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Longtan Water Treatment Plant Project (Phase I)

Environmental Management Plan

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Construction Unit: Nanjing Water Supply Company

Evaluation Unit: Hehai University

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1. Background and Objectives of Environmental Management Plan (EMP)

1.1 Project Background

With the rapid development of economic in suburb, including overall construction of Xixia District, Xianlin New Town Area and Longtan New Town, and further acceleration of urbanization, water demand in the northeast of Nanjing urban area has a large increase. There is a big gap in the regional water supply quantity and the obvious contradiction between water demand and water supply.

Longtan New Town, Xixia District and Xianlin New Town Area are located in the northeast of Nanjing urban area. Making the best of its riverbank resource, Xixia District recently fulfilled the development and construction along the Yangtze River. Regional economic and social undertakings have developed rapidly: Huaneng Jinlin Coal-fired Power Plant, Huaneng Jinlin Gas Power Plant and Nanjing Crystal Valley have been settled; North City Market Group and 312 State Road Economic Zone have taken on a certain scale; tourism and real estate sectors have shown a good momentum of development. Being close to the urban city, Xianlin New Town Area uses its location advantages to actively develop the real estate and infrastructure construction: Xianlin Campus City has basically taken shape and other constructions are in full swing. Faster development of regional economic and constructions require the improvement of quantity and quality of water supply in this region. However, the existing water treatment plants in the northeast area are township water treatment plants or enterprise-owned waterworks which are small in scale with backward technology and outdated equipment, coupled with backwardness of management and technical. The current water facilities cannot meet the increasing demands of water quantity and quality, as the result the contradiction between water supply and demand becoming prominent. Thus, it has created severe negative impacts to the quality of life and health of the residents, as well as the rapid economic development activities.

In order to better adapt to the city development and increasing demands of water quantity and quality, Nanjing Municipal Government planned to implement the First Phase Project of

the Longtan Water Treatment Plant (400,000 m^3/d), consisting of water intake project, water treatment plant project and associated works such as water transmission pipes. The total investment was estimated to be RMB 681.5046 million, with US$ 13 million to be funded by the World Bank (WB) (equivalent to RMB 89.18 million) and the rest from domestic bank loans. Considering the short of domestic fund, Jiangsu Provincial Government proposed to use the WB loan to accelerate the construction and fulfillment of the first phase of the project. Using the WB loan to construct the Longtan Water treatment plant will ease up the pressure of water supply in Nanjing and help boosting the development of city and improving the living standards.

Based on the project characteristic and location Environmental features, according to the Law of Environmental Protection of P.R.C, the Interim Regulations on Giving Punishments for Illegal Acts and Disciplinary Offences in Environmental Protection, the Regulations on the Administration of Construction Project Environmental Protection, the Law of Air Pollution Control of P.R.C, the Law of Water Pollution Prevention and Control of P.R.C, the Law of Ambient Noise Pollution Control of P.R.C, the Regulations on City Appearance and Environmental Sanitation Management and etc., this EMP is using relevant policies as guidance to realize the purpose of develop economic and protect environment. The overall principle is to control the pollution from the source to the end of treatment to ensure the effective management. The EMP is focus on the project features and addressing on the main Environmental problem, carrying out the requirements of “Cleaner Production”, “Discharge Standard” and “Total Control”. The EMP details the monitoring, supervision and control measures on Environmental impacts during construction and operation stage of project to ensure minimum these impacts. The selected Environmental protection measures are technology-reliable and economic-reasonable.

1.2 Objectives of the EMP

The Environmental Impact Assessment (EIA) of the project demonstrates that the main pollution is from the newly-built water treatment plant during construction stage and operation stage of all water treatment plants. This EMP details the mitigation, management, supervision and monitoring measures, which are the guidelines of these activities.

The roles of the EMP are as follows:

(1) Define the Environmental mitigation measures of affected objects. Nanjing Environmental Protection Bureau (EPB), EIA company and design institute have checked and confirmed the affected objects to propose effective mitigation measures which are brought into the project design.

(2) Provide Environmental guidelines. After reviewed by the WB, this EMP will provide an Environmental protection reference for all concerned parties, including construction observation companies, Environmental supervision departments and other relevant departments during construction and operation phase.

(3) Determine the responsibilities and functions of relevant parties. The EMP determines the responsibilities and roles of relevant functional departments and governing institutions and provides communication channels and manners between each party.

(4) Propose Environmental monitoring plans. In order to ensure effectively implement mitigation measures and timely deal with the unforeseen or unexpected Environmental issues, this EMP proposes the monitoring plans during construction and operation stages.

1.3 Program of action and requirements

With the joint efforts of WB officials, international consultants, EIA unit and Nanjing EPB, this EMP constitute the overall objectives of the project during construction and operation stage, including maintaining socio-economic and environmental sustainability, improving the Environmental quality, mitigating or compensating for the negative impact to the community and the environment, until the minimum.

Concrete actions: (1) propose and implement Environmental management and monitoring program; (2) propose and implement pollution-control strategy to mitigate the impacts on environment.

Specific requirement: (1) check on the monitoring results of listed parameters in the monitoring program on construction and operation stages; (2) implement Environmental mitigation measures proposed in EIA reports in accordance with prescribed procedures.

2. Compilation Basis

2.1 Compilation Basis

2.1.1 Environmental Protection Laws and Regulations

（1）Law of Environmental Protection of P.R.C (1989.12)

（2）Law of Water Pollution Control of P.R.C (revised in 1996.5)

（3）Law of Air Pollution Control of P.R.C (2000.4)

（4）Law of Ambient Noise Pollution Control of P.R.C (1996.1)

（5）Law of Solid Waste Pollution Control of P.R.C (2005.4.1)

（6）Law of Environmental Impact Assessment of P.R.C (2002.10)

（7）Law of Cleaner Production Promotion of P.R.C (2002.6)

（8）Law of Soil Conservation of P.R.C (1991)

（9）Law of Energy Conservation of P.R.C, enforced since 1998.1.1

（10）Notification on Strengthening Industry Water Conservation(State Economic and Trade Commission Resource [2000] No.1015)

（11）Classified Catalogue for Environmental Protection Management of Construction Projects (No.14 Order by the Ministry of Environmental Protection)

（12）Regulation on the Administration of Construction Project Environmental Protection (State Department [98] No.253)

（13）Detailed Method on the implementation of “Administration of Construction Project Environmental Protection” in Jiangsu Provence (Su Huan [88] No.1 by Jiangsu Environmental Protection Committee, Jiangsu Planned Economy Committee and Jiangsu Construction Committee)

（14）Approval on Surface Water Environmental Functional Zoning in Jiangsu Province (Su Zheng Fu [2003] No.29 by Jiangsu Provincial Government)

（15）Surface Water Environmental Function Zoning in Jiangsu province (2003.3 by Jiangsu Water Resource Department and Jiangsu Environmental Protection Department)

（16）Ambient Air Quality Functional Zoning in Jiangsu Province (1998.6 by Jiangsu EPB)

（17）Methods for Installation and Standardized Management of Wastewater Outfalls in Jiangsu Province (Su Huan Kong [97] No.122)

（18）Details for the Implementation of Environmental Protection Management Methods for Construction Projects in Jiangsu Province, by Jiangsu Provincial Environmental Committee, Provincial Planning Economy Committee and Provincial Construction Committee, Su Huan (88) No.01;

（19）Regulation on Administration of Urban Water Supply Resource in Jiangsu Province (revised) (issued on 1997.7.31)

（20）Regulation on Environmental Protection in Jiangsu Province (revised) (1997.7.31)

（21）Temporary Regulations on Total Amount Control of Pollutant Discharge in Jiangsu Province (No.38 order by provincial government [1993])

（22）Regulation on Ambient Noise Pollution Prevention and Control in Jiangsu Province (by the Standing Committee of Jiansu Provincial People's Congress, enforced since Mar. 1st, 2006)

（23）Requirements for Preparing Main Contents of Environmental Impact Assessment Report for Industrial Construction Projects in Jiangsu Province (2005.5 by Jiangsu Environmental Protection Department)

（24）Regulations on Drinking Water Source Protection Zones Pollution Protection and Control (1989.7.10)

（25）Technical Specifications on Drinking Water Resource Protection Zoning (TJ/T338-2007) (Environmental Protection Industry Standard of P.R.C, 2007.1)

（26）Directive Catalogue for Industry Restructure (2005)

（27）Orientation Catalogue for Encouraging Investment of Industry and Commerce in Jiangsu Province (2004)

（28）Regulation on the Yangtze River Pollution Control (2004.12)

（29）Notification on Clean-up of Newly-built and Expanded Construction Project and Dock in the Class II Drinking Water Source Protection Zones (Su Huan Guan [2007] No.159, 2007.7)

（30）Decision of Standing Committee of Jiangsu Provincial People's Congress on Strengthening Protection of Drinking Water Resource (approved on the 35th meeting of Standing Committee of 10th Jiangsu Provincial People's Congress on Jan. 19th, 2008, enforced since Mar. 22nd, 2008)

2.1.2 Technical Guidelines

（1）Technical Guidelines for Environmental Impact Assessment (HJ/T2.1～2.3-93)

（2）Technical Guidelines for Noise Impact Assessment (HJ/T2.4-95)

（3）Technica1 guidelines for environmental impact assessment-Eco1ogical environment of nature resource development (HJ/T19-1997)

（4）Technical Guidelines for Environmental Risk Assessment on Projects (HJ/T169-2004)

2.1.3 Applicable WB Policies

（1）Operation Policy of World Bank, OP/BP 4.01 Environmental Assessment

（2）WB Safeguard policies

2.2 Applicable Standards

2.2.1 Objectives of Pollution Control

This project is a municipal project with light pollution. The objectives of pollution control are to meet the discharge standards for industrial wastewater and domestic wastewater, to reach the emission standard for plant boundary noise and to realize the innocuous treatment and zero-discharge of sludge and garbage.

2.2.2 Environmental Functional Zoning

(1) Water Environment

According to the requirements of the Approval of Provincial Government on Surface Water Environmental Functional Zoning in Jiangsu province (by Jiangsu Provincial Government, Su Zheng Fu [2003] No.29) and Surface Water (Environmental) Functional Zoning in Jiangsu Province, the environmental functional zoning of the assessed water areas is listed in Table 2.2.2-1.

Table 2.2.2-1 Water Environmental Zoning in the Assessed Water Areas

Name of River	Starting and Ending Positions	Name of Water Function Area	Name of Water Environmental Functional Zone	Target of water quality[1] (GB3838-2002)
Yangtze River	Nanjing Jiuxiang Estuary – Nanjing Qixiang Estuary	Yangtze River Longtan planning drinking water resource and area for industrial water use (right bank) 6.96km	Drinking water resource protection zone	II/II
	Nanjing Qixiang estuary – Nanjing Xixia Three River Estuary	Xixia segment of Yangtze River for fishery and agricultural water use (right bank) 9.74km	Fishery water use area	II/II
	Anji Mountain - Xihua	Qixiang River Section for agriculture water use 18km	Agriculture water use area	V/IV

Note: [1] III/III refers to the target of water quality for 2010/2020

The location of planned Longtan Drinking Water Resource Protection Zone is shown in Fig. 1-2.

(2) Atmospheric Environment

This project is located on the river bank as part of the Nanjing Xixia Economic and Technology Development Zone. It is class II ambient air quality function area and adopts class II standard of Ambient Air Quality (GB3095-1996).

(3) Acoustic Environment

According to the Adjustment Plan for Ambient Noise Standard Applicable Region in Nanjing (Ning Zheng Fu [2004] No.273), the project location is class III ambient noise quality district and adopts class III Standard of Environmental Noise of Urban Area (GB3096-93).

2.2.3 Assessment Rank of EIA

Based on the project characteristics, the assessment rank of EIA is classified according to Technical Guidelines for Environmental Impact Assessment (HJ/T2.1～2.3-93), Technical Guidelines for Noise Impact Assessment (HJ/T2.4-95) and Technica1 guidelines for environmental impact assessment-Eco1ogical environment of nature resource development

(HJ/T19-1997).

(1) Aquatic Environment

The discharged effluent mainly is domestic wastewater from workers on construction stage and from staff of water treatment plant on operation stage. The complexity of water quality is relatively simple. Domestic wastewater on operation stage will be discharged to the Xianlin Wastewater Treatment Plant through municipal sewage pipe network, which would have relatively small impact on the aquatic environment. Through analysis of reliability and security of water intake, the rank of water Environmental impact assessment is class III.

(2) Atmospheric Environment

The main air pollutant from the project is total suspended particulates (TSP) on construction stage and its source is fugitive emission source. The project is located on the plain with comparatively good ambient air quality. Under normal circumstance on operation phase, there is no air pollution emission, so that it carries out a general impact analysis of air environment on construction phase.

(3) Acoustic Environment

As a municipal engineering construction project, there is no high sound power level of noise source and the charge of ambient noise level is not obvious. The rank of noise impact assessment is class III.

(4) Ecological Environment

The project site is a planning reserved land use which actually is wasteland and pond. The impact on ecological environment is mainly from construction stage and there is no ecological sensitive target such as nature reserve around the site. So that it carries out a general impact analysis of ecological environment.

2.3 Environmental Quality Standards

（1）Environmental water quality standards

Water quality standards of water source in Yangtze River are presented in table 2.3-1, among which item 1-23 are Class II standards from Table 1 of Surface Water Quality Standards (GB3838-2002), item 24-28 are from Table 2, and item 29 is the limit standard from Surface Water Quality Standards (SL-90) of the Ministry of Water Resource of the

P.R.C.

Table 2.3-1 Water Quality Standards of Water Source (Unit: mg/L)

Item No.	Parameters	Limit	Item No.	Parameters	Limit
1	pH value (dimensionless)	6～9	16	Chromium (Cr^{6+}) ≤	0.05
2	DO ≥	6	17	Total lead (Pb) ≤	0.01
3	COD_{mn} ≤	4	18	Total cyanide (CN^-) ≤	0.05
4	COD ≤	15	19	Volatile phenol ≤	0.002
5	BOD_5 ≤	3	20	Oil ≤	0.05
6	$N\text{-}NH_3$ ≤	0.5	21	Anionic detergent ≤	0.2
7	TP ≤	0.1	22	Sulphide ≤	0.1
8	TN ≤	0.5	23	Coli forms (number/L)≤	2000
9	Copper(Cu) ≤	1.0	24	Sulphate ≤	250
10	Znic(Zn) ≤	1.0	25	Chloride ≤	250
11	Fluoride ≤	1.0	26	Nitrate ≤	10
12	Selenium(Se) ≤	0.01	27	Manganese(Mn) ≤	0.1
13	Arsenic(As) ≤	0.05	28	Iron(Fe) ≤	0.3
14	Mercury (Hg) ≤	0.00005	29	SS ≤	25
15	Cadmium (Cd) ≤	0.005			

Water Quality Standards of Jiuxiang River and Qixiang River are presented in Table 2.3-2, among which item 1-8 are class V standards from Table 1 of Surface Water Quality Standards (GB3838-2002), item 9 is is the limit standard from Surface Water Quality Standards (SL-90) of the Ministry of Water Resource of the P.R.C.

Table 2.3-2 Water Quality Standards of Jiuxiang River and Qixiang River (Unit: mg/L)

Item No.	Parameters	Limit
1	pH value (dimensionless)	6～9
2	DO ≥	2
3	COD_{mn} ≤	15
4	COD ≤	40
5	BOD_5 ≤	10
6	$N\text{-}NH_3$ ≤	2.0
7	TP ≤	0.4
8	Oil ≤	1.0
9	SS ≤	60

（2）Environmental Air Quality Standards

Class II Standards of Environmental Air Quality (GB3095-1996) is presenting in the following table 2.3-3. The chlorine limit is the maximum allowable concentration for residential district in Hygienic standards for the Design of Industrial Enterprises (TJ36-79).

Table 2.3-3 Environmental Air Quality Standards

Pollutants	Sample time	Concentration limits(mg/m^3)
SO_2	Yearly average	0.06
	Daily average	0.15
TSP	Yearly average	0.20
	Daily average	0.30
NO_2	Yearly average	0.08
	Daily average	0.12
Chlorine	Once	0.10
	Daily average	0.03

（3）Environmental Quality Standards for Noise

Protection targets adopt Class II Noise Standards of Urban Area(GB3096-93) which are 60dB(A) by day and 50dB(A) by night. Project site adopts Class III standards which are 65db(A) by day and 55db(A) by night.

2.4 Emission Standards

（1）Wastewater

Effluent discharges adopt Class III standards in Table 4 of Integrated Wastewater Discharge Standard (GB8978-1996) and Maximum Allowable Concentration in Table 1 of Discharge Standard for Municipal Wastewater (CJ3082-1999), which are listed in following table 2.4-1. For effluent from wastewater treatment plant, Sanitary Standard for Drinking Water (GB5749-2006) is applicable, shown in table 2.4-2.

Table 2. 4-1 Emission Standards of Effluent （mg/L，except pH）

Item No.	Parameter	Emission limits	Note
1	PH	6~9	Class III Standard in Table 4 of GB8978-1996
2	SS	400	
3	BOD_5	300	
4	COD_{Cr}	500	
5	$N\text{-}NH_3$	35.0	Maximum Allowable Concentration in Table 1 of CJ3082-1999
6	Sulphate (P)	8.0	

Table 2.4-2 Conventional Water Quality Indicators and Limits

Indicator	Limits

Indicator	Limits
1、Microbiological Index①	
Total coliform group（MPN/100mL or CFU/100mL）	Not detected
Thermotolerant coliform bacteria (MPN/100mL or CFU/100mL)	Not detected
Escherichia coli（MPN/100mL or CFU/100mL）	Not detected
Total bacteria（CFU/mL）	100
2、Toxicological Index	
As（mg/L）	0.01
Cd（mg/L）	0.005
Cr^{6+}（mg/L）	0.05
Pb（mg/L）	0.01
Hg（mg/L）	0.001
Se（mg/L）	0.01
cyanide（mg/L）	0.05
fluoride（mg/L）	1.0
nitrate (N)（mg/L）	10 20(limited for groundwater source)
cloroform（mg/L）	0.06
carbon tetrachloride（mg/L）	0.002
bromate（disinfected by ozone, mg/L）	0.01
formaldehyde（disinfected by ozone, mg/L）	0.9
chlorite（disinfected by chlorine dioxide, mg/L）	0.7
chlorate（disinfected by chlorine dioxide, mg/L）	0.7
3、Sensory properties and chemical indicators	
chroma	15
turbidity（NTU）	1 3(when limited by source and water treatment technology)
smell and taste	none
visible materials	none
pH （pH unit）	6.5 ≤ 8.5
Al（mg/L）	0.2
Fe（mg/L）	0.3
Mn（mg/L）	0.1
Cu（mg/L）	1.0
Zn（mg/L）	1.0
chloride（mg/L）	250
sulphate（mg/L）	250
DS（mg/L）	1000
Total hardness(by $CaCO_3$,mg/L）	450

Indicator	Limits
DO（COD_{Mn}, by O_2, mg/L）	3 5(when limited by water source and origin water DO ＞6mg/L)
Volatile hydroxybenzene (by phenol, mg/L）	0.002
Anion synthetic detergent（mg/L）	0.3
4、Radioactive Index②	Guideline value
Total α radioactivity（Bq/L）	0.5
Total β radioactivity（Bq/L）	1

① MPN means most probable number; CFU means colony forming unit. When detecting total coliform group, water sample should be further tested for escherichia coli or thermotolerant coliform bacteria; if not, there is no need to further test.

② If the value of radioactive indicators exceed the guideline value, water sample should be carried out nuclide analysis and evaluation to determine whether it is drinkable.

（2）Noise

Construction noise adopts Noise Limits for Construction Site (GB12523-90) standards, shown in Table 2.4-3.

Table 2.4-3 Noise Limits for Construction Site (GB12523-90) Unit: dB(A)

Construction period	Main noise source	Limiting values	
		Day	Night
Cubic meter of earth and stone	Bulldozer, grab, loading truck, etc.	75	55
Piling	Various pile driver	85	Ban
Construction	Concrete mixer, vibrating tamper, electrical saw, etc.	70	55
Fitting	Crane, elevator, etc.	65	55

Operation noise adopts Class III Standard of Noise at Boundary of Industrial Enterprises (GB 12348-90), which are 65dB(A) by day and 55dB(A) by night.

（3）Sludge

The sludge adopts Control Standards for Pollutants in sludge from agricultural use (GB4284-84).

（4）Exhaust Gas

The chlorine of fugitive emission source adopts Class II standards of Integrated Emission Standard of Air Pollutants (GB16297-1996), that is maximum acceptable emission concentration beyond boundary 0.40mg/m^3.

3. General about the Project

3.1 Project Introduction

3.1.1 Project Name, Characteristics, Location and Existing Environmental Conditions

Project Name: Phase I of Nanjing Longtan Water Treatment Plant (400,000 m^3/d)

Characteristic of Construction: Municipal Infrastructure, newly-built

Location: in the northeast of main urban area of Nanjing municipality, in the north of Xixia Economic Development Zone, with the geographical location at 32°03’ N and 118°47’E.

Current environmental conditions: The land to be occupied by the project is the planned reserved land, where there is currently wasteland and pools. There is no ecologically sensitive target such as natural reserve around the project site; there is no protected fish pond near the area.

3.1.2 Project Investment and Time of Construction

Total investment: RMB 645.31million, with US$ 12.85 million to be funded by the World Bank loan (equivalent to RMB 78.83 million) and the rest from domestic bank loans

Time of construction: Project bidding and project construction is expected to be completed in December 2013, and the project of Longtan Water Treatment Plant is planned to be completed and put into operation in March 2015.

3.1.3 Project Implementation Schedule

According to the objectives and requirements of project construction, the proposed project implementation schedule is as follows:

(1) Complete the approval of project application report in June 2013;
(2) Complete the preliminary design and its appraisal and modification in August 2012;
(3) Complete the preparation of working drawings and design documents in October 2012;
(4) Complete construction bidding and construction commencement in December 2013;

(5) Complete project construction and installation in December 2014;
(6) Commissioning and trial operation in March 2015;
(7) Put into formal operation at the end of March 2015.

3.2 Project Composition

The Phase I of Nanjing Longtan Water Treatment Plant consists of water intake, water treatment plant and water transmission pipes with the treatment capacity of 200,000m^3/d.

3.2.1 Water Treatment Plant

（1）Mixing, table-flap and laminar settling tank

Laminar settling tank: amount 2, design scope 200,000 m^3/d and 2 cells.

Mechanical mixing tank: amount 4 (co-built with laminar sedimentation tank), design scope 100,000 m^3/d, size 2.7m×2.7m and effective depth 4.05m.

Table-flap flocculation tank: amount 2 (co-built with laminar sedimentation tank), design scope 200,000 m^3/d and one-cell. The folded plate is 120° relative folding in stainless material. Each tank is with size 20m×16.15m, effective depth 3.95-3.60m and flocculating time 16min.

Single pool laminar settling tank: size 122.05m×20m, effective depth 3.4m, allowable sludge height 0.2m, settling time 120min and laminar velocity 17mm/s. After passing through table-flap flocculation tank, effluent flows directly into settler. The outfall is stainless finger launder. Effluent load is less than 300m^3/d•m.

Each cell of settling tank has a set of siphonic drain mud machine with a height meter. When the accumulated mud reaches a certain height, the machine begins to run.

The outfall channel of settling tank is 1.6m wide, 1.2m high. There are two overhead channel connected between outfall of settler and inlet of filter. Each channel is 1.6m (wide) × 1.2m (deep) with a 1.6m×1.2m outfall sluice valve.

（2）Homogeneous media filter

Homogeneous media filter: amount 2, design scope 200,000 m^3/d, size 52.99m×48.90m, 4.3m deep, reinforced concrete structure, design filter velocity 8m/h, up-level water depth 1.2m and quartz sand as media.

Back-wash method is air water backwashing and surface sweep washing. Design parameters: air wash rate 55m^3/h•m^2; air water washing, water wash rate 10m^3/h•m^2; water wash rate 17

$m^3/h•m^2$; surface sweep wash rate 8 $m^3/h•m^2$. Air and water is from blower and pump of back-wash pumping house.

To prevent occurring of alga, a cover is set for the upper part of filter. The bottom part is disinfect contact tank, contacting time 30min, size 52.99×45.20m, roof pressure 1.45m.

（3）Back-wash pumping house

The back-wash pumping house in first phase project is designed taking into account sand filter and long-term active-carbon filter: design scope 400,000 m^3/d, 3 sand-filter water wash pumps (2 for use and 1 for stock); active-carbon filter wash will equipped after construction of long-term advanced treatment; 3 post adding chlorine booster bumps (2 for use and 1 for stock); 2 post complementing chlorine booster bumps (1 for use and 1 for stock); size 47.49m× 16.48m.

（4）Clean water tank

Clean water tank serves as a regulator, its design volume 10% of project scope, that is, total effective volume 40,000 m^3 with 2 cells.

Each cell: size 49.75m×93.25m, effective depth 4.5m, 1×DN1600 inlet pipe and 1× DN1800 outlet pipe equipped manual butterfly valve respectively. Each cell has a DN1600 overflow pipe, elevation equaling to highest water level.

（5）Water intake well and secondary pump house

Water intake well and secondary pump house are built separately. Power distribution room locates to the south of pump house.

① Water intake well

Water intake well: underground reinforced concrete structure, amount 2,size 13.6m×10m, depth 10.0m.

② Secondary pump house

Secondary pump house: civil engineering design scope 600,000 m3/d, single-row layout, size 60.48m×15.48m, lower part deep 8.60m, reinforced concrete structure.

Secondary pump house in first phase of project will be installed 5 centrifugal clean water pumps (4 for use and 1 for stock). Each pump is equipped flow meter and manual examining and repair valve. The pump start-up adopts forward water intake method.

（6）Integrated dosing house

According to the water quality of waste water, the added drugs in first phase of project include

coagulant, chlorine and potassium permanganate. Based on the adding position and layout, for the convenient of management, it is planned to set one integrated dosing house and one chlorination room. The integrated dosing house is used for the storage, preparation, and dosing of coagulant and potassium permanganate, setting aside for active-carbon powder adding.

Civil engineering design scope for integrated dosing house is 600,000 m3/d, equipment configuration in first phase of project being 400,000 m3/d.

Potassium permanganate room is equipped preparation and dosing system, average dose 0.5mg/l, maximum dose 1mg/l, dose concentration 2%. The dosing point is located on inlet pipe. There are 4 dosing points in the first phase of project. There are 2 potassium permanganate solution pools: each size 2.5m(long)×2.5m(wide)×2.2m(deep), effective depth 1.7m, effective volume 10.6m3 and each equipped a slow mixer. Potassium permanganate adding pump is diaphragm metering pump, 6 in amount (4 for use and 2 for stock), motor power 0.18kw and pressure 3 bar.

The storeroom is designed for 9.5t, giving consideration of 15 day maximum dose storage for 600,000m3/d wastewater treatment. The pile size is 3.0m×3.0m and height 1m. Coagulant is liquid polyaluminium chloride (PAC) (containing 10% Al2O3), maximum dose 30mg/L (by PAC), average dose 15mg/L, and dosing concentration 1.6% (by Al2O3). The dosing point is located in mixing tank, 4 in amount for the first phase of project.

Outside the house, there is one underground liquid aluminum pool with 3 cells. The dimension of each cell is 5.0m×5.0m×2.0m. The pool is equipped 3 alum solution lift pumps, one for each cell.

There are 4 solution pools (2 for use and 2 for stock) in alum adding room. The solution is prepared 3 times one day. The dimension of the pool is 2.5m×2.5m×2.5m (effective deep 2.1m). Every pool is equipped 1 slow mixer, 4 in amount.

The maximum dose of alum solution is 3281 l/h for 400,000m3/d wastewater treatment. Adding pump is 1000 l/h diaphragm metering pump (6 in amount), 4 for use and 2 for stock, motor power 1.5kw and pressure 5 bar. Each dosing point is equipped one diaphragm meter pump. Space is reserved for 3 filling pumps in the future.

（7）Chlorine dosing house

This project adopts chlorine disinfect technology. Civil engineering design scope is 600,000

m3/d, equipment configuration in first phase being 400,000 m3/d. Chlorination point is set on the outflow of disinfect contact tank. Post complementing chlorine point is set on the outflow of clean water tank.

The maximum chlorination dose is 3mg/l, average dose 2mg/l and post complementing dose 1mg/l. On first phase stage, there are 2 chlorination points and 2 complementing points. It is equipped with 3×40kg/h vacuum chlorine filling pumps(2 for use and 1 for stock), 3×20kg/h vacuum chlorine filling pumps(2 for use and 1 for stock) and 2×100kg/h liquid chlorine evaporators(2 for use and 1 for stock).

There are 31×1t chlorine bottles stored in storeroom, ventilated by axial flow fan and equipped by LX-3t electric suspension crane. The chlorine dosing room and storeroom are installed leakage alarm device, equipped first-aid facilities such as protective mask. The storeroom is equipped a set of chlorine neutralizer with capacity of 2000kg/h.

（8）Sludge water treatment project

① Sludge water service reservoir

The inlet water of sludge water service reservoir is from settler sludge and separated liquid from dehydration machine, the former accounting for the most.

Each laminar settling tank has 2 cells, design scope of which 100,000 m3/d. Each cell drains mud at different time. Each draining lasts 5 hours. Liquid volume from mud-drain is 500 m3/d. So that liquid volume of every settling tank is about 5,000 m3/d. At first phase stage, total liquid volume is about 10,000 m3/d.

It is designed one sludge water service reservoir, effective volume 1500 m3, plan size 24.90m×16.20m, effective depth 4.0m and 2 cells operating independently serving as mutual backup. Each cell is equipped 3 submersible sludge pumps (2 for use and 1 for stock), with flux 190m3/h and head 14m. The reservoir is installed 4 underwater push-flow mixers, 2 for each cell (1 for use and 1 for stock).

② Thickener

At first phase stage, it is designed 2 thickeners to receive the outflow of sludge water service reservoir. The clean water from upper level is reused and sludge from bottom is sent to balance tank. Circular gravity thickener: solid flux 0.9kg dried mud/m2/h, resting time 24h, diameter 37m, deep 4.50m, effluent weir around and drive concentrator located in center.

③ Balance tank

Balance tank is used for regulating the liquid quantity difference between thickener and periodic intermittent operation of plate and frame pressure filter, balancing sludge concentration and serving as quantity and quality regulator. The effective volume is 2800m3 which could store 44h designed dried mud. The planned outline size is 37.63m×21.2m. Effective depth is 4.0m. The tank is divided into 2 cells, each with effective volume of 1400m3. Each cell is equipped submersible push-flow mixer to uniform sludge concentration and avoid accumulation.

④ Sludge dehydration machine and feed pump house

Civil engineering design scope is 600,000 m3/d built one time, equipment configuration in first phase being 400,000 m3/d. The machine is designed at 3% average solid content feeding, for dried mud quantity 46.2t/d at first phase stage and maximum dried mud quantity 100.9t/d. The house is designed for 3 plate and frame dehydration machines and will be installed 2 set at first phase stage. Each machine has 92 pieces 2.0m×2.0m plate and frame. Operating time is 16h at design load and 24h at maximum turbidity. After dehydration, sludge is transferred to sludge yard by screw conveyor.

Total construction area of dehydration machine house is about 2720m2, with two-story layout. In the upper part, it is disposed plate and frame dehydration machine and auxiliary electricity power and control facilities; in the lower part, it is disposed screw conveyor, feeding pump, extrusion pump, wash pump, vacuum pump, PAM adding, air compressor, rinsing tank and air storage tank.

The maximum dose of PAM is 2kg/t, adding concentration 0.2-0.3%, dilution concentration on line 0.1%. At first phase, it is equipped a set of PAM dosing and preparing system for 5.1-6.4 kg dried powder/h. It consists of automatic feeding, storage tank, double spiral quantitative distributor, dosing pool, feeding pool etc. There are 2 screw filling pumps with design flux of 3-18m3/h.

A 300m2 sludge heap shed is designed on one side of the house for temporary storing the mud cakes which could not be timely transferred after dehydration.

3.2.2 Water Intake

（1）Water intake and gravity pipe

The position of water intake is suited in the plant on the relative downstream along the Yangtze River, which is about 240m far from the Yangtze levee. The water intake is supported by pile holder and set up warning facilities around such as iron tower. Using grid tank to intake water, raw water flows to gravity pipes, 2×DN2200 steel mains of 320m each. Center elevation height of gravity pipe is -2.80(Wusong elevation height). Pipe jacking pass through Yangtze levee and connect the intake chamber of water intake pump house.

（2）Water intake pump house

Water intake pump house is located on the northeast corner of water treatment plant, which consists of intake chamber, intake well, bump and valve well. The pump house is designed with civil engineering scope 800,000 m^3/d built one time, and equipment configuration 400,000 m^3/d. Raw water flows into intake chamber through gravity pipe, passes rotating filters to get rid of suspended solids, then enters intake well. The intake chamber is reinforced concrete structure and divided into 2 cells with 2 intake pipes respectively. At the outlet of intake pipe, there is a gate valve; in the middle, there is a compartment gate valve.

There are 6 pump positions in the house. At first phase stage, 4 pumps would be installed, 2 big ones and 2 small ones, one of the big pumps for stock. The flux of big pump is 8750-14760m^3/h and that of small one is 4375-9540m^3/h. The plane size of the intake pump house is about 40.9m×48.6m. The outfall pipes are 4×DN1600 steel mains connecting 2×200000m^3/d settling tanks respectively.

3.2.3 Water Transmission Pipes

At this stage, one DN1800 effluent main will be designed from the secondary pumping station, which will, after leaving the plant, be split into three DN1200 clean water transmission mains at Bianming River Road according to the designed water service scope. The total length is about 8.2km, and the pipes are made of nodular cast iron.

3.2.4 Associated Works

In accordance with the requirements of relevant Chinese sector standards and technical specifications, at this stage, the project will be constructed together with the associated project

facilities including general layout of roads and transportation, electric automatic control, safety and fire control facilities, energy conservation and environmental protection facilities and water supply and wastewater facilities.

3.3 Project land acquisition

For Phase I of Longtan WTP, the total land acquisition is about 360mu, minus plant setback land, and Project land acquisition is about 275mu. The plant is divided into the front district which consists of office buildings and living buildings, and production district which consists of conventional filtration technology, sludge treatment and auxiliary works such as chlorine dosing and ammoniate dosing. Two separable districts have definite function and less interference.

3.4 Environmental protection objects and ambient Environmental quality

The environmental protection objects and ambient environment quality are listed in Table 3.4-1.

Table 3.4-1 Environmental protection position and request

Environmental Indicator	Protection objects	Orientation	Distance from water intake(m)	Scope	Environmental function
Atmospheric environment	Xihua Village	WS	200	1080 villagers	Class II
Aqueouse environment	Longtou Water Source Protecting Zone	N	/	400000t/d	Class II
	Water Intake of self-supply plant of Nanjing Yangtze Tanker Ship Base	W (upstream)	2000	4500t/d	
	Water Intake of Jiangnan Xiaoye District Cement Plant	W (upstream)	1500	15000t/d	
	Water Intake of Longtan Water treatment plant	E (downstream)	1100	10000t/d	
Acoustic environment	Xihua Village	WS	200	1080 villagers	Class III

4. Environmental Impacts and Mitigation Measures

4.1 Analysis of environmental impacts

4.1.1 Analysis of environmental impacts during construction period

4.1.1.1 Analysis of acoustic Environmental impacts

The impact of construction noise on ambient acoustic environment is evaluated by adopting Noise Limits for Construction Site (GB12523-90) (shown in table 4.1.1.1-1).

Table 4.1.1.1-1 Limiting values of noise at different construction stages

Construction period	Main noise source	Limiting values dB(A)	
		Day	Night
Cubic meter of earth and stone	Bulldozer, grab, loading truck, etc.	75	55
Piling	Various pile driver	85	Ban
Construction	Concrete mixer, vibrating tamper, electrical saw, etc.	70	55
Fitting	Crane, elevator, etc.	65	55

As the noise caused by construction machines is mainly in middle and low frequency, only diffusion attenuation would be taken into consideration when predicting the noise impact. The predication mode is as following:

$L_2 = L_1 - 20\lg(r_2 / r_1)$ （$r_2 > r_1$）

L_1, L_2 – equivalent sound level A (dB(A)) at r_1,r_2

r_1, r_2 – distance from acceptance to noise source (m)

derived the attenuation difference of sound level through distance ΔL:

$\Delta L = L_1 - L_2 = 20\lg(r_2 / r_1)$

From the former formulation, it could be calculated the attenuation value of noise through distance, seeing table 4.1.1.1-2.

Table 4.1.1.1-2 Attenuation value of noise through distance

Distance (m)	1	10	50	100	150	200	250	300	400	600
ΔLdB(A)	0	20	34	40	43.5	46	48	49.5	52	55.6

According to the highest sound level machine listed in table 4.1.1.1-1, the attenuation

value of construction noise through distance is shown in table 4.1.1.1-3.

Table 4.1.1.1-3 Attenuation value of construction noise through distance

Type of machine	Distance (m)	10	50	100	150	200	250	300	400
Pile driver	Noise value dB(A)	100	86.0	80.0	76.5	74.0	72.0	70.5	68.0
Concrete mixer		84.0	70.0	64.0	60.5	58.0	56.0	54.5	52.0
Grab, crane, camion		82.0	68.0	62.0	58.5	56.0	54.0	52.5	50.0

From the table 4.1.1.1-3, it could be concluded that it would reach the limiting value of noise beyond 100m by day and 300m by night(pile driver is forbidden to operate at night). The acoustic environmental protection target is Xihua village, which locates at 200m outside the scope of construction. According to the calculation, the construction noise at night would cause certain bad influence on the villagers. It should be forbidden to operate high frequency machine at night to mitigate the influence.

4.1.1.2 Analysis of aqueous Environmental impacts

（1）Industrial wastewater

Industrial wastewater consists of cooling and washing water of all kinds of machinery, waste water from washing construction site and material, and pressure testing water, which contains some oil and sand.

（2）Domestic wastewater

Domestic wastewater is from the activities of workers, including eating, washing and toilet. There would be about 50 worker on the site. Assumed average wastewater quantity 100L/person/d, main pollutants COD (300mg/l), SS(200mg/l) and NK(30mg/l), the total quantity of domestic wastewater and concentration of discharged pollutants are shown in table 4.1.1.2-1.

Table 4.1.1.2-1 Domestic wastewater quantity and concentration

Workers	Quantity （t/d）	SS （kg/d）	COD （kg/d）	NK （kg/d）
50	5	1	1.5	0.1

Although there is relatively small quantity of wastewater, it would cause obvious water pollution if no or improper treatment. The wastewater should not discharge directly and need adopting mitigation measures.

4.1.1.3 Analysis of atmospheric Environmental impacts

During construction, the air pollutants mainly are:

（1）Exhaust gas

The exhaust gas is mainly from mechanical driver equipments (for example, diesel engine), transportation vehicles and fuel. The main pollutants are NO_x, CO and hydrocarbon.

（2）Dust

The dust is mainly from:

① earthworks (excavation, piling up, removal, backfilling and site preparation)

② transportation

③ assembling, transporting and piling up of construction materials (such as cement, lime and sand) and earthwork

④ ground dust caused by mixer and transporting vehicles

⑤ piling up and removal of solid waste

The exhaust gas and dust would cause ambient air pollution, especially the dust.

The dust pollution depends on the construction practices, materials stacking and wind power, the last one affecting the most. With the increase of wind speed, the extent and scope of dust pollution would subsequently enhance and expand.

At construction stage, with the construction activities, including excavation, loading and transportation, the dust would adversely affect the neighboring air environment. Reasonable and practicable control measures must be taken to minimize the degree of pollution, narrowing the incidence.

4.1.1.4 Analysis of solid waste impacts

The solid wastes mainly consist of earth from excavation, waste construction materials (such as sand, lime, concrete, bricks and stones), and domestic solid waste.

If the construction garbage piles up for a long time, it would generate dust; if the domestic solid waste could not be timely cleared up and transported, it would rot and breed flies and mosquitoes, resulting in noxious odors and infectious diseases, which adversely affect the surrounding environment and workers health.

The excavated earth and stone is about 84000m^3, most of which is back filled. There is about 76000 m^3 earth and stone used for back filling the pond and other depression

construction area and the rest 8000m^3 could be piled up in the blank on the north side of the plant, the piled height about 0.2m, which needs timely vegetation recovery.

4.1.1.5 Analysis of ecological Environmental impacts

（1）Impacts of ecological environment in the waters

The water intake project would increase the concentration of suspend solids in local water bodies, affect fish habitat and cause adverse affection on hydrobios. The constructions temporarily narrow down the scope of fish activities.

This section of river is about 2200m wide and the head of water intake is 240m from the dam. The underwater construction is about 200m wide, accounting for 9% of the total width, so that there are relatively small impacts on the migration routes of fish and other aquatic organisms. If the construction period chooses to be undertaken in winter, it would avoid the spawning migration of fish and other aquatic organisms. After the completion of the project, the water intake head will extend into the river for about 200m. Except the head of water intake, fish could pass over the pipeline. Because the relative decrease of river cross-section, the impacts on fish are comparatively small.

The project is located at a wide river section with strong tidal action. The water taking by proposed project will only have very minor impact on the water level of water-taking river section, which will neither result in the dramatic decline of water level at the water-taking river section, nor lead to significant impact on water ecosystem for the downstream section of Yangtze River. Therefore, the water taking by the project will not lead to significant decrease of water quantity and dramatic decline of water level in the water-taking area, and it will affect regional water resource utilization.

In comparison to the whole Yangtze River, the water taking quantity by the project is not significant, so the impacts on roes and fries in the water area during water taking process are relatively minor. In addition, roes and fries mainly float in the water and soil about 3m on the surface. The water intake for the project has topographically avoided the surface layer with many activities of fishes and shrimps, which can reduce the impacts of water taking on roes and fries.

The domestic wastewater and industrial wastewater is not discharged into the Yangtze River, which would not affect the water ecosystem in the waters.

（2）Impacts of terrestrial ecological environment

Construction activities will cause loss of partial terrestrial ecological environment,

including about 275mu reed beach and pond inside the dam changing into plant area. In the later period of construction, greening and shelter belt will be constructed at the plant boundary and in the assisting districts for production and living. The greening area will reach 71500m2 and the green coverage 39%. The loss of terrestrial ecological environment will receive the maximum recovery.

4.1.2 Analysis of environmental impacts during operation

4.1.2.1 Analysis of aqueous Environmental impacts

（1）Industrial wastewater

The industrial wastewater consists of the sludge water of laminar settler tank and back-wash waste water of sand filter. Daily discharged volume is 3-4% of the produced volume and the maximum tail water capacity is 16000 m^3/d (5840000 t/a). Sludge water accounts for 40% of tail water, that is 6400 m^3/d (2336000 t/a), flowing into sludge water treatment system; back-wash waste water accounts for 60%, that is 9600 m^3/d (3504000 t/a), recycling directly. After condensed by thickener, the supernatant of sludge water capacity is 6300 m^3/d (2294000 t/a), flowing into reclamation tank; the rest enters into dehydration room and after dehydration the separated water capacity is about 10350000 m^3/d (378000 t/a). The mud cakes weigh 115 t/d (42000 t/a) and solid content is 40%. Designed dried mud is 46.2 t/d (17000 t/a), containing water 68.8 m^3/d (25000 t/a). In summary, the industrial wastewater (back-wash waste water, supernatant from thickener and wastewater after dehydration) is entirely reused and the recycling rate is 100%.

（2）Domestic waste water

There are 60 staffs in the plant. The average water consumption is 150 L/d and the sewage discharge ratio is 0.8. The domestic wastewater capacity is 7.2 t/d (2628 t/a), discharged into municipal sewage network.

The main pollutants of wastewater and planned treatment measures are listed in table 4.1.2.1-1.

Table 4.1.2.1-1 Main pollutants of discharged wastewater

Item	Waste	Main pollutants	Treatment

	water capacity (10^4 t/a)	Name	Concentration (mg/L)	Capacity (t/a)	measures
Industrial wastewater	229.4	SS	100	229.40	reuse
Domestic wastewater	0.2628	COD_{Cr}	300	0.79	into sewage network
		SS	200	0.53	
		NK	35	0.09	

4.1.2.2 Analysis of acoustic Environmental impacts

Main noise equipments are back-wash pump, blower, water supply pump, sludge dehydrator and water intake pump. The back-wash pump house is built together with air blower house. Main noise sources are detailed in table 4.1.2.2-1.

Table 4.1.2.2-1 Main noise sources and sound-proof effects

Noise source		Quantity	Measure noise value in the house (dB(A))	Measure noise value 1m away the house (dB(A))	Sound-proof effects (dB(A))
Item	Name				
Water treatment plant	Back-wash pump Blower	3	85～95	/	20*
	Water supply pump	5	83.0～84.3	60.0～62.0	22.2～23.4
	Sludge dehydrator	2	85～95	/	20*
Water intake pump house	Water intake pump	4	83.7～85.3	60.7～62.4	22.9～23.3

Note: The measured noise values of back-wash pump, blower and sludge dehydrator are analogy results.

4.1.2.3 Analysis of solid waste impacts

Solid wastes at operation stage mainly are mud cakes after dehydration, capacity 115 t/d (42000 t/a) and water-containing rate 60%. There are 60 staffs in the project. If the domestic solid waste generation is 1 kg/person/d, the capacity is 21.9 t/a.

Solid waste source and planned treatment measures are listed in table 4.1.2.3-1.

Table 4.1.2.3-1 Solid waste generation

Item	Capacity (t/a)	Moisture content (%)	Planned treatment measures
Sludge	42000	60	Multipurpose utilization and sanitation landfill
Domestic solid waste	21.9	/	Removed and transported by Environmental sanitation sector

4.1.3 Indirect Impacts

The wastewater from new Longtan City, Xixia District and Xianlin new urban area is all discharged into Xianlin WWTP. Xianlin WWTP is situated in Daijiaku Village of Xixia District, which serves the Xianlin university city and surrounding areas. The WWTP is designed with the total capacity of 250,000m3/d and is planned to be constructed phase by phase. The currently built Phase I project occupies the land surface about 3.95ha, which was completed and put into operation in August 2008 with the treatment capacity of 50,000m3/d. Nanjing Xianlin WWTP adopts CAST wastewater treatment process, which is featured by small land use, compact layout, concentrated equipment and high level of automation. The wastewater generated by the WTP will be discharged into Nanjing Municipal Xianlin Wastewater Treatment Plant through the municipal sewage network. All the wastewater generated by the WTP will be treated by the WWTP to meet the standard requirements before discharge with minor environmental impacts.

4.2 Environmental Protection Measures

4.2.1 Protection of Water Intake

To mitigate the impacts of water intake on ambient environment, the following measures should be taken:

(1) The terrain elevation near the water intake avoids the surface layer with many activities of fish and shrimps. It is lower than the water depth for fish migration

and higher than the sphere of activities for benthic organism, which can reduce the impacts on aquatic organisms.

(2) The water intake is designed with coarse bars and rotatory screen to reduce the impacts on aquatic organisms.

4.2.2 Mitigation measures during construction period

4.2.2.1 Mitigation measures against acoustic impacts

To mitigate the construction noise impacts, the following measures should be taken:

(1) To enhance construction management, reasonably schedule construction activities timeline, notify the local citizens; strictly comply with the relevant provisions of the construction noise management, implement Noise limits for Construction Site and strictly prohibit carry out high-frequency noise construction activities at night.

(2) Preferably use low-frequency instruments, for example using hydraulic tools instead of pneumatic tools; adopt low noise construction practices as far as possible.

(3) Machinery should be located at the position which would cause the least impacts on the surrounding residents, that is in the side close to the dam, and keep away from the southwest settlement.

(4) Sound proof measures should be implemented on construction site, such as setting screens around high-frequency equipments, placing the high-frequency small machines (electronic saw, etc.) inside the room and blocking out the construction site by adcolumn.

(5) To enhance management of transportation vehicles, specify vehicle routing, as far as possible reduce the quantity and density of vehicles and control the whistling.

Adopting the above measures, the noise value of construction site would meet the limits of Noise limits for Construction Site. The impacts on Xihua Village would be very small.

4.2.2.2 Mitigation measures against aquatic ecological impacts

Protection and control measures mainly are:

(1) To enhance management at construction period; aiming that wastewater generation is not continuous and categories of wastewater are relatively single, corresponding measures should be adopted to effectively control wastewater and capacity of pollutants.

(2) Temporary septic tank should be built in the living quarters of labour camps and

domestic sewage should be discharged into septic tank and used as agriculture or green fertilizer for nearby residents.

(3) According to local condition, temporary wastewater treatment facilities should be constructed, such as settling tank, oil separator and drainage ditch. High oil content washing wastewater of machinery and high suspending solid content wastewater should be treated by oil separator and settling tank until meet the standards and then be discharged. The supernatant liquid from settling tank could be used for aspersion and as spray for dust suppression. Wastewater from mortar and lime slurry should be treated together. After desiccation, solid should be treated with solid wastes.

(4) Construction materials such as cement, sand, lime, etc. should be piled together and corresponding scour protection measures should be adopted. The spilled building materials during transportation should be removed and cleared in time and treated nearby or with solid wastes to avoid being washed by rain and contaminate nearby water bodies.

(5) The project construction will be scheduled in winter to avoid the spawning and migration periods of aquatic organisms such as fish. After the project is completed, the head of water intake will be about 200m into the river. Other than the head of water intake, fish can still pass over the pipe, therefore, the impacts on fish resulting from relevant decrease of river cross-section will be minor.

None of the domestic and production wastewater from the project will be discharged into Yangtze River; therefore, there will be no impact on water ecosystem.

4.2.2.3 Mitigation measures against atmospheric impacts

Main mitigation measures are:

(1) Management should be rationalized on construction site. Sand and stones should be stored together. Cement should be stored at a dedicated warehouse. Try to reduce the process of handling and gently convey to prevent rupture of packing bags.

(2) Mainly use mechanical tools at earthwork and try to reduce construction time.

(3) Frequently asperse the construction site and earth deposit. Properly water the operation space and piled earth at excavation to keep certain moisture and reduce dust. Timely back fill the excavated area after completion of pipe laying. The excavated earth and stone and building materials should be transported in time to prevent generating dust because of surface dryness caused by long time stack or rain erosion.

(4) Transportation vehicles should be in good condition and not over loaded. Coverage

and closure measures should be adopted to reduce spillage along the road. Timely clear and remove the spilled earth and building materials and flush the tyres and regularly watering to reduce the dust in the process of transportation.

(5) Mixing mortar and concrete on site, try to do with nothing spilled, nothing leaked, nothing left and nothing dumped. Concrete mixer should be located in the shed and there should adopt spray for dust suppression when mixing.

(6) Enclosure should be installed or partially installed on site to reduce the diffusion scope of dust.

(7) When wind speed is excessively great, construction activities should be held on and covering measures should be adopted on piled building materials.

(8) Construction machines which generate a great deal of smoke should be equipped with smoke-absorption devices to mitigate the air pollution.

4.2.2.4 Mitigation measures against solid wastes impacts

All the solid waste generated by the project will be sent to Nanjing Jiaozishan Solid Waste Disposal Site. Nanjing Jiaozishan Solid Waste Disposal Site is located near Doucun Village in Qilin Neighborhood in Jiangning District of Nanjing Municipality. It was constructed in 1992 and put into use in 1993. The land use is 420mu. It is designed with the capacity of 1.5million m3. The disposal site mainly consists of three parts including landfill area, wastewater treatment system and office building. To prevent the direct flow of storm water from surrounding mountains into the site, the cut-off ditches are constructed surrounding the three landfill areas along the mountain ridge. The bottom of three landfill areas is installed with separate storm water and sewage drains, which are respectively connected with the clean water tank and wastewater tank downstream of the landfill site. The clean water is directly discharged into the local river, while the wastewater is pumped to the WWTP for treatment. The daily treatment capacity of wastewater is 240m^3 and 400m^3. Currently the site is in normal operation.

(1) Timely clear up the construction site, collect the domestic waste produced by workers and remove it in time.

(2) Try to reuse the valuable building garbage and the rest should be removed and transported in time.

(3) As there are lots of ponds and bottom land in the project location, most part of waste spoil could be back filled and the rest could be stacked on the blank in the north side of plant

close to the dam. The pile is about 0.2m high and the cover should be timely revegetated.

4.2.3 Mitigation measures during operation

4.2.3.1 Protection measures of water source

(1) Point source and non-point source control

① The planned manufacturing projects in Xixia Economic Development Zone should adopt total amount and concentration control. Besides that water quality must meet the national discharge standards, in compliance with the principle of total amount control, the newly increased emissions amounts must be balanced in the region and should not exceed the sum of emissions reductions.

② The imported industry in the vicinity of water intake should mainly be high-tech industry and avoid introduction of the industrial project which generates a great amount wastewater and high concentration organic pollutants. The Management Committee of Xixia Economic Development Zone should strictly control the import of industry and environmental protection sector should take the responsibility of single-vote veto for heavily polluting projects.

③ With the development of local economic, the population will quickly increase. In order to prevent domestic wastewater polluting the Yangtze River, the improvement of pipeline network should be completed as soon as possible. Domestic wastewater and industrial wastewater in the Development Zone should be treated by water treatment plant and reach the emission standards.

④ To carry out standardized regulation on Jiuxiang River and Qixiang River, strictly inspect and supervise the illegally discharge in to rivers, set up on-line monitors at sewage outfalls to on-line monitor the pollution discharge units. Once find the over standard discharge, notify the waterworks to respond in time.

⑤ Regularly inspect the berthed ships on Sheshan Base Wharf and conveyance ships on Yangtze river waterway to prevent leakage of oil. Once leakage occurs, implement emergency measures in time and notify the Longtan water treatment plant at the first time.

⑥ All kinds of enterprise in the evaluation district should regularly inspect the wharves, conveyance ships and transporting pipelines to prevent leakage of hazardous materials and oil. Once leakage occurs, implement emergency measures in time and notify the Longtan water

treatment plant.

⑦ All kinds of enterprise in the evaluation district should establish emergency plans and precaution measures to protect the water source for pollution incidents and carefully put these plans and measures into effect. Depending on the situation of leakage, waterworks could suspend the water supply and use the emergency water source from Chengbei water treatment plant. Waterworks should start operation after the restoration of water quality.

(2) Control measures of water source protection zone

① Management of protection zones at all levels in Longtan waterworks should be compliance with the relevant provisions from Regulations of Protection and Pollution Control for Drinking Water Source Protection Zone, Regulations of Urban and Township Water Supply Source in Jiangsu province and Regulations of the Yangtze River Protection and Pollution Control in Jiangsu province. Announcement boards are set up at the boundary of first-grade and second-grade protection zones to specify the limited activities. At the same time, according to the actual development conditions in the upstream and downstream of water intake and certain range along the bank, stipulate specific water source protection and management methods, implement regional integrated control of water environment to ensure water supply security.

② First-grade protection zones:The Yangtze River water quality in the first-grade protection zones should not below Class II standards. It is forbidden to construct or expand any projects that have nothing to do with water supply facilities and protection of water sources within the protection zones; it is forbidden to discharge waste water into water bodies and the existing effluent outfalls must be uninstalled and relocated; it is forbidden to set up any wharves that have nothing to do with water supply and forbidden to dock ships and rafts; it is forbidden to pile up and store industrial waste, domestic garbage, wastes and other waste materials; it is forbidden to establish fuel depot; it is forbidden to carry out planting, artificial breeding, fishing and poultry and livestock farming; it is forbidden to travel, swim, fish and carry out other activities that may possibly cause pollution to the drinking water body. Shelter belt should be constructed along the bank of water supply source. Water supply unit should set up obvious boundary signs and announce board with listed forbidden activities.

③ Second-grade protection zones: water quality should satisfy the Class II standards. It is not allowed to construct and expand any projects that discharge pollutants into water bodies and the reconstructed projects must reduce the pollutant discharge; it should not set emission outfalls and the existing outfalls must reduce the discharged capacity to guarantee that water

quality in the protection zones could satisfy the stipulated standards; it is forbidden to set up any wharves that load and unload garbage, wastes, fuel and hazardous chemicals or bulk cargo such as coal, sand and cement; it is not allowed to breed fish with bait and carry out other activities that cause pollution to water bodies; it is not allowed set up wharves and hazardous chemicals warehouse and stack; it is not allowed set up water dining and entertainment facilities; it is not allowed to carry out building and dismantling of ships and motor vehicles; it is not allowed to excavate sand and acquire soil in the water regions; it is not allowed to reclaim rivers and bottomlands and carry out enclosure and cage aquaculture; it is not allowed to set up centralized livestock and poultry farms, slaughterhouses. The existing units which pollute water supply source must undertake treatment within limited period to ensure that water quality of water source satisfy national standards. If not, the units must stop production, transform or remove. Shelter belt should be gradually established along the bank.

④ Quasi-protection zones: it is forbidden to any activities that destroy the ecological Environmental balance in the water and destroy water conservation forests, bank protection forests and any vegetation related to water source Environmental protection; it is forbidden to dump industrial waste, domestic garbage, wastes and other solid wastes into the water bodies; ships and vehicles transporting hazardous materials, oil and wastes are generally not allowed to enter protection zones, and necessary entrants need apply for permission of relevant sectors in advance, get official approval, register and be equipped with prevention facilities of seepage, spill and leakage; it is forbidden to utilize highly toxic and high residual pesticide, to abuse fertilizers and to catch fish with dynamite and poison; it is forbidden to construct and expand any projects that discharge pollution containing persistent organic pollutants, mercury, cadmium, lead, arsenic, sulphur, chromium, cyanide and etc.; it is forbidden to construct and expand any projects in the following industry, including chemical pulping and papering, tanning, electroplating, printed circuit board, printing, dyeing, oil refining, coke, pesticides, asbestos, cement, glass and smelting; it is forbidden to discharge any pollutants that are listed in the catalogue of organic toxic materials in Jiangsu province; it is forbidden to construct golf course, waste recycling (processing) plant, hazardous materials warehouse or stack, or coal field, ash yard and landfill; it is forbidden to construct and expand any other projects that severely pollute water bodies and to carry out any activities that is forbidden by laws and regulations. In the quasi-protection zones, reconstructed projects should reduce the emission capacity.

⑤ The scope of production district of waterworks should be indicated with obvious

signs. It is not allowed to set up residential areas and build livestock farming plants, seepage latrines and soakaway in the periphery of waterworks within less than 10m; it is not allowed to stack garbage, wastes and industrial wastes or lay sewage channels; it should keep good sanitary condition and do well in green.

⑥ In case of incidents and other break-outs, which could cause or possibly already have caused contamination accidents, pollutant discharging unit must implement emergency measures to eliminate or mitigate pollutions, timely inform waterworks and report to local environmental protection sector; ships that cause accidents should report to nearby harbor superintendence administration and accept for investigation and treatment.

⑦ To prevent oil pollution in water bodies, any motor vessels should be equipped with oil and waste storage devices to timely recover the residual oil and waste oil; motor vessels with above 15 dead weight (containing 15t) and non-motor vessels with above 40 dead weight (containing 40t) should be equipped with wastes and garbage containers.

⑧ To enhance the construction of wastewater treatment infrastructure in Xixia Development Zone, to ensure that wastewater of enterprises in the Development Zone are collected and treated in wastewater treatment plant and attain discharge standards after the completion of this project.

⑨ To deploy full-time environmental protection staff taking charge of routine management and supervision of water source protection.

4.2.3.2 Wastewater treatment measures

Industrial wastewater from water treatment plant consist of back-wash wastewater of filter, supernatant liquid of thickener and separating water after dehydration, among that the back-wash water and separating water could be directly reused, supernatant could go back to mechanical mixing and be reused, recycling rate 100%.

Back wash waste water is discharged into drainage tank, then elevated to the front part of treatment system to be reused directly.

Sludge water of settling tank is transported by pipeline to sludge tank. After certain period of settling and concentration, supernatant liquid is reused in the mechanical mixing tank which is in the first part of water production process.

Sludge after concentration is dehydrated by dehydration pump. Separating water is reused in sludge tank and mud cake is transported to landfill.

Through the above process, there is no wastewater discharge in the production process.

4.2.3.3 Acoustic environmental pollution control measures

Noises during operation period mainly are from back wash pump, water supply pump, and sludge dehydration pump. Implementing the following noise control measures could ensure that noise value at the plant boundary attains standards and there is no impact on the residential district around the plant boundary.

(1) Purchase low-frequency instruments and implement shock absorption and noise reduction measures, equip blower with intake and exhaust muffler and coverage, adopt shock absorption measures at installation, use noise adsorption material at fitment of pump house, reduce the noise level in the pump house to satisfy the sanitation standards for industrial enterprises.

(2) In the total layout, locate the noise source as far as possible from the plant boundary and protection objects. Pump house should be far away from the centralized place. Operating room and pump station should use double layer doors and windows and be equipped with sound insulation rubber band. At the premise of lightening and ventilation, the window areas of pump house should be designed as small as possible to mitigate the impacts of motor noise on staff and surrounding environment.

(3) Implement integrated green, planting flowers, grass and forests, at the boundary of water treatment plant to further mitigate noise impacts.

4.2.3.4 Solid waste pollution control measures

(1) Sludge treatment measures

At present, most national water treatment plant have not implement sludge treatment and the normal practice is discharge directly or after simple settling. Concentration and dryness of sludge water is commonly used abroad. In this project, sludge treatment device is installed to concentrate and dehydrate the sludge water and the final solid waste is sludge cake with capacity of 115 t/d (42000 t/a) and moisture 60%. Water source of Longtan waterworks is from the Yangtze River and sludge mainly compose of inorganic substances which are non-hazardous, non-toxic and innocuous, have relatively good environmental acceptability and usually cause no adverse impacts on environment. For the treatment of sludge cake, the

first consideration is comprehensive utilization. Nanjing Water Supply General Company considers using sludge for road construction and back-fill of municipal engineering project in the aspect of cleaning production and circular economics. The rest sludge would be regularly cleared and collected by plant part and transported to Jiaozishan waste disposal site used as coverage earth of landfill.

(2) Domestic waste treatment measures

As located in Xihua village, domestic waste of this project could be collected and treated by environment and sanitation system of Xihua village district. After being packed, domestic waste is cleared and transported to Xincheng waste transfer station by villager committee of Xihua village district, then collected by environment and sanitation sector and transported to Jiaozishan waste disposal site for sanitary landfill treatment. As a result, all generated solid wastes are properly treated and realize zero discharge, causing no pollution on environment.

4.2.3.5 Greening

(1) Implement greening activities according to Green Standards of Urban Residents and Units in Jiangsu province (DB32/139-95). Plant shelter belts at the plant boundary and around pump stations and blowers.

(2) Plant intensive chlorine-adaptability trees around chlorination room, such as yew, hemlock, holly and etc.

(3) Use shrub and grass for isolation on ground green. Plant street trees on both sides of factory main road. Grow shrub, grass and flowers at other region and blank areas. Implement greening at the rest areas of plant except roads, buildings and constructers. Greening rate reaches 39%.

4.3 Pollution accidents emergency plan

Implement the following emergency plans to nip accidents in the bud and realize the object of accident prevention.

4.3.1 Emergency action plan

Constitute emergency action plan in case of chlorine leakage. Determine the specific activities depending on the degree of accidents. Each activity should be carried out by a

particular person in advance to ensure that action plan could be implemented quickly and smoothly in case of accidents. Main contents of emergency action plan are listed as following:

(1) In case of chlorine leakage, quickly estimate the degree of accident, impacts scope, characteristic and extent on staff inside the factory, residents around the factory and surrounding environment.

(2) Implement necessary accident control and mitigation measures.

(3) Implement necessary protection measures on possible affected staff inside plant and residents around plant.

(4) Provide emergency tools and facilities related with chlorine leakage accidents for local emergency service sector.

(5) Staff from security department of waterworks and trained workers take on duty in turn.

(6) Notify environmental protection monitoring sector to carry out follow-up monitoring on diffusion at downwind of chlorine leakage.

4.3.2 Leakage emergency plan in chlorination room

Set up full-time safety staff, environmental protection staff in chlorination room and make full use of constituted accidents emergency plan to guide safe production. Suggest establishing emergency responding organization (leading group), which compose of waterworks director and leaders from production, safety and environmental protection department. In case of accidents, leading group takes charge of command of emergency rescue in chlorination room. Main contents are as following:

(1) Send alarm once accidents break out.

(2) Quickly find out source point, leakage part and reasons of accidents and control its development.

(3) Waterworks leading group and rescue team should quickly arrive on site and make corresponding contingent decisions based on state of accident and degree of damage.

(4) Leading group should organize vigilance on site and perambulation inspection and evacuation in the effected region if necessary; should organize rescue of the injured and

poisoned and indicate protection measures.

(5) Leading group should organize relevant staff and accident-occurrence department to find out the cause of accident, bring forward accident control and elimination proposes, notify the local safety and fire-fighting sectors, and organize accidents temporary treatment.

(6) Environmental protection monitoring staff should monitor accident site and diffusion district, organize equipment repair and accident treatment. After the treatment of accident, organize accident investigation group to investigate accident, summarize lessons and put precaution measures into effect.

(7) After accident, based on the degree of impacts compensate the affected region and people according to national policies and restore the damage on the environment.

4.3.3 Leakage emergency plan of liquid chlorine steel bottles

Based on the physical, chemical characteristics and toxicological features and latent accident risk analysis of main equipments, leakage emergency plan of liquid chlorine steel bottles is listed as following:

(1) Quickly evacuate the staff of leakage contamination region to upwind and implement isolation, 150m for small leakage and 450m for big one. Strictly limit entrance and exit. If found anyone inhaled chlorine and poisoned, move him and lay him down at the place with fresh air, elevate his head, loosen his clothes and treat him with medicine or transported into hospital.

(2) Emergency treatment staff should wear positive-pressure breathing apparatus and gas protective clothing. Try to cut down the leakage source. Leaking containers should be put away, repaired and reused after inspection.

(3) Reasonably ventilate to increase diffusion and use spray water to dilute and dissolve. Should not use direct flow because that chlorine acts with water and generate hypochlorous acid and hydrochloric acid which are extremely caustic.

(4) Construct dam or tunnel to receive generated wastewater. If possible, use pipe to introduce leakage into reducing agent (acid sulfate or acid sodium carbonate).

(5) Ruptured chlorine bottles should be quickly put into neutralizing tank or be treated by

chlorine absorption devices. Leaking bottles should be soaked in lime emulsion. Leaking containers should be put away, repaired and reused after inspection.

(6) Protection and control measures are listed as following:

① Respiratory protection: When the atmosphere chlorine concentration exceeds the standards, wear air respirator or oxygen breathing apparatus. In case of emergency rescue or evacuation, must wear oxygen breathing apparatus.

② Protection of eyes: covered by respiratory protection.

③ Protection of body: wear mask and rubber gas protective clothing.

④ Protection of hands: wear rubber gloves.

⑤ Other protections: It is forbidden to smoke, eat and drink on working site. After work, it is suggested to take a shower and change clothes. Keep good sanitation habitudes. Practices in the high-concentration district must be supervised.

(7) First-aid measures are as follows:

① Contact with skins: put off contaminated clothes at once, flush by a great deal of water and go to hospital.

② Contact with eyes: lift eyelid, rinse eyes with flowing water and saline.

③ Inhalation: quickly get away from the site and arrive at the place with fresh air. In case of heartbeat stop, carry out artificial respiration and chest cardiac massage and then sent to the hospital.

4.3.4 Emergency plan of oil leakage

At present, the Sheshan Oil wharf of Jiangsu Armed Police Corps is not completed. After completion, if oil leakage accident occurs, risk prevention measures and emergency plan proposed in wharf EIA report should be carried out immediately. The wharf owner should set up oil booms around the accident occurrence point and control the oil spillage in the range of water bodies encircled by oil booms. Longtan waterworks should set up an oil boom in 100m upstream of water intake to prevent impacts of oil spillage accident on water quality. At the same time, waterworks should assist wharf owner to initiate emergency plan, recover spilled oil and eliminate the residual on the water. Implementing the above measures, oil spillage

accident will cause small impacts on water quality of water intake.

4.3.5 Water contamination emergency plan of water intake

Implementing the following emergency plan could ensure the least impacts on water quality in case of water contamination accident occurred at water intake.

(1) In case of accidental contamination of water quality at water intake, stop water supply immediately. Enhance the water quality monitoring at water intake region and intake water after identifying that water quality attain the standards; if the contaminated water has entered waterworks through pipelines, increase drug adding quantity and capacity of back wash water. Distribute water until water quality attains the standards.

(2) In the case that waterworks could not supply water for a long time because of contamination, contingent water supply should be carried out. Besides initiating emergency plan, contingent water source should be ready for normal supply of local citizens.

At present, Nanjing Water Supply General Company has 4 waterworks in Jiangnan District and total water supply capacity is 1950000 m^3/d. In 2005, the highest daily water supply capacity was 1280000 m^3/d. Besides, there are 3 industrial self-supplies in Jiangnan District with the total capacity of 400000 m^3/d. As the 3 self-supplies mainly provide water for industrial district whose water quality and management standards are not in compliance with urban water supply, water supply scope is gradually decreased and basically stop providing water for neighboring residents.

Table 4.3.5-1 List of water supply situation in Jiangnan District

Name of waterworks	Capacity (10^4 m^3/d)	Water intake source	Water quality protection object(2010)
Beihekou waterworks	120	Yangtze River Jia Branch drinking water source, fishery water area (right bank)	II
Chengbei waterworks	25	Yangtze River Shangyuanmen-Yanziji drinking water source, fishery water area (right bank)	II

Shangyuanmen waterworks	20	Yangtze River Shangyuanmen-Yanziji drinking water source, fishery water area (right bank)	II
Chengnan waterworks	30	Yangtze River Jia Branch drinking water source, fishery water area (right bank)	II

Water intake of Chengbei waterworks locates in the Santaitong of the Yangtze River and water quality is excellent, which is the nearest from the construction project, so that it could be used as emergency water source. Water conveyance pipelines are under construction in Jiangnan district. There are water conveyance pipelines between construction project and Chengbei waterworks, so that Chengbei waterworks should supply water in case of outbreak of contamination accident in water intake of the project.

4.4 Environmental risk prevention and control measures

Environmental risk accidents are unpredictable. However, except for some sudden accidents and natural damage, most of pollution accident could be prevented. Complying with certain principles and implementing necessary measures, the tragedy of pollution accidents could be avoided.

The commonly-used 6 principles of accident prevention are:

① Accident prevention is the necessary part of realizing good management and ensuring production qualities in a enterprise;

② Management staff and operation staff must cooperate in the activities of accident prevention;

③ The head of the enterprise is the first responsible of safety who must act as a leader in organizing production activities;

④ Each post must have a definite safety guideline which is familiar to and acceptable by everyone on the post;

⑤ There must be an organization structure covered every aspect of safety and specific measures;

⑥ Try the best to obtain the latest safety production technologies and methods.

The above six principles are related with a lot of key parts in the modern enterprise

management. Complying with these principles will have no doubt to minimize the possibilities and results in chlorination room to an acceptable level.

4.4.1 Chlorine leakage risk prevention and control measures

4.4.1.1 Chlorine storeroom and adding room safety measures

Chlorine leakage accident is the biggest latent pollution source which would cause adverse impacts on environment. In this project, the following measures are carried out to ensure production safety.

(1) Storeroom of chlorine is designed with consideration of natural ventilation; for the part where could not adopt natural ventilation, mechanical ventilation is used with frequency of 8-12 times/hour.

(2) Besides using mechanical ventilation to keep clean of inner air, the storeroom is equipped with rescue instruments and effective protection apparatus, and installed gas leakage monitoring and alarm device. The installed position, quantity and method is compliance with Specifications for Design of Combustible Gas and Toxic Gas Detection and Alarm Systems in Petrochemical Industry (SH3063-1999).

(3) Operating staff in the chlorination room must be strictly and specially trained and be employed until familiar with the detailed procedure of operating liquid chlorine steel bottles. Avoid varieties of leakage. No entrance for the indirect operating staff.

(4) Chlorination room and storeroom should open outwards and be equipped with flexible locker for immediate evacuation in case of emergency.

4.4.1.2 Leakage protection and control measures of chlorine storeroom and adding room

This project adopts neutralization and absorption devices to treat and control chlorine leakage. Implement the following measures to ensure that leak chlorine could not diffuse outside the room. In case of leakage accident, prompt alarm, neutralization and adsorption would greatly decrease impacts on environment.

(1) Chlorination device is a vacuum adding machine which could make the pipes in the

state of vacuum. If the adding pipes are broken, chlorine would not leak in the air.

(2) Equip chlorination room and storeroom with axial-flow blower to eliminate the possible leakage.

(3) Install the leakage alarm, neutralizer and adsorption device in storeroom. When the concentration of chlorine inside the room exceed limited value, leakage monitor will automatically alarm and initiate absorption device which absorb and transfer the chlorine to neutralizer to react with caustic solution. In that way, the chlorine would not spill outside the room.

(4) Place oxygen breathing apparatus and protective mask in the watch chamber of chlorination room in case of troubleshooting.

4.4.2 Oil leakage risk prevention and control measures

(1) It is forbidden to construct and expand any project which could cause great risks on the water supply safety in the water source protection zone; the existing project should be planned to limit its expansion or transformed.

(2) Install real time monitors for monitoring the water quality in the protection region, one at and the other at 500m upstream of the water intake. Once the water quality is accidentally contaminated, stop intake water and enhance monitoring activities. Intake water after identifying that water quality attains the standards; if the contaminated water has entered waterworks through pipelines, increase drug adding quantity and capacity of back wash water. Distribute water until water quality attains the standards.

(3) Equip with a set of spillage intercept and recovery device, including oil boom, buoy, anchor, anchor rope, oil absorption felt, oil absorption machine and etc.

(4) After completion of the planned Sheshan oil wharf of Jiangsu Armed Police Corps on the upstream, wharf owner should strictly implement the risk prevention and control measures and emergency plan proposed in EIA report. Trough strict management, prior prevention and prompt treatment, wharf owner should avoid pollution impacts of spillage accident on water intake downstream.

4.5 Water-taking Reliability and Safety Analysis

4.5.1 Reliability Analysis of Water Quality

The original planned scope of Longtan Water Resource Site is from Qixiang Estuary to its upstream for 2500m. The water intake for this project is located within the planned scope, where the water quality has always been protected. The project location is shown in the attached Figure 1.

What will affect water quality safety is the quantity of influent pollutants. According to the investigation, there is no industrial wastewater outfall within the Class I protected zone of water resource. The influent pollutants are mainly from the branches and non-point pollution, which is finally reflected by the current water quality of river section. The scope of protected zone for the project is shown in the attached Figure 2.

The monitoring of current water quality for wet and dry seasons has been respectively implemented for the project. The monitoring results show that the water quality in wet season is better than that in dry season. The water quality of Yangtze River is obviously better than that of inland rivers. The water quality monitoring results of Longtan section for Yangtze River show that, in the wet season, all the monitoring indicators could satisfy the Class 2 functional requirements for water bodies except that the SS monitoring results generally failed to meet the requirements. It indicates that the river section where the proposed project is located has relatively good water quality in wet season which could satisfy the requirements of defined water body function. In dry season, all the monitoring indicators could satisfy the Class 2 functional requirements for water bodies except ammonia and TP. The monitoring results of ammonia and TP can satisfy the requirements of Class III water quality standard. In general, the water quality for the river section at Nanjing plant site of Yangtze River generally maintains at Class II water quality level, and it is relatively stable within certain period at different cross-section, different distance from the banks and different water depth. The water quality in wet and dry seasons is also very similar. For some monitored cross-sections, the incompliance of SS, ammonia, BOD, TN and fecal coliform were found, which may be mainly due to busy ship traffic in the river section and the discharge of untreated domestic

wastewater. It is required to strengthen the regional monitoring and control of pollution sources, in particular, the centralized management and limitation of wastewater discharge activities in the tributaries joining Yangtze River within the regional water resource protected zone in order to implement the control measures of total amount control and compliant discharge of pollution sources. For the upstream docks, the accident risk prevention measures and emergency action plan should be established and implemented to ensure the water quality in the area could meet the Class II standard of "Environmental Quality Standard for Surface Water" (GB3838-2002).

The water quality for Nanjing section of Yangtze River near the water resource is good. The monitoring shows that all the indicators for the river section near water intake for the project generally comply with the Class II standard of "Environmental Quality Standard of Surface Water" (GB3838-2002) and also the water quality standard for surface water used as centralized drinking water sources. Therefore, the water quality of Yangtze River can generally meet the water taking requirements of the project.

4.5.2 Reliability Analysis of Water Quantity

According to the conclusions of water resource justification in the "Water Resource Justification Report for Phase I of Nanjing Municipal Longtan Water Treatment Plant" (by Hohai University), the rationality analysis for project water taking activity is as follows:

The water taking flow rate in 2010 for Phase I of the project is 400000m3/d, and that in 2020 for Phase II is 800,000m3/d. According to the statistic results in Section 3.2 of the EIA report, the annual water taking quantity along Yangtze River in Nanjing Municipality is totally 3.197billion m3 with the average water taking flow rate of 101.38m3/s.

(1) Analysis of minimum annual flow rate

According to the statistic data of Datong Hydrology Station from 1950 until 2005, the historical minimum flow rate is 4620m3/s (Jan. 1979). The frequency analysis was carried out based on the historical minimum flow rate. When P=99%, the corresponding flow rate is 5050m3/s. Without considering the influent within the river section and with the deduction of water taking flow rate within the section, the flow rate for the main stream of Yangtze River

passing the water intake for the project is 4958.6m3/s; in relation to the maximum water taking flow rate of 800,000m3/d for the project, i.e., 9.26m3/s, there is high margin. That means sufficient water taking guarantee rate can still be maintained for the project even with the minimum flow rate of Yangtze River in dry season.

(2) Analysis of minimum annual runoff

Without considering the influent within the river section, the annual minimum runoff at Datong Hydrology Station is 675billion m3. At the frequency of P=99%, the corresponding annual runoff is 639billion m3. The maximum annual water taking quantity of the project is 0.292billion m3. Even in the driest year, the water taking quantity of the project only accounts for its 0.045%. With the deduction of total actual annual water taking quantity in the river section, it only accounts for 0.05% of the runoff in the driest year. Therefore, the water quantity of Yangtze River can satisfy the water taking requirements of proposed project.

In general, the water taking quantity of the project can be sufficiently guaranteed.

4.5.3 Analysis of Ecological Impacts

(1) Impacts on water ecosystem

The construction of water intake will increase the SS concentration in part of the water body, affect the habitat of fishes and result in adverse impacts on aquatic organisms. During construction, the scope of activities for fishes will temporarily decrease.

The involved river section is about 2200m wide, and the head of water intake is 240m away from the river embankment. The river section related to the underwater construction activities is about 200m wide, only accounting for 9% in the total width of river section. Therefore, the impacts on the migration passage of aquatic organisms such as fish are minor. If the construction is scheduled in winter, then the spawning and migration period of aquatic organisms such as fish can be avoided. With the project completion, the head of water intake will be about 200m into the river. Except for the head of water intake, fish can still pass over the pipe; therefore, there is minor impact on fish due to the relative decrease of river cross-section.

None of the domestic wastewater and production wastewater from the project is discharged

into Yangtze River; therefore, there will be no impact on the water ecosystem.

(2) Impacts on terrestrial ecosystem

The project construction will lead to the loss of partial terrestrial ecosystem, which mainly includes about 275mu bottomland and pools within the river embankment dominated by reeds that will be turned into the WTP site. In the latter phase of project construction, greening works and protection zones will be implemented, which is mainly to enable the sufficient greening at the boundaries of plant site and auxiliary areas for production and living. The greening area will be 71500m2 with the greening rate up to 39%. Therefore, the loss of terrestrial ecosystem resulting from the project will be restored to the maximum extent.

5. Precautions during construction period

5.1 Safety during construction period

Pay attention to the safety of worker and other staff during construction period. It is suggested to adopt the following measures:

(1) Clearly mark the safe passage for the passerby

(2) Maintain the supply of transport facilities (including paints, easels, signs, etc.). Provide traffic signs, road marking and guardrail to maintain the safety of pedestrians.

(3) Safety training for construction workers should be carried out before starting work.

(4) Provide protective equipment and clothing (goggles, gloves, masks, dust masks, etc.) for construction workers.

(5) Provide material safety data sheet (MSDS) for every chemical on site.

(6) Require all workers to read and fully understand the MSDS.

(7) Removal of asbestos materials and other toxic materials, it should be disposed of by specially trained workers.

(8) Suspend all construction activities in case of storm and other forms of emergency.

5.2 Community relations

To enhance the communications with local residents and mitigate the environment impacts, it is suggested to implement the following measures during construction period:

(1) Timely notify the project construction plan, traffic bypass and temporary bus routes, etc. to prevent residents from being interfered.

(2) Try to reduce construction at night. In case of necessity, strictly plan and timely notify local residents.

(3) In case of interruption of public service (water supply, electricity, telephone, bus route, etc.), post announcement at least 5 days in advance through project website or at bus stop.

5.3 Cultural relics discovery treatment procedure

When discover culture relics on construction site, following procedure should be complied:

(1) Suspend construction activities at the place where culture relics are discovered;

(2) Immediately protect the site to avoid damage and loss, arrange safekeeping to guard the site until take-over by local government;

(3) Immediately announce engineers and timely report local government and State Administration of Cultural Heritage (SACH).

(4) Take charge of protecting and preserving the cultural relics before decisions of follow-up procedure by local government and SACH; evaluate the cultural relics from different evaluation standards (including aesthetic, historic, scientific, social and economic values, etc.) and indentify the meaning and importation of the discovery.

(5) Let administration authority or SACH to decide how to deal with this finding, which could possibly change the layout of construction for protection of cultural relics;

(6) Decision-making sector should notify local government in written form;

(7) Construction practices could be resumed until receive agreement of local administration authority or SACH.

6. Environmental management and monitoring plan

6.1 Environmental management plan

6.1.1 Environmental management organizations and responsibilities

Jiangsu Provincial Construction Department World Bank Project Management Office (PPMO) is the coordination unit of project Environmental management plan and Environmental monitoring plan.

Nanjing Environmental Protection Bureau (EPB) is responsible for the unified supervision and management of project environmental protection. According to the Environmental monitoring report supported by qualified monitoring unit and monitoring plan provided by Project Implementation Unit (PIU), EPB carries out supervision and random inspection on environmental protection activities during construction and operation period to ensure that every Environmental protection measure is put into effect.

As the PIU, Nanjing Water Supply Company (WSC) should implement unified supervision and management on project environmental protection, establish environmental protection management system and organize implementation, constitute monitoring plan and training plan, organize project bidding, commission qualified unit to carry out Environmental monitoring, accept the monitoring data provided by qualified monitoring unit and send on-site monitoring information to Nanjing EPB.

Contractor implements Environmental protection measures during construction period indicated in tender or design document, carries out auxiliary monitoring and accept supervision of PIU and EPB on environmental protection.

Qualified unit (passing national metrology accreditation examination and obtaining a qualification certificate) carries out on-site monitoring according to project monitoring plan, submit the report of environment state to PIU after data compilation.

The framework of project environmental protection supervision and management system (EPSMS) during construction and operation period are shown in figure 6-1 and figure 6-2.

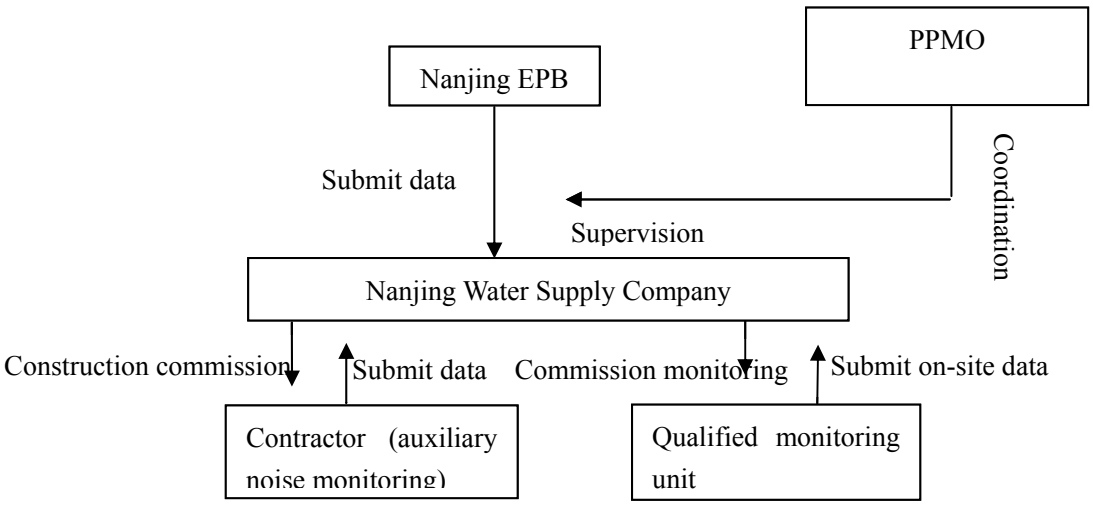

Figure 6-1 EPSMS Framework during construction period

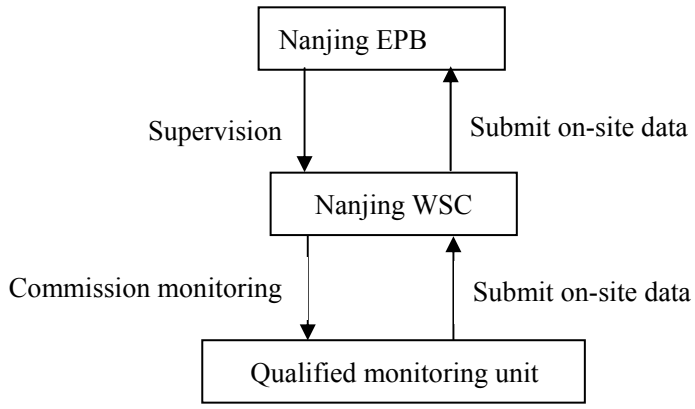

Figure 6-2 EPSMS Framework during operation period

6.1.2 Environmental management organizations and responsibilities during construction period

In implementation of first phase of Nanjing Longtan waterworks project, organizations which are responsible for project planning, management, implementation and monitoring are Jiangsu PPMO, Nanjing EPB, Nanjing WSC, Environmental monitoring unit and construction unit. As the construction unit, Nanjing Municipal Water Supply Company will be responsible for integrating the environmental protection measures for construction period in the Environmental Management Plan into the following-up bidding documents and construction contracts.

- Jiangsu PPMO is responsible for project application and approval, communication and

coordination between Nanjing PMO and World Bank, and is not directly envoled in the project environmental protection.

- Nanjing EPB is responsible for project environmental management and supervision (independent with project implementation unit and construction unit).

  Detailed management activities include:

  - Subordinant Environmental monitoring station carries out selective inspection on water, air and noise monitoring points of Longtan regional water supply project according to EMP and EIA.
  - Inspect implementation of each environmental protection measures.
  - Inspect implementation of protection measures and construction safety during construction period.
- Nanjing WSC is construction unit of Longtan water supply project (first phase) and is responsible for unified management of project environmental protection, including the following activities:
  - establish environmental protection management system and organize implementation, constitute monitoring plan and training plan
  - Commission design unit to carry out project and construction design.
  - Organize bidding and commission construction unit to carry out project construction.
  - Commission qualified monitoring unit to carry out Environmental monitoring during construction and operation period according to project EMP, estbalish monitoring files, verify the data provided by monitoring unit and submit to EPB.
- Qualified Environmental monitoring unit, which pass national metrology accreditation examination and obtain a qualification certificate, is responsible for Environmental monitoring, data analysis and data compilation for Phase I of Longtan WTP, providing monthly monitoring data and submit semiannual monitoring report to PIU.
- Construction unit is responsible for implementation of Environmental protection measures during construction period indicated in tender or design documents, constituting and implementing environmental protection working plan and accepting supervision and management of related sectors, including the following activities:
  - Before construction, construction unit, design unit and related unit constitute

construction site and waste transportation plan to avoid impacts on residential district and other protection objects.

- Construction unit is responsible for implementation of environmental protection measures on site, ensuring that industrial and domestic wastewater attain discharge standards, reasonably arranging construction schedule and carrying out effective measures to attain noise standards at plant boundary and fulfilling dust control measures.
- Construction unit is responsible for transportation of solid waste during construction, timely recovering temporary occupied land along water supply pipeline in late period and providing situation report.
- Construction unit should do well in implementation of every environmental protection measures.
- Construction unit should constantly consult related sectors and residents, accept supervisions and supports from every aspect. Enhance inspection on construction noise and timely implement measures in case of problems.
- Construction unit is responsible for sanitation protection of on-site workers. Construction unit should carry out physical examination of workers before entering site and regular physical examination at working areas, regularly provide health and disease prevention reports. At the same time, construction unit should ensure that living areas is clean and clear, that domestic waste is collected and transported timely, domestic wastewater is gathered or treated together and septic tank is cleared and removed timely.
- Since the major environmental impacts of the project occurs during construction, the Environmental Management Rules for Construction Activities have been developed, and the details are provided in the attachement.

6.1.3 Environmental monitoring measures during construction period

The project Environmental impacts are mainly at construction stage, so as to constitute Environmental management measures during construction period. Main contents are as

follow:

(1) Enclose construction site with colored cloth;

(2) In the pipeline construction, if the weather is good and windy, asperse or use green coverage net to cover temporary stack of excavated earth to avoid dust.

(3) Use canvas to cover the top of vehicles during transportation of waste earth.

(4) Avoid carrying out excavation, loading and unloading of materials when it is windy.

(5) Clear cleanlily earth on the wheels before leaving of vehicles with a broom, and implement cleanness protection system on construction road. Timely clear and remove once there is waste earth on road.

(6) Specify routes and periods of heavy motor vehicle transportation and avoid sensitive areas and peak traffic.

(7) Excavated earth should be piled up on one side of road, be backfilled in time and timely restore the soft and hard coverage of road. Earth which could not be timely backfilled should be managed strictly and is not allowed to be arbitrarily stacked. Make the earthworks with slop ratio 1:1.5 and beat hardly. In windy day, add coverage on it.

(8) Construction on rainy day, pay attention to prevent soil and water loss. Properly adopt coverage measures avoid blocks in sewage system. Suspend construction activities in the flood season and heavily rainy day.

(9) It is forbidden to discharge domestic wastewater at random.

(10) Reasonably arrange construction plan and working areas. Try to avoid construction at night at where is close to residential district and other sensitive district.

(11) Relative high-frequency machines should operate as far as possible by day and it is forbidden to construct at night.

(12) Timely clear building material and it is forbidden to discharge and stack at random.

(13) Regularly clear up domestic waste by environment and sanitation sectors, and transport to landfill.

(14) Loading vehicle drive in urban area, velocity could not exceed 33km/h. The driving velocity on site should not exceed 10km/h.

6.1.4 Environmental management organizations and responsibilities during operation period

Environmental management of Longtan water treatment plant during operation period is in charge of Nanjing EPB, Nangjing WSC and qualified Environmental monitoring unit.

- In compliance with Environmental management requirements on construction project by the State, Nanjing EPB is responsible for supervision and inspection of environmental protection activities during operation period proposed by EIA and EMP, supervising the implementation of "three simultaneous" by construction unit, ensuring implementation of construction project protection measures on surface water and surrounding environment.
- Nanjing WSC is mainly responsible for:
  - Commission qualified unit to carry out Environmental monitoring, verify and submit monitoring data to EPB.
  - Ensure implementation of each environmental protection measure.
  - Constitute water treatment plant EMP.
  - Make sure smooth operation of water supply project.
- According to monitoring plan, qualified Environmental monitoring unit gathers water, air and noise samples, analyze and compile data, regularly provide monitoring data and report, submit them to Nanjing EPB.

6.2 Environmental monitoring plan

6.2.1 Environmental monitoring organizations

Environmental monitoring during operation period is in the charge of local Environmental monitoring station. During operation period, water quality monitoring in water source keeps its existing conditions, monitoring and analysis of inlet and outlet water quality of water treatment plant is in the charge of water quality laboratory, and noise monitoring is completed part-time by full-time environmental protection staff.

6.2.2 Monitoring plan during construction period

During construction period, main pollutant factor on Environmental impacts is noise. So that, during construction period, it should organize noise monitoring on water treatment plant construction areas, water intake pump station construction areas and pipelines construction areas to master noise pollution condition and control construction noise, protect acoustic environment and prevent disturbing local residents. Monitoring time and frequency should be determined according to development of construction.

6.2.3 Monitoring plan during operation

(1) Water quality monitoring

① Monitoring items: The water quality monitoring items for water sources include the basic items in the "Environmental Quality Standard for Surface Water" (GB3838-2002) and 34 monitoring items of "Water Quality Standard for Domestic Drinking Water Sources" (CJ3020-93). The monitoring items for treated water are the 106 monitoring items of "Hygienic Standard for Domestic Drinking Water" (GB5749-2006).

② Monitoring methods: The monitoring will be carried out in accordance with the standard methods listed in the "Hygienic Standard for Domestic Drinking Water" (GB5749-2006) and "Environmental Quality Standard for Surface Water" (GB3838-2002). The standard monitoring methods for various monitoring items are all listed in Table 15.2.3.

③ Locations of monitoring points: The water source is sampled in the effluent of water intake pump, while the treated water is sampled in the inlet pipe of delivery pumping station.

④ Monitoring frequency: The water quality monitoring frequency and corresponding monitoring items are shown in Table 6.2.3-1.

Table 6.2.3-1 Monitoring Plan during Operation

Item	Monitoring Indicator and Method	Source of monitoring method standard	Monitoring frequency	Monitoring unit
Water Source	Colority (spectrophotometry)	GB/T11903-1989	Daily (15 items)	Lab of the WTP
	Turbidity (scattering method)	GB/T13200-1991		

Item	Monitoring Indicator and Method	Source of monitoring method standard	Monitoring frequency	Monitoring unit
Water	Odor and taste (smelling and tasting methods), visible substance (direct observation), total bacteria count (plate count method), total coliforms (multiple tube fermentation technique)	"Water and wastewater monitoring and analysis method"		
	pH (glass electrode method)	GB6920-86		
	Total hardness (EDTA titration method)	GB/T7477-87		
	Free residual chlorine (spectrophotometry)	GB/T5750.11-2006		
	Water temperature (thermometer measurement method)	GB13195-91		
	Alkalinity (titration method using pH indicator)	"Water and wastewater monitoring and analysis method"		
	Ammonia (Salicylic acid spectrophotometry)	GB7481-87		
	Nitrite (spectrophotometry)	GB/T5750.5-2006		
	Chloride (ion chromatography)	HJ/T84-2001		
	Oxygen consumption (titration method using acid potassium permanganate)	GB11892-89		
	Chloride (ion chromatography)	HJ/T84-2001	Once a week (4 items)	
	Nitrite (spectrophotometry)	GB/T5750.5-2006		
	Ammonia (Salicylic acid spectrophotometry)	GB7481-87		
	Oxygen consumption (titration method using acid potassium permanganate)	GB11892-89		
	Colority (spectrophotometry)	GB/T11903-1989	Once a month (20 items)	
	Turbidity (scattering method)	GB/T13200-1991		
	Odor and taste (smelling and tasting methods), visible substance (direct observation), total bacteria count (plate count method), total coliforms (multiple tube fermentation technique)	"Water and wastewater monitoring and analysis method"		
	Total hardness (EDTA titration method)	GB/T7477-87		
	Conductivity (electrode method)	GB/T5750.4-2006		
	Nitrite (spectrophotometry)	GB/T5750.5-2006		
	Oxygen consumption (titration method using acid potassium permanganate)	GB11892-89		
	Alkalinity (titration method using pH indicator)	"Water and wastewater monitoring and		

Item	Monitoring Indicator and Method	Source of monitoring method standard	Monitoring frequency	Monitoring unit
		analysis method”		
	Water temperature (thermometer measurement method)	GB13195-91		
	pH (glass electrode method)	GB6920-86		
	Ammonia (Salicylic acid spectrophotometry)	GB7481-87		
	Sulfate, fluoride, chloride (ion chromatography)	HJ/T84-2001		
	Fe, Mn (flame atomic absorption spectrometry)	GB11911-89		
	Free residual chlorine (spectrophotometry)	GB/T5750.11-2006		
Treated water	Colority (spectrophotometry), Turbidity (scattering method), Odor and taste (smelling and tasting methods), visible substance (direct observation), pH (glass electrode method), Conductivity (electrode method), Alkalinity (titration method)	GB/T5750.4-2006	Daily (13 items)	Lab of the WTP
	Ammonia (spectrophotometry)	GB/T5750.5-2006		
	Free residual chlorine (spectrophotometry)	GB/T5750.11-2006		
	Total bacteria count (plate count method), total coliforms (multiple tube fermentation technique)	GB/T5750.12-2006		
	Nitrite (spectrophotometry)	GB/T5750.5-2006		
	Water temperature (thermometer measurement method)	GB13195—91		
	Oxygen consumption (titration method using acid potassium permanganate)	GB/T5750.7-2006	Once a week (4 items)	
	Ammonia (spectrophotometry)	GB/T5750.5-2006		
	Nitrite (spectrophotometry)	GB/T5750.5-2006		
	Fluorid (ion chromatography)	GB/T5750.5-2006		
	Colority (Pt-Co standard spectrophotometry), Turbidity (scattering method), Odor and taste (smelling and tasting methods), visible substance (direct observation), pH (glass electrode method), Conductivity (electrode method), total hardness (titration method), Alkalinity (titration method)	GB/T5750.4-2006	Once a month (20 items)	
	Nitrite (spectrophotometry), sulfate (ion chromatography), chloride (ion chromatography), ammonia	GB/T5750.5-2006		

Item	Monitoring Indicator and Method	Source of monitoring method standard	Monitoring frequency	Monitoring unit
	(spectrophotometry), fluoride (ion chromatography)			
	Fe, Mn (spectrophotometry)	GB/T5750.6-2006		
	Oxygen consumption (titration method using acid potassium permanganate)	GB/T5750.7-2006		
	Free residual chlorine (spectrophotometry)	GB/T5750.11-2006		
	Total bacteria count (plate count method), total coliforms (multiple tube fermentation technique)	GB/T5750.12-2006		
	Water temperature (thermometer measurement method)	GB13195-91		
Water in the network	Colority (Pt-Co standard spectrophotometry), Turbidity (scattering method), Odor and taste (smelling and tasting methods), visible substance (direct observation), pH (glass electrode method)	GB/T5750.4-2006	Once a week (10 items)	Lab of the WTP
	Oxygen consumption (titration method using acid potassium permanganate)	GB/T5750.7-2006		
	Free residual chlorine (spectrophotometry)	GB/T5750.11-2006		
	Total bacteria count (plate count method), total coliforms (multiple tube fermentation technique), fecal coliform groups (multiple tube fermentation technique)	GB/T5750.12-2006		
	Colority (Pt-Co standard spectrophotometry), Turbidity (scattering method), Odor and taste (smelling and tasting methods), visible substance (direct observation), pH (glass electrode method), Conductivity (electrode method), Alkalinity (titration method)	GB/T5750.4-2006	Once a month (15 items)	
	Free residual chlorine (spectrophotometry)	GB/T5750.11-2006		
	Total bacteria count (plate count method), total coliforms (multiple tube fermentation technique)	GB/T5750.12-2006		
	Nitrite (spectrophotometry)	GB/T5750.5-2006		
	Ammonia (spectrophotometry)	GB/T5750.5-2006		
	Oxygen consumption (titration method using acid potassium permanganate)	GB/T5750.7-2006		
	Water temperature (thermometer measurement method)	GB13195-91		
	Total hardness (titrate method)	GB/T5750.4-2006		

(2) Water sanitation inspection

Local sanitation and protection station is responsible for supervision, inspection and evaluation of water sanitation at inlet and outlet of water treatment plant.

(3) Noise environment monitoring

Set up monitoring points around plant water intake pump station. Carry out irregular monitoring by day and by night. Monitoring parameter is equivalent continuous A sound level.

6.2.4 Three simultaneous inspection and acceptance monitoring plan

In compliance with Administration Methods of Inspection and Acceptance of Environmental Protection of Construction Project, it should carry out inspection and acceptance after completion of construction. Construction inspection and acceptance monitoring plan is shown in table 6.2.4-1.

Table 6.2.4-1 Construction inspection and acceptance monitoring plan

Item	Monitoring position	Parameters	Time and frequency	Cost	Monitoring unit
Air	Downwind at plant boundary	Chlorine	Two-day, once a day	RMB 780	Nanjing Environmental monitoring station
Wastewater	Outlet of domestic wastewater	COD、SS	Two-day, once a day	RMB 520	
Noise	East, South, West, North 1m outside plant boundary	Leq(A)	Two-day, once by day and once at night	RMB 1426	

6.2.5 Budget for Environmental monitoring

Environmental monitoring costs consist of costs during construction period, during operation period and monitoring of water, air and noise at three simultaneous inspection and acceptance. The budget is summarized in table 6.2.5-1.

Table 6.2.5-1 Project Environmental monitoring budget Unit: RMB

Item	Detailed item	Cost	Total	Total
Monitoring cost during construction period (18 months)	Noise	26584	46664	186330
	TSP	11830		
	Labor cost	8250		
Monitoring cost during operation period (3 months)	Noise	14520	136340	
	Chlorine	1320		
	Treated water from the WTP	112500		
	Labor cost	8000		
Monitoring cost at three simultaneous inspection and acceptance.	Chlorine	780	3326	
	Wastewater	520		
	Noise	1426		
	Labor cost	600		

7. Training and monitoring plan

7.1 Training plan

Nanjing water supply project (first phase) is very important for improvement of sanitation and safety of township drinking water. After completion of project, local environment will be greatly improved. To ensure successful construction and operation of project, all participated staff should have good environmental protection knowledge and technology and receive further training to guarantee through implementation of environmental protection measures. According to propositions of Environmental management, training will be carried out in following aspects:

- Environmental laws and regulations: national Environmental protection legal framework, World Bank Environmental policies, legal responsibilities stipulated in Environmental

protection laws, construction project Environmental protection administration regulations, local relevant Environmental protection laws and regulations, local economic and development plan

- Pollution accident treatment and emergency response capabilities: accident generation mechanism, prevention measures and methods, emergency treatment methods
- Pollution control and management during construction period: project construction process and pollution-generating link, pollution control methods and management monitoring measures during construction.

Training plan is designed for 60% of staff, that is 36 persons. Training period lasts 6 months. If training cost is RMB 1500/person/month, total cost is RMB 324000.

7.2 Environmental monitoring report

7.2.1 Environmental monitoring report during construction period

During project construction period, Environmental management organization should commission local Environmental monitoring station to carry out Environmental monitoring according to construction stage, and submit reports to local environmental protection department.

Main contents of reports consist of project schedule, main construction activities and methods, comments on environment impacts and implementation situation of mitigation measures.

During project construction period, monthly report is submitted to construction management sector and Nanjing EPB.

7.2.2 Environmental monitoring report during operation period

During project construction period, Environmental management organization should commission local Environmental monitoring station to carry out Environmental monitoring on project operation situation according to propositions of EIA, and timely submit reports to local environmental protection department.

Contents of monitoring report mainly are:

(1) Monitoring time, frequency, position, parameter, method and quality control plan;

(2) Monitoring data and statistical analysis;

(3) Summary of operation state of facilities during monitoring period

(4) Abnormal item.

7.3 Information communication

According to propositions of Environmental management, it should carry out necessary information communication among different departments and posts inside the management structure and announce relevant information to external part (involved parties and the public). Internal information communication could in form of meeting, internal brief report and a formal meeting must be held once a month. All communicated information should be recorded and filed. External information communication should be held semiannually or annually. Information communication with cooperation unit should be formed into minutes and filed.

7.4 Record

For the effective operation of Environmental management system, a complete record system must be established and consists of the following records:

(1) Requirements of laws and regulations;

(2) Permission of project;

(3) Environmental factors and relevant Environmental impacts;

(4) Management and training of construction worker

(5) Construction inspection, verification and maintenance and management activities;

(6) Environmental quality monitoring data records;

(7) Analyzing whether Environmental quality complies with standards;

(8) If not, correct and check the effectiveness of prevention measures;

(9) Information of project relevant parties

(10) Review;

(11) Evaluation.

Besides, necessary controls must be carried out for the above records, including identification, collection, cataloging, archiving, storage, management, maintenance, inquiry,

retention period, disposal and etc.

7.5 Report

In the process of project implementation, contractor, monitoring unit and PMO should record project progress, implementation state of EMP, environment monitoring results and timely report to relevant sectors, including mainly the following three parts:

(1) Monitoring unit and contractor should record the implementation state of EMP in detail and report to PMO.

(2) Project progress report (monthly, quarterly, annual) provided by PMO must contain progress of EMP, for example, implementation progress and effects of EMP.

(3) Executive summary report of annual EMP must be completed and submitted to the World Bank before March 31st in the following year. EMP executive summary report could contain the following contents:

① Implementation state of training plan;

② Project progress, such as length of laid raw water pipeline, completion degree of building engineering;

③ With or without complaints from the public; in the event of complaints, record complaints, solutions and degree of public satisfaction.

④ EMP executive plan in the following year.

7.6 Environmental protection monitoring program

Project environmental protection monitoring program is shown in table 7.6-1.

Table 7.6-1 Project environmental protection monitoring program

Phase	Organizations	Contents	Objectives
Design period	World Bank Nanjing Municipal Government Nanjing EPB	1. Review and approve EIA 2. Review and approve EMP	1. Ensure that EIA was comprehensive, has proper subjects and emphases. 2. Have already proposed the possible great and latent Environmental problems 3. Ensure that Environmental impact mitigation measures has specific implementation plan

Construction period	Nanjing Municipal Government, Nanjing EPB, Nanjing Cultural Relics Protection Bureau	1. Review and approve the preliminary design of environmental protection and EMP 2. Inspect reversion of temporarily land use and vegetation, and environmental restoration 3. Inspect dust and noise control measures and decide the construction period 4. Inspect discharge of air pollutant 5. Inspect treatment and disposal of domestic and oil-contained wastewater 6. Treatment of discarded earth 7. If discover cultural relics, suspend construction, preserve site and notify local cultural relics protection bureau 8. Constantly communicate with the public, ask for public opinion.	1. Strictly implement three simultaneous 2. Ensure temporary land use satisfy environmental protection 3. Reduce construction impacts and implement relevant laws and standards 4. Ensure that river water quality is not contaminated. 5. Ensure that landscape and soil source could not be severely damaged and avoid water and soil loss. 6. If discover cultural relics, ensure that cultural relics would not be destroyed.
Operation period	Nanjing Construction Committee, Nanjing EPB Nanjing Fire-fighter Department of Public Security	1. Inspect implementation of EMP 2. Inspect implementation of monitoring plan 3. Inspect that whether or not implement further environmental protection measures on sensitive points(could occur unpredicted problems) 4. Inspect whether that Environmental quality of sensitive points could attain relevant standards 5. Enhance supervision, prevent accident, and establish emergency plan.	1. Implement EMP 2. Implement monitoring plan 3. Protect environment 4. Enhance environment management and protect public health 5. Ensure reasonable discharge of wastewater

7.7 Management audit system

(1) Environmental quality reporting system

Establish and implement Environmental quality monthly, quarterly and annual report system

(2) Post responsibility system

Specify certain range and procedure of each post. Identify responsibilities and objects.

(3) Safety system

Safety measures, drug management, alarm devices, signs and etc.

(4) Evaluation and reward and punishment system

Carry out regular evaluation on operators and implement reward and punishment system

8. Summary of estimated budget

Estimated budget of Environmental management, monitoring and staff training is summarized in Table 8-1, total amount RMB 560330.

Table 7-1 Estimated budget of EMP

Phase		Estimated budget (10^4 RMB)
Environmental monitoring	Construction period	4.6664
	Operation period	13.6340
	Three simultaneous acceptance and inspection	0.3326
	Total	18.633
Staff training		32.4
Environmental management		5.00
Total		56.033

9. Ongoing Public Consultation Plan and Grievance Relief Mechanism

9.1 Ongoing Public Consultation Plan

During the construction period and in three years after operation, the random return visit survey will be carried out once every three months targeting at various environmentally sensitive targets, and the on-the-spot public consultation meeting will be held in the areas with environmentally sensitive targets relatively centralized once a year.

According to the results of quarterly and annual surveys, the public's satisfaction level will be assessed, relevant opinions will be analyzed, and the environmental mitigation measures will be improved when necessary.

9.2 Grievance Relief Mechanism

Establishment and composition of complaint organization In order to better guarantee the legal rights of affected people, the grievance relief mechanism will be established to provide the affected people with a convenient, transparent, just and effective route for making complaints; therefore, the environmental impact complaint handling leading group has been established for the project. The director of Development Dept. under Nanjing Municipal EPB will act as the group leader, and the group members are from the project management office, Nanjing Municipal Environmental Monitoring Station and the EIA consulting team. There is a complaint handling office under the environmental impact complaint handling leading group, which is established at the Nanjing Municipal Environmental Monitoring Station. The daily complaints will be collected and filed by the complaint handling office. The office will propose the handling opinions after discussing with relevant responsible units.

Complaining procedure The complaint handling leading group and the office will start to handle with external complaints in one week after the commencement of project construction. At the same time, the complaint hotline and complaint mail box will be opened. The detailed complaining procedure is as follows:

If the affected person feels his/her own rights have been violated in any aspect related to environmental protection, the complaint can be made in written or oral form to the complaint

handling office. The oral complaints will be recorded and filed in details by the officials of complaint handling office, and the feedback will be submitted in two weeks.

If the complainer is not satisfied with the opinions of the complaint handling office, the complaint can be made to Jiangsu Provincial EPB in written form in one month upon the receipt of feedback, and the EPB should response in three weeks.

If the complainer is not satisfied with the handling opinions of the municipal EPB, he/she can start a suit in the local people's court upon the receipt of handling opinions in accordance with "Civil Procedure Law of the People's Republic of China" and the court will be responsible for the trial and judgment.

Appendix 1 Environmental Management Rules for Construction Activities

General

1. The Contractor and his employees shall adhere to the mitigation measures set down in these specifications to prevent harm and nuisances on local communities, and to minimize the impacts in construction and operation on the environment.

2. Remedial actions which cannot be effectively carried out during construction should be carried out before issuance of the acceptance of project completion:

（1）All affected areas should be landscaped and any necessary remedial works should be undertaken without delay, including grassing and reforestation;

（2）water courses should be cleared of debris and drains and culverts checked for clear flow paths;

（3）All sites should be cleaned of debris and all excess materials properly disposed;

（4）Borrow pits should be restored.

Environmental Rules to be followed by Contractors during Construction

Before initiation of construction activities, the Contractor shall present a Construction Plan and corresponding environmental rules, and explicitly state how he plans to abide by these specifications. After approval of such Plan, construction activities can be proceeded.

Prohibitions

The following activities are prohibited on or near the project site:

1. Cutting of trees for any reason outside the approved construction area;
2. Hunting, fishing, wildlife capture, or plant collection;
3. Use of unapproved toxic materials, including lead-based paints, asbestos, etc.;
4. Disturbance to anything with architectural or historical value;
5. Building of fires;
6. Use of alcohol by workers.

Transport

The Contractor shall select appropriately sized vehicles suitable to the class of roads in the area,

and shall restrict loads to prevent damage to local roads and bridges. The Contractor shall be held responsible for any damage and the compensation in relation to local roads and bridges due to the transportation of excessive loads. Specific routes and timing shall be designated for the transportation using heavy trucks to avoid the rush hours of sensitive areas.

The Contractor shall not use any vehicles with exhaust gas or noise emissions on the road due to overuse. In any built up areas, noise mufflers shall be installed and well maintained on all motorized equipment under the control of the Contractor.

Adequate traffic control measures shall be developed by the Contractor for the duration of the Contract and such measures shall be subject to prior approval of relevant authorities.

Workforce and Camps

The Contractor should whenever possible locally recruit the majority of the workforce and shall provide appropriate training as necessary.

The Contractor shall install and maintain a temporary septic tank system for any residential labor camp and without causing pollution of nearby watercourses.

The Contractor shall establish a method and system for storing and disposing of all solid wastes generated by the labor camp and/or construction sites.

The Contractor shall not allow the use of fuel wood for cooking or heating by any construction workers in any labor camp or construction site for cooking or heating, and alternate clean fuel shall be provided to them.

The Contractor shall ensure that site offices, depots, asphalt plants and workshops are located in appropriate areas as approved by local authorities and not within 500 meters of existing residential settlements.

The Contractor shall ensure that site offices, depots (storage areas) and particularly storage areas for diesel fuel are not located within 500 meters of watercourses, and are operated so that no pollutants enter watercourses, either by runoff or through groundwater seepage, during construction, especially during periods of rain. This will require lubricants to be recycled in the settling tank or oil trap for maximum reuse.

Solid Waste Management

For all kinds of solid waste generated during construction, the contractors shall take the following measures for solid waste management:

1. Minimize the production of waste that must be treated or eliminated.

2. Identify and divide the treatment areas to specify the storage areas for specific solid waste.

3. Control the unified placement of all construction waste at the approved disposal sites (>300 m away from rivers, streams, lakes, or wetlands). Timely clear all the garbage, metals, used oils and construction waste in the construction sites. It is forbidden to discard them randomly. Their storage shall be incorporated in to the recycling system with sorting.

4. Garbage shall be dumped at designated sites, which will then be collected and sent to the landfill site for disposal by environmental sanitation department.

5. Once the construction is completed, all the solid waste and debris generated by construction shall be removed from the construction sites.

Erosion Control

The contractors shall take the following measures for erosion control:

1. Disturb as little ground area as possible, stabilize that area as quickly as possible, control soil erosion, and establish erosion control barriers around excavated areas and roads.

2. Conserve topsoil with its leaf litter and organic matter, and reapply this material to local disturbed areas to promote the growth of local native vegetation.

3. Apply local, native grass seed and mulch to barren erosive soil areas or closed construction surfaces.

4. Applicable erosion control measures are preferably implemented before rainy season.

5. Spray water on dirt roads, excavated areas, fill material and stockpiled soil to reduce wind-induced erosion, as needed.

Repair and Maintenance

Identify and demarcate equipment maintenance areas (>5m from rivers, streams, lakes or wetlands). Fuel and oil storage shall be located in proper areas with the approval of relevant authorities.

The contractors shall ensure that all the equipment maintenance activities, including oil changes, are conducted within the demarcated maintenance areas; never let used oils spill over the ground or into the water courses, drainage channels or sewer systems.

Fuel storage and refilling areas shall be located at least 300m from all cross drainage structures

and important water bodies.

Earthworks, Cut and Fill Slopes

The Contractor shall maintain stable cut and fill process and minimize the disturbance outside the prescribed scope.

The Contractor shall complete cut and fill operations as soon as possible and preferably in one continuous operation. The construction activities shall prevent soil erosion. Any excavated cut shall be temporarily stored on one side of the road for timely backfilling, and the soft and hard coverage of the road surface shall be restored. The cut unable to be backfilled in time shall be strictly managed, and random stockpiling is not allowed. The piles shall be compacted with the slope ratio of 1:1.5. Appropriate coverage measures shall be taken, in particular in windy days to prevent the silting up of sewage system.

Construction shall be stopped in flooding season and stormy days. It shall be prevented to excavate and load materials in windy days.

Cleaning-up of Construction Sites

The contractors shall establish and implement the daily cleaning-up of construction sites, including maintaining sufficient cleaning appliances for the cleaning of construction waste.

If the miscellanies or sand of the construction sites are stored in the neighboring land, the contractors shall immediately take measures to remove them as soon as possible and to restore the affected area back to its original status.

Safety during Construction

The Contractor shall be responsible for complying with all national and local safety requirements and any other measures necessary to avoid construction accidents. The following measures shall be taken by the contractors to ensure the construction safety:

1. Carefully and clearly mark pedestrian-safe access routes;

2. If there is any school in the vicinity, include traffic safety personnel to direct traffic during the hours for the students to go to and back from the school;

3. Supply the materials (including paint, easel, sign material, etc.) for the maintenance of traffic signs, road marking and guard rails to protect pedestrians;

4. Conduct safety training for construction workers prior to the construction;

5. Provide personal protective equipment and clothing (goggles, gloves, respirators, dust masks, hard hats, etc.,) to the construction workers and enforce their use;

6. During heavy rains or emergencies of any kind, suspend all the work.

7. Strengthen electrical and mechanical equipment to withstand seismic events during the construction.

Control of Construction Wastewater, Noise and Dust

To control the adverse impacts of construction wastewater, noise and dust, the following measures shall be taken by the contractors:

1. Maintain all construction-related traffic at or below 24 km/h (i.e. 15miles per hour) on the streets within 200m of construction sites;

2. Maintain all the vehicles within the construction sites at or below 16km/h (i.e., 10 miles per hour), and the vehicle speed when entering and leaving the construction sites shall be no more than 10km/h.

3. To the extent possible, maintain noise levels associated with all machinery and equipment at or below 90 dB.

4. Minimize production of dust and particulate materials at all times to avoid impacts on the areas around construction sites.

5. Reasonably schedule the construction plan and construction surface. In sensitive areas (including residential neighborhoods, hospitals, rest homes, etc.), stricter measures need to be implemented to prevent undesirable noise impacts.

6. The use of high-noise equipment is not allowed at night. Try to use the high-noise machinery during the daytime. Try to avoid the construction at night near the sensitive areas such as residential neighborhood.

7. The construction sites shall be enclosed. Dust screens shall be installed around the construction sites, paying particular attention to the areas close to housing, commercial and recreational areas.

8. During the pipe works, if there are continuous sunny days with winds, water spray and dust control measures or green coverage shall be implemented for the mud roads, excavated

areas and temporary storage sites for cut or fills to prevent the generation of flying dust.

9. Appropriate measures shall be taken to reduce the vibration or noise resulting from construction activities.

10. It is forbidden to randomly discharge the domestic wastewater and construction wastewater, which shall be drained into the simple wastewater treatment facilities such as storage tank, oil trap, settling tank and septic tanks through the drains for treatment and complaint discharge.

11. Clear the mud from the wheels of vehicles with brooms before their leaving. At the same time, implement cleaning system for the construction roads, which shall be timely cleaned once there is any spoil.

Maintenance of Community Relationship

To maintain the relationship with the communities neighboring the construction sites, the contractors shall:

1. Inform the nearby residents about construction and work schedules, interruption of traffic, traffic detour routes and provisional bus routes, as appropriate.

2. Limit construction activities at night. When the construction at night is necessary, the construction activities shall be carefully scheduled to minimize the impacts on the surrounding. The residents from nearby community shall be informed so that they can take necessary mitigation measures.

3. The interruption of any service (including water, electricity, telephone and bus routes) shall be informed at least five days before the interruption, and the announcement shall be posted at the construction sites, bus stops and affected households and industries.

Environmental Supervision during Construction

The Environmental Supervision Engineer for the project will implement the environmental supervision. If the contractor fails to comply with this Environmental Management Rules for Construction Activities, its construction activities will be suspended with a fine imposed until the incompliance is addressed. Contractors are also required to comply with national and governmental environmental protection regulations and the regulations related the public health and safety.

Appendix 2 Public Consultation

1 Objective of Public Consultation

Public participation process demonstrates the respect of the public's interests and rights (for example, residing rights), which will obtain understanding and cooperation of the public and help enhance public environment awareness. Aims of public participation are as follows: to be well recognized by the public, so as to find problems as early as possible which are indiscoverable during project environment evaluation and design process and reflect to relevant departments and project owner who will adopt effective measures and avoid adverse impacts; to prevent project in the process of implementation from causing damage and threat on the public's interests, so as to harmoniously unify economic, social and environmental benefits.

Public opinions and suggestions should be attended to in order to understand views of the public around the project, to democratize the environment evaluation and to make design and construction of project more comprehensive and more reasonable.

2 Forms of public consultation

Based on the Interim Methods of Environment Impacts Evaluation Public Participation, public opinions poll was employed to interview residents and staff of enterprise and institutions around project site and in the range of water supply. During compilation of EIA report, methods of distributing questionnaires, holding public consultation meetings and publishing information online were employed to interview and consult the public, especially to consult people who would be directly affected by planned project on comments, suggestions and requirements of project, to respond public questionable problems and explain mitigation measures to solve environment issues, to completely understand the public's opinions on project impacts and degree of satisfaction of mitigation measures, and to reflect public suggestions to construction unit and environmental protection department. Methods of public survey are as follows: publicity, to survey public opinions, to consult specialists, to hold consultation meetings, to hold demonstration meetings and to hold hearings. In this project, methods of post bulletin, publicity online, distributing questionnaires,

publishing in the newspaper and holding consultation meeting were employed to interview the public's opinions.

3 Distribution of questionnaires

3.1 Subjects of survey

Longtan water treatment plant is located in northeast of Nanjing urban area and the first phase project is mainly lain on the north side of Bianmin Road. During compilation of EIA report, methods of post bulletin (see photo 3), distributing questionnaires and random interview were employed to consult the public's comments and requirements of project, to respond public questionable problems and explain mitigation measures to solve environment issues, to completely understand the public's opinions on project impacts and degree of satisfaction of mitigation measures. Questionnaire mainly is to be filled out in form of choice, and can also be attached with written comments and suggestions. Contents of questionnaire are listed in Table 3.1-1. Totally 40 copies of questionnaire were sent out and all the feedback were effectively collected.

Photo 3 Post bulletin in community bulletin window

This project is located in Xixia Economic Development Zone and surrounded mainly by enterprises and residents to be resettled. The scope of survey is enterprises in the development zone and residential districts which are not demolished. Subjects of the participatory public consultation mainly include the following groups, workers, famers, staff and technicians, which have a certain representation. Subjects of the participatory public consultation are listed in Table 3.1-2 and Table 3.1-3.

Table 3.1-1 Questionnaire for public consultation of Nanjing Longtan water supply project

<table>
<tr><td>Project name</td><td colspan="3">Nanjing Longtan water supply project, first stage</td><td>Construction location</td><td colspan="3">Nanjing Qixia economic development zone, south bank downstream of Yangtze river, between Changjiang oil conveyance company and Jinling gas turbine power plant</td></tr>
<tr><td>General situation</td><td colspan="7">With the rapid development of Nanjing suburb economics, overall construction of Qixia district, Xianlin New Town area and Longtan New Town, water demands in northeast of urban area has a great increase and there is a big gap in regional water supply. So that Nanjing water supply general company decided to implement 400,000m3/d Longtan water treatment plant project (first stage). Project content consists of water intake project, water treatment project and clear water conveyance mains. Construction of water treatment plant consists of conventional treatment capacity of 400,000m^3/d, industrial wastewater treatment and auxiliary high and low voltage distribution systems, instruments and PLC automatic control system, etc. and preservation of land use for advanced treatment.</td></tr>
<tr><td colspan="4">Surveyed individual</td><td colspan="4">Surveyed enterprise</td></tr>
<tr><td>Name</td><td colspan="3"></td><td>Name</td><td colspan="3"></td></tr>
<tr><td>Age</td><td></td><td>Profession</td><td></td><td>Size</td><td></td><td>Main products</td><td></td></tr>
<tr><td>Home address</td><td></td><td>Education</td><td></td><td>Characteristics</td><td></td><td>Authority department</td><td></td></tr>
<tr><td>Tel.</td><td colspan="3"></td><td>Address</td><td colspan="3"></td></tr>
<tr><td>Tel.</td><td colspan="3"></td><td>Tel.</td><td colspan="3"></td></tr>
<tr><td colspan="8">Are you satisfied with present environment status? (State reasons if not)
□very satisfied □satisfied □basically satisfied □not satisfied □not at all</td></tr>
<tr><td colspan="8">How is your understanding of the project?
□not clear □a little clear □basically clear □clear □very clear</td></tr>
<tr><td colspan="8">Your understanding of the project is from which information channel?</td></tr>
</table>

□newspaper □television and broadcast □bulletin □internet □folk
According to your understanding, how is the environment impacts caused by project construction? □severe □great □common □a few □few □not clear about
What is your biggest concern about environment issues? □wastewater □exhaust gas □noise □solid waste □in case of accident
From angle of environmental protection, what is your attitude to this project? Briefly explain the reason. □firmly agreed with □agreed with □conditionally agreed with □against with
Any suggestions and requests on environmental protection
Any suggestions and requests on project review and approval by environmental protection department

Table 3.1-2 List of basic information for surveyed individuals

No.	Name	Sex	Age	Educated	Home address (work address)	Occupation	Telephone
1	Chu Yuemei	F	31	Junior high school	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	Worker	13951847523
2	Zhou Jianquan	M	30	Undergraduate	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	sales	13951790353
3	Wang Peiling	F	50	Elementary school	Qixia Xihua village community	worker	13913943880
4	Yang Guang	F	38	Senior high school	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	employee	13601584651
5	Wang Jiaxing	M	60	Junior high school	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	dispatch	13016964218

No.	Name	Sex	Age	Educated	Home address (work address)	Occupation	Telephone
6	Shi Hongmei	F	26	college	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	administration	13951072300
7	Zhu Ying	F	29	Senior high school	Qixia Xihua village community	clerk	13913976154
8	Wang Min	M	48	Senior high school	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	business	51643576
9	Zhao Keqin	M	64	Elementary school	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd.	worker	13814096329
10	Zhou Yufu	M	25	Technical secondary school	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	clerk	13584015630
11	Ma Ming	M	28	Master	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	clerk	13851473451
12	Xu Hongmin	M	33	Technical secondary school	Huaneng Nanjing Jinlinggg electricity generation Co.,Ltd.	clerk	85728209
13	Jiang Hongjun	M	25	undergraduate	Huaneng Nanjing Jinlinggg electricity generation Co.,Ltd.	clerk	85728289
14	Ma Jinglong	M	58	Elementary school	Qixia Xihua village community	farmer	85728211
15	Xu Tuo	M	33	Technical secondary school	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	accountant	85778886
16	Zhou Zheng	M	32	College	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	accountant	13914068668

No.	Name	Sex	Age	Educated	Home address (work address)	Occupation	Telephone
17	Guan Zhixiong	M	37	Elementary school	Qixia Xihua village community	farmer	85728203
18	Xie Yuanqi	M	42	Graduate	Huaneng Nanjing Jinlinggg electricity generation Co.,Ltd.	staff	85728205
19	Liu Nan	M	51	Technical secondary school	Huaneng Nanjing Jinlinggg electricity generation Co.,Ltd.	worker	13913992609
20	Qian Changchun	M	37	Technical secondary school	Nanjing Jinling gas turbine power plant	employee	13913992612
21	Zhang Hong	F	45	Junior high school	Qixia Xihua village community	farmer	13913992909
22	Shao Rongguo	M	44	undergraduate	Huaneng Nanjing Jinlinggg electricity generation Co.,Ltd.	clerk	85728202
23	Chang Jie	F	39	Junior high school	Huaneng Nanjing Jinlinggg electricity generation Co.,Ltd.	clerk	85728218
24	Wu Jianqiao	F	26	Senior high school	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	employee	13701451330
25	Luo Aijun	M	29	Senior high school	Qixia Xihua village community	farmer	13851421215
26	Wang Hui	F	34	Junior high school	Qixia Xihua village community	employee	13851513373
27	Zhao Bin	M	39	Technical secondary school	Qixia district Sheshan star city	statistics	85712450

No.	Name	Sex	Age	Educated	Home address (work address)	Occupation	Telephone
28	Hu Hongling	F	26	Technical secondary school	Shiyuan Digital & Electronic Jiangsu Co.,Ltd.	employee	85778103
29	Za zhinan	M	24	Senior high school	Qixia,Xihua village	farmer	85778101
30	Li Zhen	M	29	Technical secondary school	Shiyuan Digital & Electronic Jiangsu Co.,Ltd.	employee	85778103
31	Xu Zhengyi	M	35	Junior high school	Shiyuan Digital & Electronic Jiangsu Co.,Ltd.	driver	13057677951
32	Ou Jiangao	M	48	Elementary school	Qixia Xihua village	farmer	85778100
33	Zhang Xu	M	30	Technical secondary school	Shiyuan Digital & Electronic Jiangsu Co.,Ltd.	staff	85778103
34	Zhao Aihua	F	20	Junior high school	Shiyuan Digital & Electronic Jiangsu Co.,Ltd.	worker	85778102
35	Xu Wenquan	F	24	College	Shiyuan Digital & Electronic Jiangsu Co.,Ltd.	accountant	85778101
36	Zhang Mei	F	26	University	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	management	13003418003
37	Liu Fang	F	22	Senior high school	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	worker	13601583249
38	Wang Run	M	28	University	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	investment	13851942779

No.	Name	Sex	Age	Educated	Home address (work address)	Occupation	Telephone
39	Tang Jindong	M	28	University	Qixia Economic and Technological Development Zone along the Yangtze River Development Co., Ltd.	investment	13913927835
40	Zhang Yi	M	40	Junior high school	Qixia Xihua village community	farmer	13905170945

Table 3.1-3 Statistics of basic information of surveyed individuals

Age/Sex	People	Rate (%)	Education	People	Rate (%)	Occupation	People	Rate (%)
18-40	31	77.5	Elementary school	5	12.5	Worker	19	47
41-75	9	22.5	Junior high school	8	20	Farmer	7	18
Male	26	65	Senior high school and Technical secondary school	15	37.5	Technician	6	15
Female	14	35	University or above	12	30	Other	8	25

3.2 Statistics and analysis of survey results

The statistics of survey results for public consultation are shown in Table 3.2-1.

Table 3.2-1 Statistic results of public consultation questionnaire

1. Are you satisfied with present environment status?	very satisfied 8 (20%)	satisfied 17 (42.5%)	basically satisfied 15(37.5%)	not satisfied 0 (0%)	not at all 0 (0%)	
2. How is your understanding of the project?	not clear 0 (0%)	a little clear 14 (35%)	basically clear 16 (40%)	clear 7 (17.5%)	very clear 3 (7.5%)	
3. Your understanding of the project is from which information channel?	newspaper 10 (15%)	TV, broadcast 22 (33%)	bulletin 9 (14%)	internet 3 (5%)	folk 22 (33%)	
4. According to your understanding, how is the environment impacts caused by project construction?	severe 0 (0%)	great 0 (0%)	common 6 (15%)	a few 10 (25%)	few 22 (55%)	not clear about 2 (5%)
5. What is your biggest concern about	wastewater	exhaust gas 3 (7%)	noise 6 (14%)	solid waste 9 (20%)	in case of accident	

environment issues?	20 (45%)				6 (14%)	
6. From angle of environmental protection, what is your attitude to this project? Briefly explain the reason.	firmly agreed with 11 (27.5%)	agreed with 25 (62.5%)	conditionally agreed with 4 (10%)	against with 0 (0%)		

Results of survey suggest that:

① 42.5% of the surveyed public is satisfied with the status of environment quality; 15% of the surveyed public is basically satisfied; 8% of the surveyed public is very satisfied. It demonstrates that local environment quality is in good condition and brings no inconvenience to local people's lives.

② 7.5% of the surveyed public is well aware of the planned project; 17.5% of the surveyed is aware of; 40% of the surveyed is basically aware of; 35% of the surveyed knows a little. It shows that planned project has certain popularity in the local.

③ 14% of the surveyed obtains information of planned project from bulletin; 15% of the surveyed from newspaper; 33% of the surveyed from television and broadcast; 33% of the surveyed from the folk; 5% of the surveyed from the internet. It shows that local government attaches relatively great importance to planned project and publicize to local residents through various channels.

④ 25% of the surveyed believes that environment impacts caused by planned project are relatively small; 15% of the surveyed believes that environment impacts caused by planned project are commonly; 55% of the surveyed believes that environment impacts caused by planned project are very small. It shows that the surveyed has a certain understanding of possible environment impacts caused by planned project and commonly believes these impacts are not great.

⑤ 15% of the surveyed are most concerned about the impact of noise on ambient environment; 20% of the surveyed are most concerned about the impact of solid waste; 45% of the surveyed are most concerned about the impact of wastewater; 7% of the surveyed are most concerned about the impact of exhaust gas; 14% of the surveyed are most concerned about the impact of accidents. Construction unit should properly dispose the "three waste" and implement noise control measures.

⑥ 27.5% of the surveyed is firmly agree with construction of this project; 62.5% of the

surveyed is agree with construction of this project; 10% of the surveyed is conditionally agree with construction of this project because of concern about impacts of exhaust gas and noise during construction period. It is visible that local residents basically support the construction of this project.

4 Public consultation meeting

4.1 Forms of public consultation meeting

On April 14, 2012, a public consultation meeting was held in the meeting room of Xihua Village Community Residents' Committee and organized by the committee. The preside is the director of the committee, Mr.Ma. Scope of survey is representatives of residents and enterprises around the water treatment plant and in the range of water supply. 16 public representatives participated this meeting. Public consultation meeting was held to interview and consult the public's comments and requirements of project, to respond public questionable problems and explain mitigation measures to solve environment issues, to completely understand the public's opinions on project impacts and degree of satisfaction of mitigation measures.

4.2 Process and contents of public consultation meeting

Agenda:

(1) The preside spoke and explained the objects of this consultation meeting. (See photo 4).

(2) Dongyue, the representative from construction unit, introduced the project. (See photo 5).

(3) The representative of EIA consultants introduced the environment impacts during construction and operation periods and mitigation measures. (See photo 6).

(4) The public presents their opinions and communicated with the EIA consultants and the construction unit (See photo 7).

Topics:

(1) Possibly caused environment impacts by planned project, including positive and negative impacts;

(2) What are the comments and requirements of the public on project construction

around the project; degree of understanding and recognition on environmental protection measures; whether having rational and constructive comments and suggestions.

Photo 4 Director Ma is making the speech as the host

Photo 5 Speech made by the representative of construction unit

Photo 6 Speech made by the representative of EIA consultant

Photo 7 Public hearing of project introduction

4.3 Participants of public consultation meeting

16 public representatives participated the consultation meeting, name list shown in table 11.4.3.1: 3 representatives for enterprises and 13 representatives for people who will be affected; 9 male and 7 female; 5 worker, 9 famers and 2 others; 3 with education degree above college, 9 with education degree of high school and 3 with education degree below preliminary school.

Table 4.3-1 List of public representatives participating in the public consultation meeting

No.	Name	Sex	Education	Tel.	Home address
1	Ma Shangfu	M	College	85706733	Xihua village Yanjiabian group
2	Luo Dungui	M	Junior high school	1381651073	Xihua village green group
3	Ms. Yin	F	Senior high school	85761030	Xihua village community
4	Lv Changzhou	M	Senior high school	13851822862	Xihua village Yanjiabian group
5	Zhang Jialong	M	College	13776667065	Xihua village community Zhaodong group
6	Shi Xingmei	F	Junior high school	13851982415	Xihua village Hongshui group
7	Zhao Xiaping	F	Junior high school	85761279	Xihua village Yanjiabian group
8	Xu Xiaoping	F	Elementary school	13675108519	Xihua village Hongshui group

No.	Name	Sex	Education	Tel.	Home address
9	Chuang Changlai	M	Junior high school	13405804178	Xihua village
10	Wang Xiaohong	F	Junior high school	13770689392	Xihua village Hongshui group
11	Wang Huilin	F	Elementary school	13584050322	Xihua village Yanjiabian group
12	Zhu Yonghong	M	Senior high school	13813805979	Nanjing Lexicon Electronic Co.,Ltd. (enterprise representative)
13	Dai Libing	M	Senior high school	85761849	Xihua village
14	Wong Shibin	M	undergraduate	13951940295	Qixai street park service office (representative of institution unit)
15	Xu Youzhong	M	undergraduate	13611563508	Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd. (enterprise representative)
16	Sun Xiuying	F	illiteracy		Xihua village Zhao village

4.4 Exchange between representatives and specialists on the meeting

Public representatives and EIA specialists carried out extensive exchange, shown in photo 8. Public consultation meeting record is in the appendix. Summary of public opinions is listed in Table 4.4-1.

Photo 8 Exchange between the public and EIA consultants on the meeting

Table 4.4-1 Summary of Public Consultation

Date	Interviewee	Provided material	Main comments/suggestions	Response
2012.4.14	Xu Youzhong Nanjing High-Tech Knitting & Weaving Technology Development Co.,Ltd. (enterprise representative)	(1) Public participation questionnaire (2) EIA report (3) EMP	(1) Before formal construction of project, it should repair roads on both sides of Huaneng Jinling gas turbine power plant to avoid dust; (2) it must protect pipelines under the original roads	Check out pipelines before construction and aspersion during project construction
2012.4.14	Wong Shibin representative of Qixai street park service office		(1) Scientifically design and plan at early stage; be rigorous and responsible in implementation (2) Carefully review and approve the project; supervise at the entire course of construction and perform one's duties	Construction and operation are strictly implemented in compliance with relevant national and local regulations. Welcome to supervision.
2012.4.14	Shi Xingmei	(1) Public participation questionnaire (2) EIA report (3) EMP	basically satisfied with present environment status; aware of project through folk talk; believed small construction impact; mainly concerned about wastewater impacts; suggested waterworks to keep water clean and better supply water for free	Industrial wastewater will be recycled and water charges in strict accordance with the relevant provisions of national and local charge.
2012.4.14	Zhang Jialong		satisfied with environment status; a little clear about this project through newspaper; believed	Implement protection and control measures to ensure discharge of

Date	Interviewee	Provided material	Main comments/suggestions	Response
			common construction impacts; agreed with this project; suggested to pay attention to environment impacts on ambiance during construction	noise, exhaust gas and wastewater attain relevant standards
2012. 4.14	Xu Xiaoping		basically satisfied with present environment status; a little clear about this project through folk communication; believed common construction impact; mainly concerned about wastewater impacts; suggested waterworks to prevent water from contamination and better supply water for free	Waterworks intake water from the Yangtze river. After the removal of turbidity, organic matter, chroma, and pathogenic microorganism, it could guarantee that water quality attains standards. Water charges in strict accordance with the relevant provisions of national and local charge.
2012. 4.14	Ma Shangfu		satisfied with environment status; clear about the project; believed small construction impacts; agreed with this project; suggested to begin construction soon as that the public could be beneficial from it soon	Project has already been implemented and is estimated to operate in 2013.
2012. 4.14	Sun Xiuying		Basically satisfied with environment status, a little clear about project by bulletin, not clear about environment impacts because of poor education	Could review relevant environment evaluation documents with help of Xihua village community committee
2012. 4.14	Wang Xiaohong		Basically satisfied with environment status; a little clear about project construction; believed common construction impacts; firmly agreed with construction of water treatment plant and	Water charges in strict accordance with the relevant provisions of national and local charge. Waterworks intake water from the Yangtze river. After

Date	Interviewee	Provided material	Main comments/suggestions	Response
			suggested that water discharge should be lower and to keep water clean.	the removal of turbidity, organic matter, chroma, and pathogenic microorganism, it could guarantee that water quality attains standards.
2012. 4.14	Chuang Changlai		Basically satisfied with environment status; clear about project construction; believed that there would be common construction impacts; agreed with project construction; suggested to ensure adequate water source and lower water discharge	Water treatment plant intake water from the Yangtze river, which is rich in water source. Water charges in strict accordance with the relevant provisions of national and local charge.

5. Information Disclosure

5.1 Online information disclosure

According to the relevant regulations of Interim Methods of Environment Impacts Evaluation Public Participation (Huanfa [2006] No.28), environment evaluation unit carried out two rounds of information disclosure, in October and December 2007, about environment impacts of first phase of Nanjing Longtan Water Supply Project on the website of Nanjing Water Supply General Company (http:// www.jlwater.com) (webpage snapshots are shown in Figure 1 and Figure 2) to consult the public's opinions. There has been no negative feedback received during information disclosure. The environmental management plan is planned to be disclosed on the website of Nanjing Water Group Corporate during Aug. 1st~10th, 2013.

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阅读新闻

公示

来源： 作者： [字体：大 中 小]

南京市龙潭水厂一期工程

公众参与一次公示

（一）工程概况

名称：南京市龙潭水厂一期工程

概况：随着南京市近郊经济的快速发展，栖霞区、仙林新市区以及龙潭新城的全面建设，主城东北地区的需水量有较大的增长，目前区域内供水量存在较大缺口。为此南京市自来水总公司决定实施南京市龙潭水厂一期工程（40万吨/天），建设地点位于南京市栖霞经济开发区，长江下游南岸南京长江油运公司与金陵船机电厂之间。工程内容包括取水工程，净水厂工程和清水输水主干管工程三部分。净水厂建设内容为40万m^3/d规模的常规处理、生产废水处理及配套的高低压配电系统、仪表及PLC自动控制系统等，并预留深度处理等用地。

（二）建设单位和联系方式

建设单位：南京市自来水总公司

联系人：娄洪发

联系电话：025-84412313

（三）承担评价工作的环境影响评价机构和联系方式

评价单位：河海大学环境水利研究所

联系人：刘晓东

联系电话：025-83787145

Figure 1 Snapshot of 1st online information disclosure

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来源： 作者： [字体：大 中 小]

随着南京市近郊经济的快速发展，栖霞区、仙林新市区以及龙潭新城的全面建设，主城东北地区的需水量有较大的增长，目前区域内供水量存在较大缺口，供水矛盾日益突出，这使南京市安全供水面临新的严峻挑战。为此，南京市自来水总公司委托河海大学进行南京市龙潭水厂一期工程（40万m3/d）的环境影响评价工作。

按国家环保总局发2006「28号」文《环境影响评价公众参与暂行方法》有关规定，现对项目环境影响评价信息进行公示，欢迎公众积极参与并提出宝贵意见。

1、建设项目情况简述

1.1、基本情况

(1) 项目名称：南京市龙潭水厂一期工程。

(2) 项目性质：新建。

(3) 项目投资：总投资估算为67067万元。

(4) 占用长江岸线：320m。

(5) 建设规模：规划总规模为80万m3/d，一期工程为40万m3/d

(6) 建设进度：龙潭水厂一期工程计划于2010年高峰前建成通水

Figure 2 2nd online information disclosure

5.2 Information disclosure on newspaper

At the late stage of environment impacts evaluation process, environment impacts assessment report and environment management plan were placed in Xihua village community residents' committee for the public to examine and read. Publicity in the newspaper was employed in Nanjing Morning Newspaper in April 14, 2012 in order to make the public understand project environment impacts evaluation progress and provide valuable suggestions, to inform the public check environment evaluation documents in Xihua village community residents' committee or environment evaluation unit. Contents of information disclosure in the newspaper is shown in Figure 3.

10民警将醉汉送到迈皋
醒了一大半，也老实多
厂里面的工人，当晚和
，喝了四瓶啤酒。之后他
街找自助取款机，但找不
下，他就冲砸了取款机
育，王某认识到了错误，
表示以后再也不喝酒了。
11时左右，在下关新民
男子赤膊横躺在快车道
活了，让车子轧死算了。
全是水，过往车辆还不
民立即报警并提醒车辆
赶到后，劝说轻生男
派出所。
（请报料人来领线索费）

通 告

龙潭水厂位于南京市栖霞区经济技术开发区华能电厂西侧，一期工程40万m³/d，主要承担南京市龙潭等地区的供水重任。目前，该项目的环境影响评价工作已基本完成，市民可到西花村社区居委会或环评单位查询环评文件，欢迎公众对该项目的环境影响提出意见和建议，联系方式如下：

项目建设单位：南京市自来水总公司 联系人：董岳 电话 025-84402716

环境影响评价单位：河海大学 联系人：刘晓东 电话 13915974931

南京市自来水总公司
2012年4月12日

Figure 9-3 Copy of Notification on Project EIA Information Disclosure on the Newspaper of Nanjing Morning

6 Conclusions of public consultation

The results of public participation show that:

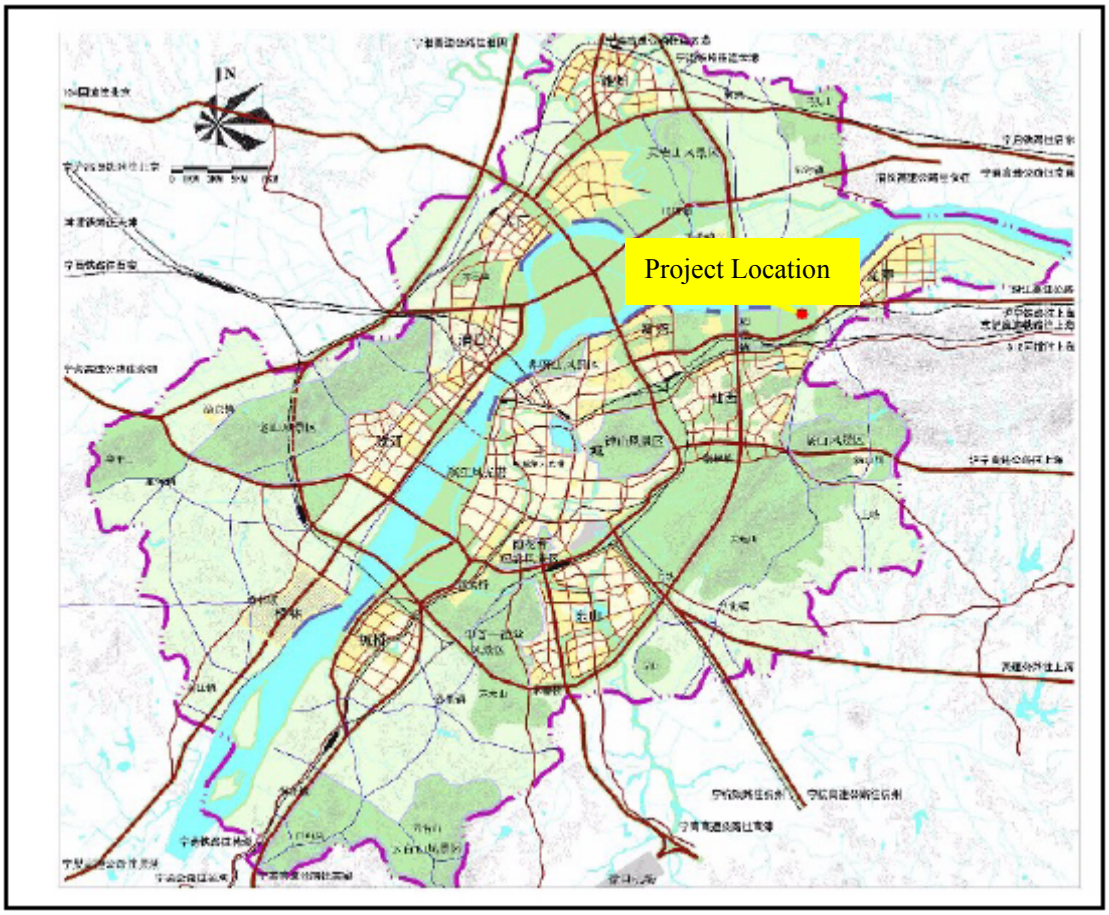
(1) Subjects to the survey were distributed extensively, which had an extensive representation in ages and education levels. Most of the surveyed is the public and staff of enterprises around the planned project, who will be directly affected by the project and know better about local environmental and social backgrounds and whose suggestions and comments could well reflect public opinions in the region and be representative.

(2) Individuals and units around the project are with supportive attitude in general and concerns about the impacts caused by the project. So that, based on the protection of planned construction areas, environment evaluation unit must demonstrate feasibilities of project construction from scientific point of view and propose constructive suggestions to mitigate local environment impacts to the minimum.

(3) Residents worried about noise, wastewater and exhaust gas problems during construction period and commonly suggested that construction unit could reasonably schedule, put every environmental protection into effect and try the best to reduce the inconvenience of

noise, exhaust gas and wastewater pollution.

(4) Relevant departments should enhance strength of publicity of project environmental protection, to make the public in the affected areas further understand environmental protection measures so as to more positively support project construction.



Project Location

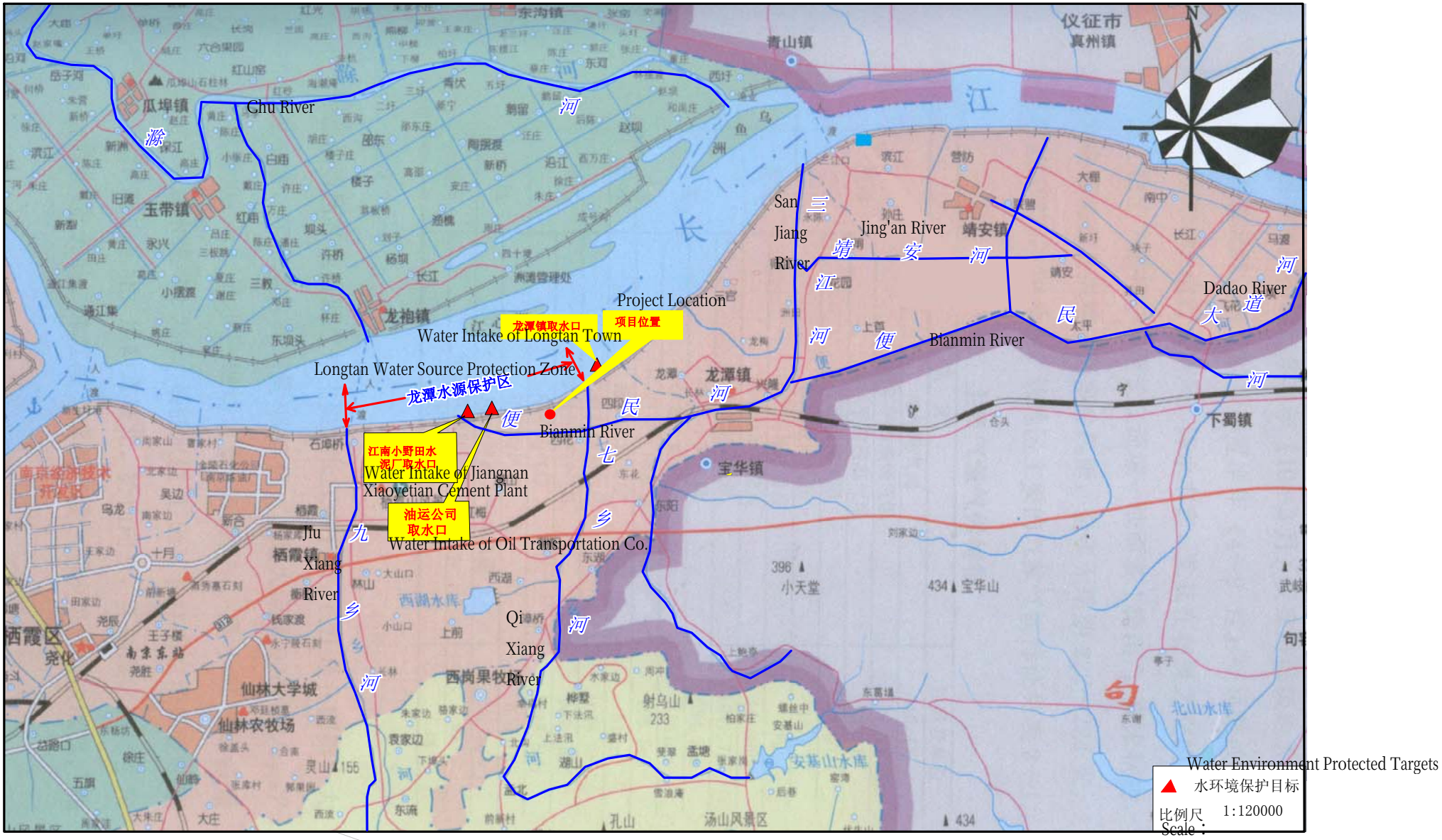


图1-2水环境保护目标位置图

Figure 1-2 Locations of Water Environment Protected Targets