractor</td>
<td>Shanghai EPB /Nanhui EPB, Pudong New District Environmental Protection &amp; City Appearance Sanitation Administration Bureau</td>
<td>TSP In pumping station construction site: 1; 1 term/quarter; 2 days/term; 3 times/day Sensitive points along pipeline: 25, 2 terms/quarter; 2 days/term, 3 times/day</td>
<td></td>
</tr>
<tr>
<td>Wastewater</td>
<td>1) Set up wastewater collection and treatment facilities near each construction site and pumping station. Discharge wastewater into close river course or municipal sewers after treated to meet the standards; 2) Workers of pipeline construction should use。。。</td>
<td>。。。</td>
<td>。。。</td>
<td>。。。</td>
<td>。。。</td>
<td>。。。</td>
</tr>
</tbody>
</table>

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79
existing sanitary facilities close to the construction site as much possible. In places without sanitary facilities, mobile toilets can be used to collect sewerage. The environment and sanitation department will collect periodically; 3) Oil containing wastewater from canteen of construction workers should be treated by oil separating facility before discharge into municipal sewers; 4) Wastewater from construction cannot be discharged without sedimentation treatment. Discharge route should be clear, and direct discharge to water body is prohibited. Washing water and storm water runoff should be collected in open ditches and discharged after treated; 5) Groundwater seepage caused by excavation should be collected and discharged in a timely manner; 6) Construct 50cm high retaining wall with bricks around bulk material storage site as temporary protection measures; 7) Enhance environmental management, protect water body from pollution of leaked oil or poured oil of machinery. Suggest using container to collect leaked oil from machinery. 8) Construction materials, such as oil and chemicals should be stored away from rivers and canvas should be available for temporary covering to avoid entering into water body caused by heavy rain. 9) Strictly enforce construction operation standards and implement civil construction to avoid and reduce pollution accident.

<table>
<thead>
<tr>
<th>Noise</th>
<th>Contractors</th>
<th>Leq</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Construct building barriers on construction sites; 2) Use low noise equipment; 3) Reasonably schedule construction and prepare scientific construction plans; additionally, use of equipment that has high noise</td>
<td>Shanghai EPB /Nanhui EPB, Pudong New District Environmental Protection &amp; City</td>
<td>East and north boundaries of pumping station construction site; sensitive points along pipeline: 25; 1 term/month 1day/term; twice for daytime and twice for night</td>
</tr>
</tbody>
</table>
level, strong impact and vibration should be arranged in daytime. Construction activities that generate serious noise pollution should be strictly prohibited during night (22:00pm to 8:00am) and daytime (12:00-14:30); 4) Reasonably arrange construction sites to be away from residential areas.

**Solid waste**

1) Wasted soil should be reused to backfill foundation of other facilities in the city in priority by consultation with relevant administrations, disposed on site as much as possible, or delivered to designated sites for proper disposal; 2) Clean and dispose the solid wastes of construction sites in time; the sludge from wastewater treatment should be transported out of sites in time; the cleaning and disposal of solid wastes on construction site should be done well when construction completed; 3) Dumping solid waste into river course is prohibited when construction is close to rivers. Scattered solid waste floating on the water should be collected as much as possible; 4) Garbage bins for different categories of solid waste should be placed in different parts of construction sites; avoid mixing municipal solid waste with wasted soil (debris); the garbage should be periodically transported by sanitation department; 5) Education and management for temporarily employed workers should be strengthened to avoid littering of garbage and ensure centralized disposal of night soil and domestic garbage.

**Ecological system**

1) Optimize construction routes, reduce temporary land occupation as much as possible, try the best to reduce the damage on green belts; 2) Transplant the

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**Appearance Sanitation Administration Bureau**

- Shanghai EPB /Nanhui EPB, Pudong New District Environmental Protection & City Appearance Sanitation Administration Bureau

- Shanghai, (Nanhui District and Pudong New District) City Appearance Sanitation Administrative Bureau Wasted Soil Management Department

- Shanghai (Nanhui District, Pudong New District) Greening
| Public health | 1) Health check should be done by professional health agency for construction workers before entering construction site and during construction; 2) Enhance the management of drinking water supply, food and sanitation; 3) Enhance education and training on disease prevention and good health practice on construction site to, enhance sanitation and epidemic prevention. 4) Sanitation management guidelines should be developed and inspection on sanitation status of construction site should be strengthened. 5) Management and disposal of domestic sewage and garbage on construction site should be strengthened to maintain environmental sanitation. | Administrative Bureau | — | — |
| Social impact | 1) Shorten construction period with prerequisite of construction quality; 2) Construct temporary connections for construction in advance; 3) Inform residents along pipelines and pumping station in advance; 4) Assign dedicated person to solve complaints of public; 5) Take measures of diversion or pumps to ensure municipal drainage unbarred discharge during construction; 6) Enhance water spray to control dust suspension, noise control and traffic | Contractor | Shanghai (Nanhui District, Pudong New District) Health and Quarantine Station | — | — |
| sod and trees on the occupied lands and damage are not allowed; 3) Clean the sites after construction completed, deliver the wasted materials and debris; 4) Vegetation should be recovered as much as possible on naked surface caused by temporary land occupation. Dominating grass species in local area should be selected for planting. The recovered area of greening should not be less than original greening area. | | | | | |
dispersion on the roads close to sensitive targets, i.e. residential targets; 7) When pipe jacking across magnetic suspension rail or other large infrastructures, construction management should be strictly implemented based on construction plan to ensure construction safety.

| Culture relic | Enhance education on relic protection construction workers. Once cultural or historical relics are found during construction, construction activities should be suspended immediately and the site should be closed to avoid man-made damage. Existence of cultural or historical relics should be reported to local relic protection agency in time, and then the local relic protection agency will decide protection measures after field investigation, rescue or excavation. |
| Dist, Pudong New District) Traffic Administrative Departments |
| Shanghai/ (Nanhui, Pudong New District) Cultural Relic Protection Departments |

**Operation Period**

| Noise | 1) Semi-underground pump chamber is used; sound insulation and sound absorption treatment should be adopted for pump chamber, for example, acoustic shield is installed for pump and sound absorption material is used for inner wall of pump chamber to reduce noise escape; 2) low-vibration and less noisy pumps should be selected, damping treatment should be done to pump foundation, and flexible rubber joints should be equipped for inlet and outlet of the pump to reduce noise; 3) machinery should be well maintained to keep low noise level; 4) Based on landscape and needs, planting should be done as much as possible outside pump chamber and at pump station boundary |
| Operators |
| Shanghai EPB /Nanhui, EPB |
| Leq |
| Set one monitoring point at each of four boundaries of Nanhui North Pumping Station (east, south, west, north): 1 term/quarter; 2days/term; twice for daytime and twice for night |

<p>| 1,008,000 (including 19,200 for monitoring expenses) | — | — |</p>
<table>
<thead>
<tr>
<th>Ecological environment</th>
<th>1) Importance should be given to combination of trees, bush and grass planting proportionally and in certain structure; 2) Local species should be used as much as possible to reduce introduction of external species; 3) Dedicated persons should be assigned for planting and management of the pump station. Regulations should be made to protect green area and ecological environment; 4) Vegetation should be recovered as much as possible on naked surface caused by temporary land occupation. Dominating grass species in local area should be selected for planting. The recovered area of greening should not be less than original greening area. Meanwhile timely protection should be provided in major areas to prevent damages caused by various factors.</th>
<th>Shanghai EPB /Nanhui EPB, Pudong New District Environmental Protection &amp; City Appearance Sanitation Administration Bureau</th>
<th>Shanghai (Nanhui District, Pudong New District) Greening Administrative Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewerage</td>
<td>Sewage should be collected by sewers to municipal sewer mains.</td>
<td>Shanghai EPB /Nanhui EPB, Pudong New District</td>
<td>Shanghai (Nanhui District, Pudong New District)</td>
</tr>
<tr>
<td>Solid waste</td>
<td>Place garbage bins by category in the pumping station to keep clean environment and sanitation. Screening grits and municipal solid waste should be stored at designated place by category and transported in time. Entrust Nanhui environment and sanitation department to deliver the solid waste.</td>
<td>Operators</td>
<td></td>
</tr>
<tr>
<td>Safety of pipeline</td>
<td>1) Define protection range of transmission pipelines (8 meters wide of both sides of pipe center), establish permanent identification marks in the protection area; 2) enhance inspection along pipelines. Activities which are not accordance with Protection Methods for</td>
<td>Shanghai EPB /Nanhui EPB, Pudong New District Water Authorities</td>
<td>Shanghai (Nanhui, Pudong New District) Water Authorities</td>
</tr>
</tbody>
</table>
Raw Water Diversion Pipe and Canal of Shanghai, such as Piling, well drilling, pit digging, soil exaction, are not allowed; 3) Develop a strict operation manual for pipe safety inspection and implement seriously.
Table 10-2 Summary of Nanhui Conveyor Environmental Monitoring Plan

<table>
<thead>
<tr>
<th>Potential Impacts/Issues</th>
<th>Parameters to be monitored</th>
<th>Location of monitoring</th>
<th>Frequency of monitoring</th>
<th>Budget in RMB</th>
<th>Responsibility for implementation (monitoring)</th>
<th>Responsibility for supervision and analysis of monitoring data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>One at construction site of Nanhui North pumping station</td>
<td>1 term/quarter, 2 days/term, 3 times/day</td>
<td></td>
<td>Shanghai/(Nanhui District, Pudong New District) Environmental Monitoring Stations</td>
<td>Shanghai/(Nanhui District, Pudong New District) Environmental Monitoring Stations</td>
</tr>
<tr>
<td>Environment atmosphere</td>
<td>TSP</td>
<td>25 sensitive points along pipeline</td>
<td>2 term/quarter, 2 days/term, 3 times/day</td>
<td>89,280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction wastewater</td>
<td>SS, oil</td>
<td>87 outfalls of construction wastewater treatment facilities</td>
<td>1 term/quarter, 2 days/term, 3 times/day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction noise</td>
<td>Leq</td>
<td>East and north boundaries of Nanhui North pumping station construction site; 25 sensitive points along pipeline</td>
<td>1 term/month, 1 day/term, twice at day time and twice at night</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise of pumping station</td>
<td>Leq</td>
<td>One each at east, south, west, north boundaries of Nanhui North pumping station</td>
<td>1 term/quarter, 2 days/term, twice at day time and twice at night</td>
<td>19,200</td>
<td>Shanghai/Nanhui District Environmental Monitoring Stations</td>
<td>Shanghai/Nanhui District Environmental Monitoring Stations</td>
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### Abbreviation

<table>
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<th>Full Form</th>
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</thead>
<tbody>
<tr>
<td>BOD</td>
<td>Biological Oxygen Demand</td>
</tr>
<tr>
<td>CCV</td>
<td>Construction Contract Value</td>
</tr>
<tr>
<td>COD</td>
<td>Chemical Oxygen Demand</td>
</tr>
<tr>
<td>CSE</td>
<td>Construction Supervision Engineer</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EMD</td>
<td>Environmental Management Director</td>
</tr>
<tr>
<td>EMC</td>
<td>Environmental Manager Coordinator</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>EPB</td>
<td>Environmental Protection Bureau</td>
</tr>
<tr>
<td>ESE</td>
<td>Environmental Supervision Engineer</td>
</tr>
<tr>
<td>MEP</td>
<td>Ministry of Environmental Protection</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
</tr>
<tr>
<td>PMO</td>
<td>Project Management Office</td>
</tr>
<tr>
<td>PRC</td>
<td>People's Republic of China</td>
</tr>
<tr>
<td>RAP</td>
<td>Resettlement Action Plan</td>
</tr>
<tr>
<td>RMB</td>
<td>Renminbi</td>
</tr>
<tr>
<td>SEPA</td>
<td>State Environmental Protection Administration</td>
</tr>
<tr>
<td>SEPB</td>
<td>Shanghai Environmental Protection Bureau</td>
</tr>
<tr>
<td>SH PMO</td>
<td>Shanghai World Bank Loan Project Management Office</td>
</tr>
<tr>
<td>SMG</td>
<td>Shanghai Municipal Government</td>
</tr>
<tr>
<td>SS</td>
<td>Suspended Solid</td>
</tr>
<tr>
<td>TA</td>
<td>Technical Assistance</td>
</tr>
<tr>
<td>WB</td>
<td>the World Bank</td>
</tr>
<tr>
<td>WTP</td>
<td>Water Treatment Plant</td>
</tr>
</tbody>
</table>
Qingcaosha Water Source Raw Water Project-Nanhui Conveyor Works

Environmental Management Plan

Project Implementing Agency:

Shanghai Qingcaosha Investment, Construction and Development Ltd.

EIA Institute:

Shanghai Investigation, Design & Research Institute

September, 2008
Qingcaosha Water Source Raw Water Project-Nanhui Conveyor Works

Environmental Management Plan

Project Name: Qingcaosha Water Source Raw Water Project
-Nanhui Conveyor Works

Project Implementing Agency: Shanghai Qingcaosha Investment,
Construction and Development Ltd. (Guohuanpingjiazi No. 1812)

EIA Institute: Shanghai Investigation, Design & Research Institute

Legal Person: Shi Xiaoqiang

Project Manager: Zhang Hongwei

Examined by: Du Xinhui

Verified by: Zhang Hongwei

Prepared by: Cheng Bixin, Ji Yao, Gui Qing, Shen Che