SFG2444 V9

The World Bank Financed

Yugan Water Environment Management Project

Environmental Assessment Report

CERI eco Technology Co., Ltd.

August 2016 Nanchang

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Map

1 Overview

1.1 Project Introduction

Project Name	The World Bank-Financed Yugan Water Environment Management Project				
Construction Unit	Yugan County Leading Group Office of the World Bank-Financed Yugan Water Environment Management Project				
Legal Representative	/		Contact Person	Mr. Zhang	
Telephone	0793-3398346	Fax	/	Zip Code	332600
Construction site	Yugan county seat of Shangrao City				
Approval Department	/		Registered Number of Approval	/	
Construction Type	New ■ Reconstruction and Expansion □ Technical Renovation □		Industry Type and Code	E4852, Pipeline; project construction; N7721, Water pollution control; N7820, Environmental sanitation management	
Floor area(m^2)	/		Green Area(m^2)	/	
Total Investment (10,000 yuan)	23250.06	Environmental investment (RMB)	280.94	Proportion of environmental protection Investment in total investment	1.2%
EIA Cost (10,000 yuan)	/	Expected commissioning date	December 2022		

1.2 Project Background

To protect Jiangxi's ecological environment, safeguard the green mountains and clear waters, strengthen ecological civilization construction, consolidate ecological advantages, and effectively improve ecological environment as well as accelerate social and economic development, Jiangxi Provincial Government plans to use the World Bank loan to implement Poyang Lake Basin Town Water Environment Management Project. This project was approved by the State in October, 2014 and included in World Bank loan 2015 to 2017 fiscal year alternative projects, and Yugan Water Environment Management Project is one of the sub-projects. Yugan County, located in the northeast of Jiangxi Province, is at the southeast bank of Poyang Lake and in the lower stream of Xin River, with Wanian County to the east, Yujiang and Dongxiang County to the south, Jinxian, Xinjian, Nanchang to the west, and Boyang to the north. It borders on Poyang Lake, with Duchang County at the other side of the Lake. Pipa Lake, the only lake in the county, is connected with Huhui River-the tributary of Xin River, and flows into Poyang Lake. Therefore, the ecology of Yugan County has direct impacts on Poyang Lake and the improvement of pollution control of Pipa Lake is also beneficial to the ecological safety of Poyang Lake Basin.

The aim of this project is to reduce pollutants entering into Poyang Lake basin from key water bodies, and improve water quality management of the County by taking the following measures: engineering measures, such as improving lake and river water environment, enhancing domestic sewage management system, building a garbage collection and treatment system, etc.; and non-engineering measures such as strengthening Poyang Lake Basin management, and project implementation facilitation to improve pollution control of Pipa Lake Basin and continuously reduce the total volume of pollutants.

Pursuant to *Environmental Impact Assessment Law of the People's Republic of China*, the World Bank-Financed Yugan Water Environment Management Project needs conduct environmental impact analysis (EIA). Owner of the project commissions CERI eco Technology Co., Ltd. to compile the EIA. Upon accepting the

commission, technical teams were sent to make an on-the-spot survey and to collect relevant documents. Pursuant to relevant technical guidelines and standards, EIA of this project is compiled and submitted to the owner as the basis of getting the approval of the World Bank and conducting pollution prevention.

1.3 Assessment Purpose

Pursuant to stipulations of *Environmental Impact Assessment Law of the People's Republic of China*, *Regulations on Administration of Environmental Protection in Construction Projects*, *Circular on Strengthening Administration of Environmental Impact Assessment for Development Projects Financed by International Finance Corporation Loan*, requirements of the World Bank Safeguard Policies, as well as domestic and the World Bank environmental impacts assessment process, the report shall comment on the project's positive environmental impacts, identify, screen, predict and analyze the potential negative environmental impacts, provide targeted and effective mitigation measures and environmental management plan for major unavoidable negative environmental impacts so as to provide bases for the independent assessment of the project by the World Bank, and for decision making and management by governmental comprehensive management and environmental management departments.

1.4 Basis for EIA Preparation

1.4.1 National Environmental Protection Laws, Rules and Regulations

1) Environmental Protection Law of the People's Republic of China (April, 2014);
2) Environmental Impact Assessment Law of the People's Republic of China (September, 2003);
3) Law of the People's Republic of China on Water Pollution Prevention and Control (June, 2008);
4) Law of the People's Republic of China on Atmospheric Pollution Prevention and Control (August, 2015);
5) Law of the People's Republic of China on Prevention and Control of Ambient Noise Pollution (March, 1997);

6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (June, 2013);
7) Law of the People's Republic of China on Land Administration (August, 2004);
8) Law of the People's Republic of China on the Protection of Wildlife (August, 2004);
9) Law of the People's Republic of China on the Protection of Cultural Relics (June, 2015);
10) Water Law of the People's Republic of China (August, 2002);
11) Law of the People's Republic of China on Flood Control (April, 2015);
12) Law of the People's Republic of China on Soil and Water Conservation (December, 2010);
13) Urban and Rural Planning Law of the People's Republic of China (October, 2007);
14) Regulation on the Implementation of the Water and Soil Conservation Law of the People's Republic of China (August, 1993);
15) Regulations of the People's Republic of China on Nature Reserves (October 9, 2006);
16) Regulations on Scenic and Historic Areas (State Council Decree No.474, September 19);
17) Measures for the Administration of National Wetland Park (For Trial Implementation) (State Forestry Bureau Decree No.1 of wetland, February 21, 2010);
18) Provisions on Administration of Wetland Protection (State Forestry Bureau Decree No.32, March 28, 2013);
19) Regulations on Basic Farmland Protection (State Council Decree No.257, December, 1998);
20) Law of the People's Republic of China on River Channel Administration (State Council Decree No.474, March, 1988);
21) National Ecological Environment Protection Program [Guo Fa (2000) No. 38, November, 2000];

22) Regulations on Administration of Environmental Protection in Construction Projects (State Council Decree No. 253, November, 1998);
23) Classification Management Directory of Environmental Impact Assessment for Construction Projects (April, 2015);
24) Interim Procedures of Public Participation in Environmental Impact Assessment (SPEA,Huan Fa [2006] No. 28, March 18, 2006);
25) Decision of State Council on Implementing Scientific Outlook on Development and Strengthening Environmental Protection (Guo Fa [2005] No. 39);
26) Opinions on Enhancing Supervisions of Resource Development and Ecological Environmental Protection (SPEA, Huan Fa [2004] No. 24);
27) Regulations on Control and Management of Pollution in Drinking Water Source Protection Zones (Revised) (October,2010);
28) Guiding Catalogue on Industrial Restructuring (2011 Version) (Revised in 2013);
29) Circular on Strengthening Administration of Environmental Impact Assessment for Development Projects Financed by International (June, 1993).

1.4.2 Local Environmental Protection Laws and Regulations

1) Regulations of Jiangxi Province on Environmental Protection in Development Projects (Revision, September 17, 2010);
2) Regulations of Jiangxi Province on Environmental Pollution Prevention and Control (January 1, 2009);
3) Methods of Jiangxi Province for Prevention and Control of Pollution to Domestic Drinking Water Sources (August 1, 2006);
4) Surface Water (Environment) Functional Divisions in Jiangxi Province (reply vision);
5) Regulations on Environmental Protection of Poyang Lake Ecological Economic Zone (May 1, 2012);
6) Methods of Jiangxi Province for Land Acquisition Administration (December 22, 2001).

1.4.3 EIA Technical Guidelines and Specifications

1) Technical Guidelines on EIA: General Principles (HJ/T 2.1-2011);

2) Technical Guidelines on EIA: Atmospheric Environment (HJ2.2-2008);
3) Technical Guidelines on EIA: Surface Water Environment (HJ/T 2.3-1993);
4) Technical Guidelines on EIA: Groundwater Environment (HJ610-2011);
5) Technical Guidelines on EIA: Acoustic Environment (HJ 2.4-2009);
6) Technical Guidelines on EIA: Ecological Impacts (HJ 19-2011);
7) Technical Guidelines on Assessment of Environmental Risks of Development Projects (HJ/T 169-2004);
8) Technical Specifications for Ecological Environmental Assessment (HJ/T 192-2006);
9) Technical Specifications for Acoustic Environment Functional Divisions (GB/T15190-2014);

1.4.4 The World Bank Safeguard Policies

Correlation analysis was conducted in the EIA work between this project and World Bank safeguard policies/procedures. Results are shown in Table 1-1.

Table1-1 World Bank Safeguard Policies

World Bank Operation Policies (OP)/Procedures	If involve	If yes, why?
OP/BP 4.01 Environmental Assessment (EA)	√	The project involves this policy. This is a water environment management project, which aims for reducing the pollutant inflow into surface water to improve local environmental quality, thus leading to positive environmental benefits; meanwhile, it will bring some negative impacts such as: (1) common influences caused by construction; (2) noises of the equipment during the operation period.
OP/BP4.04 Natural habitat	×	The project does not involve this policy. The project site is located in the urban area, without involving any natural habitat.
OP/BP 4.36 Forestry	×	The project does not involve this policy. The project will not have any impact on the health and quality of forests, nor will it damage interests of the masses and their dependency on forests who enjoy

		the forest ownership.
OP/BP 4.09 Pest Management	×	The project does not involve this policy. The project does not involve procurement of pesticide and will not result in the increase of pesticide requirement
OP/BP 4.11 Physical Cultural Resources	×	The project does not involve this policy. The construction site is located in the urban area which, according to site survey and investigation, does not involve any physical cultural resource.
OP/BP 4.10 Ethnic Minorities	×	The project does not involve this policy. The project area neither involves indigenous nor any ethnic minority area.
OP/BP 4.12 Involuntary Resettlement	√	The project involves this policy. The construction activities will temporarily or permanently occupy some land.
OP/BP 4.37 Dam Safety	×	The project does not involve this policy. The construction neither involves any dam, nor relying on any existing dam or that under construction.
OP/BP 7.50 International Waters	×	Proposed project site is located at Yugan County, Shangrao City, Jiangxi Province of China and does not involve any international waters.
OP/BP 7.60 Disputed Area	×	The project site is located entirely in Jiangxi Province, without involving any disputed area.
BP 17.50 Information Disclosure	√	Public consultation and information disclosure were conducted on project EIA documents.
IFC *Environmental, Health and Safety General Guidelines*	√	IFC *Environmental, Health and Safety General Guidelines* applies to this project.
IFC *Environmental, Health and Safety Guidelines for Water and Sanitation*	√	IFC *Environmental, Health and Safety Guidelines for Water and Sanitation* applies to this project.
IFC *Environmental, Health and Safety Guidelines for*	√	IFC *Environmental, Health and Safety Guidelines for Waste Management Facilities* applies to this project.

Waste Management Facilities		

1.4.5 Project Related Documents

(1) Project Feasibility Study Report;

(2) Project Resettlement Plan;

(3) Project Social Impact Assessment.

1.5 Assessment Content and Keys

Pursuant to requirements of domestic EIA technical guidelines and the Bank's safeguard policies, the EIA report focuses on answering the following questions:

(1) Engineering characteristics of the project and major environmental issues that may arise;

(2) The project's site selection feasibility and major environmental protection targets (sensitive points);

(3) Potential positive environmental benefits and negative environmental impacts after the implementation of this project;

(4) Measures to mitigate negative impacts caused by this project;

(5) Analysis on alternatives;

(6) Environmental Management Plan (EMP).

1.6 EIA Standards

The IFC *Environmental, Health and Safety General Guidelines* (EHS) contains standards and requirements about gas emission, noise and acoustic environment quality, wastewater, waste management, and occupational health and safety.

The assessment criteria were finalized by comparing and analyzing the applicable domestic standards with those in the Bank's *Environmental, Health and Safety Guidelines*. Specific comparative analysis and results are shown in the following content.

1.6.1 Environmental Quality Standards

1.6.1.1 Ambient Air

In accordance with EHS, ambient air quality shall meet national standard stipulated by law. If there is no such standard, the latest WHO *Air Quality Guideline* or other globally recognized reference standard shall be applied. See Table 1-2. As China has issued *Ambient Air Quality Standards* (GB3095-2012) and the ambient air involved in the project is classified as Category II, the Category II standard in *Ambient Air Quality Standards* (GB3095-2012) is applied. See Table 1-3. Meanwhile, NH_3 and H_2S in garbage collection points shall meet relevant standards in *Hygienic Standards for the Design of Industrial Enterprises (*TJ36-79). See Table 1-3 for details

Table 1-2 Ambient Air Quality Standards in EHS ($\mu g/m^3$)

Item	Average cycle	Guideline value	Standard
SO_2	24h	125 (target value of the first phrase) 50 (target value of the second phrase)	WHO *Air Quality Guideline*
	10min	20 (guideline value) 500 (guideline value)	
NO_2	1a	40 (guideline value)	
	1h	200 (guideline value)	
PM_{10}	1a	70 (target value of the first phrase) 50 (target value of the second phrase) 30 (target value of the third phrase) 20 (guideline value)	
	24h	150 (target value of the first phrase) 100 (target value of the second	

		phrase) 75 (target value of the third phrase) 50 (guideline value)	
$PM_{2.5}$	1a	35 (target value of the first phrase) 25 (target value of the second phrase) 15 (target value of the third phrase) 10 (guideline value)	
	24h	75 (target value of the first phrase) 50 (target value of the second phrase) 37.5 (target value of the third phrase) 25 (guideline value)	

Table 1-3 Ambient Air Quality Standards

Pollution Factor	Environmental Quality Standards(μg/m³)			Basis
	1-hour Average	Daily Average	Annual Average	
SO_2	500	150	60	Category II standard in *Ambient Air Quality Standards* (GB3095-2012)
NO_2	200	80	40	
TSP	--	300	200	
PM_{10}	--	150	70	
$PM_{2.5}$	--	75		
H_2S	--	--	10	*Hygienic Standards for the Design of Industrial Enterprises*(TJ36-79)
NH_3	--	--	200	

After comparison, it is found the 1-hour average value of NO_2 in China's national standard and its annual average value in EHS Guideline are the same; the 1-hour average value of PM_{102} in China's national standard and its target value in the first phrase in EHS Guideline are the same; the 24-hour average of $PM_{2.5}$ in China's national standard and its target value in the first phrase in EHS Guideline are the same; and the 24-hour average of SO_2 in China's national standard is lower than its target value in the first phrase in EHS Guideline.

Pursuant to EHS, ambient air quality shall meet national standard stipulated by law, therefore, relevant standard in Table 1-3 is applied.

1.6.1.2 Water Environment

Pipa Lake and Huhui River involved in this project are sightseeing and entertainment water bodies. The water quality is subject to Category Ⅲ Standard in *Surface Water Environment Quality Standards* (GB3838-2002).Details are shown in Table 1-4.

Table 1-4 Surface Water Environment Quality Standards(mg/L，excluding pH)

Assessment Factor	Category Ⅲ Standard in *Surface Water Environment Quality Standards*(GB3838-2002)
pH	6 – 9
DO	≥5
permanganate index	≤6
COD	≤20
BOD_5	≤4
TN	≤1.0
NH_3-N	≤1.0
TP	≤0.2 (Lake and reservoir: 0.05)
petroleum	≤0.05
sulfide	≤0.2
fecal coliform	≤10000

1.6.1.3 Acoustic Environment

Standard limits of acoustic environment quality relevant indicators based on Chinese national standards and noise guideline values based on EHS are shown in Table 1-5.

Table 1-5 Acoustic Environment Quality Standard (dB(A))

Acoustic Environment Quality Standard (GB3096-2008)				EHS Noise Guideline Value		
Implementation Area	Type of Function Zone	Daytime 6:00~22:00	Nighttime 22:00~6:00	Acceptor	Daytime 7:00 ~22:00	Nighttime 22:00~7:00
Area for residential, commercial, and industrial use	Category II	60	50	Area for living, working and education	55	45

Areas involved in this project belong to residential, commercial and industrial combined areas. After comparison, Category II standard in *Acoustic Environment Quality Standards* (GB3096-2008), i.e. 60 dB(A) in daytime and 50 dB(A) in nighttime, is applied in this project.

1.6.1.4 Soil

Bottom sludge in the outlet channels of Pipa Lake is involved in this project. At present, there is no existing standard for dredging bottom sludge. Common standards for sludge include *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), *Standard of Soil Quality Assessment for Exhibition Sites* (HJ350-2007), *Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of Sludge Used in Forestland (*CJ/T362-2011), etc. *Guidelines for the Utilization and Disposal of Wastewater Sludge* (40CFR Part 503) is applied in the USA while *Sludge (Use in Agriculture) Regulations* (Directive 86/278/EEC) issued by European Committee for Standardization is used in the European Union. Here is a comparison of those standards.

Table1-6 A Comparison of Sludge Standards Home and Abroad (mg/kg)

Item / Standard	Category	pH	cadmium	copper	lead	chromium	zinc	nickel

	Category I	natural background	0.20	35(such as farmland) —(orchard)	35	90 (paddy land and dry land)	100	40
Soil Environment Quality Standards (GB15618-1995)	Category II	<6.5	0.30	50(such as farmland) 150(orchard)	250	250 (paddy land) 150 (dry land)	200	40
		6.5~7.5	0.30	100(such as farmland) 200(orchard)	300	300 (paddy land) 200 (dry land)	250	50
		>7.5	0.60	100(such as farmland) 200(orchard)	350	350 (paddy land) 250 (dry land)	300	60
	Category III	>6.5	1.0	400(such as farmland) 400(orchard)	500	400 (paddy land) 300 (dry land)	500	200
Standards for Control of Pollutants in Agricultural Sludge (GB4284-84)	—	＜6.5	5	250	300	600	500	100
	—	≥6.5	20	500	1000	1000	1000	200
Standard of Soil Quality Assessment for Exhibition Sites (On trial) (HJ350-2007)	Category A	—	1	63	140	190	200	50
	Category B	—	22	600	600	610	1500	2400
*Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of Sludge Used in Forestland (*CJ/T362-2011)	—	5.5~8.5	20	1500	1000	1000	3000	200
Guidelines for the Utilization and Disposal of	—	—	85	4300	840	—	7500	420

Wastewater Sludge (40CFR Part 503) (in the USA)								
Sludge (Use in Agriculture) Regulations (Directive 86/278/EEC) (in EU)	—	—	20~40	1000~1750	50~1200	—	2500~4000	300~400

Note: 1. Generally, the application of sludge that meets *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) shall not exceed 2000kg (for dry sludge) per acre per year.

2. The accumulated application of sludge used in forestland that meets *Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of Sludge Used in Forestland* (CJ/T362-2011) shall not exceed 30t/hm^2 per year.

As these standards all use heavy metal as the controlling indicator of main pollutants, this report will focus on comparing heavy metal. Take zinc as an example. After comparison, it is found that the maximum allowed concentration limit of zinc is the lowest in *Soil Environment Quality Standards* (GB15618-1995) in which the Category III standard is 500 mg/kg (pH>6.5); next is in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) in which the standard is 1000 mg/kg; the third lowest is in *Standard of Soil Quality Assessment for Exhibition Sites* (HJ350-2007), in which the Category B standard is 1500 mg/kg; the fourth lowest is in *Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of Sludge Used in Forestland (*CJ/T362-2011), 3000 mg/kg; The fifth is in the EU standard, 2500 mg/kg ~4000 mg/kg; the highest one is in American standard, 7500 mg/kg.

Generally speaking, China's maximum allowed concentration limit in *Soil Environment Quality Standards* (GB15618-1995) is the lowest. The limits increase one after another, from *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), *Standard of Soil Quality Assessment for Exhibition Sites* (HJ350-2007), *Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of*

*Sludge Used in Forestland (*CJ/T362-2011), to the EU standard. The highest one is the American standard. Therefore, China's *Soil Environment Quality Standard*s (GB15618-1995) and *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) are the strictest two standards. Reference can be made to other standards in China, the USA and the EU for the universality and risk evaluation of sludge.

When the heavy metal indicator does not meet the Category III standard of China's *Soil Environment Quality Standards* (GB15618-1995), but is up to the American standard or other sludge standards, it is believed that sludge does not belong to hazardous waste and can be treated as common sludge in this project.

1.6.2 Pollutant Discharge Standards

1.6.2.1 Atmospheric Pollutant

Construction dust is the major air pollutant during the construction period, for which monitored concentration limits for fugitive discharge in *Comprehensive Atmospheric Pollutant Emission Standards* (GB16297-1996) are applied.See in Table 1-7.

Odor pollutant generated in waste collection station is the major air pollutant during operation period, for which Category Ⅱ Standard in *Emission Standards for Odor Pollutants* (GB14554-93) is applied. See in Table 1-8.

Table 1-7 Comprehensive Atmospheric Pollutant Emission Standards (excerpt)

Pollutant	Monitored concentration limits for fugitive discharge	
particulate matter	Monitoring Point	Concentration (mg/m_3)
	The highest concentration outside the boundary	1.0

Table 1-8 Emission Standards for Odor Pollutants (excerpt)

Pollutants	Monitored Concentration Limits(mg/m_3)
NH_3	1.5

H_2S	0.06

1.6.2.2 Water Pollutant

Collected garbage leachate is sent to be treated in the leachate treatment station of Yugan Garbage Landfill Plant; after collection, sediment treatment and meeting Level B in *Standards for Water Quality of Sewage Discharged into Urban Sewer*(GJ343-2010),, flushing wastewater from garbage collection points and transfer vehicles drains into Yugan wastewater treatment plants through sewage pipeline network. If the treated wastewater meets the Category I B standard in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (GB18918-2002), it will be discharged into Xin River. The effluent water quality standards of sewage treatment plants can be found in Table 1-9.

Table 1-9 Emission Standards for Waste Water (Unit: mg/L, excluding pH)

Source of standard / Pollutant	Level B in *Standards for Water Quality of Sewage Discharged into Urban Sewer*(GJ343-2010)	Category IB in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (GB18918-2002)
pH	6.5-6.9	6 – 9
SS	400	20
BOD_5	350	20
COD	500	60
NH_3-N	45	8(15)

Note: the value outside the brackets is control indicator when the temperature is above 12 ℃, while the value inside the brackets is control indicator when the temperature is below 12 ℃.

1.6.2.3 Noise

Standards for Ambient Noise Emission at Construction Site Boundary

(GB12523-2011) is applied for construction noise in this project; Category II standard in *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008) is applied for noise at pumping station during the operation period. See details in Table1-10.

Table 1-10 Acoustic Environment Quality Standard (Unit: dB(A))

Item	*Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008)	*Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011)
	Category II	Construction Site Noise Emission Standards
Daytime	60	70
Nighttime	50	55

1.6.2.4 Solid waste

Pollutant Control Standards for Storage and Disposal Sites of General Industrial Solid Waste (GB18599-2001) is applied for disposal of general solid waste. *Standards for Pollution Control at Hazardous Waste Storage Site* (GB18597-2001) is applied for hazardous wastes generated in the monitoring laboratory. Requirements of EHS and the Bank's relevant safeguard policies should also be met.

1.7 Environmental Impact Factors and Assessment Factors

Matrix is applied to identify key environmental issues of the project. See Table 1-11.

Table 1-11 Matrix of Environmental Impact Identification

Environmental Factor	Pollutant	Construction Period				Operation Period			
		Pipeline network	Refuse collection and transportation	Water system restoration	Water environment monitoring system	Pipeline network	Refuse collection and transportation	Water system restoration	Water environment monitoring system
ambient air	particulate matter	△	△	ambient air	particulate matter	△	△	ambient air	Particulate matter
	odor	—	—		odor	—	—		odor

Environmental Factor	Pollutant	Construction Period				Operation Period			
		Pipeline network	Refuse collection and transportation	Water system restoration	Water environment monitoring system	Pipeline network	Refuse collection and transportation	Water system restoration	Water environment monitoring system
water	COD	—	—	water	COD	—	—	water	COD
	BOD_5	—	—		BOD_5	—	—		BOD_5
	SS	—	—		SS	—	—		SS
	NH_3-N	—	—		NH_3-N	—	—		NH_3-N
	TN	—	—		TN	—	—		TN
	TP	—	—		TP	—	—		TP
noise	noise	△	△	noise	noise	△	△	noise	noise
solid waste	solid waste	△	△	solid waste	solid waste	△	△	solid waste	solid waste
ecology	soil	—	—	ecology	soil	—	—	ecology	soil
	animal	△	—		animal	△	—		animal
	vegetation	△	—		vegetation	△	—		vegetation
	land use	△	△		land use	△	△		land use
social impact	acquisition land for settlement	△	△	social impact	acquisition land for settlement	△	△	social impact	acquisition land for settlement
	traffic and municipal facilities	▲	—		traffic and municipal facilities	▲	—		traffic and municipal facilities
	living quality	▲	—		living quality	▲	—		living quality
	commerce and economy	▲	—		commerce and economy	▲	—		commerce and economy
	occupational health	△	△		occupational health	△	△		occupational health

Environmental Factor	Pollutant	Construction Period				Operation Period			
		Pipeline network	Refuse collection and transportation	Water system restoration	Water environment monitoring system	Pipeline network	Refuse collection and transportation	Water system restoration	Water environment monitoring system
	landscape environment	△	△		landscape environment	△	△		landscape environment

Note: ▲ stands for significant negative impact; △ general negative impact; - no impact, ● significant positive impact, ○ general positive impact; - no impact.

The above table shows that the main environmental impacts are:

（1） Construction period: impacts of construction dust, wastewater, noise, solid waste, other factors, as well as social impacts of pipe network construction on traffic and municipal services interruption, and impact of dredging sludge on environment;

（2） Operation period: mainly include positive impacts on water quality, negative impacts by odor and leachate in garbage collection and transfer project, as well as impacts of waste liquor from monitoring laboratory test on environment.

Through environmental impact identification, the assessment factors in this assessment are shown in Table 1-12.

Table1-12 List of Assessment Factors

Factor	Status Quo Assessment Factor	Impact Prediction and Assessment Factor
ambient air	SO_2, NO_2, PM_{10}	NH_3, H_2S
surface water	pH, COD, BOD_5, NH_3, SS	COD, BOD_5, NH_3-N, SS
noise	Equivalent Sound Level Leq(A)	Equivalent Sound Level Leq(A)
ecological environment	animal and plant resources	—
solid waste	—	dredging amount, earthwork

1.8 Environment Protection Targets

1.8.1 Acoustic and Atmospheric Environmental Protection Targets

Based on on-site investigation by the PLG, all the involved acoustic and atmospheric environmental protection targets are shown in Table 1-13.

Table 1-13 List of Acoustic and Atmospheric Environmental Protection Targets

Project	Impact Phase	Impact Factor	Name of Sensitive Point	Location	Distance (m)	No. of Households
Pipeline Network	construction period	dust during construction period, construction noise	Pipazhou Community	northwest of Former Municipal Public Utility Administration Bureau garbage transfer station	100	100
			Guankou Village	pipeline network	20	250
Sewage lifting and pumping station	operation Period	noise	Pipazhou Community	north of the pumping station	100	100

1.8.2 Water Environmental Protection Targets

Water environmental protection targets of this project are shown in Table 1-14.

Table 1-14 Water Environmental Protection Targets

Serial No.	Protection targets	Water quality planning target	Water body function	construction content involved
1	Huhui River	Category III	scenic and	Improve water quality of Pipa

Serial No.	Protection targets	Water quality planning target	Water body function	construction content involved
			recreational purposes	Lake through pollution source control and sewage interception for Pipa Lake, Huhui River water diversion project as well as ecological restoration.
2	Pipa Lake	Category III	scenic and recreational purposes	

1.8.3 Ecological Environmental Protection Targets

Ecological environmental protection targets of each project are shown in Table 1-15.

Table 1-15 Ecological Environmental Protection Targets

Serial No.	Environmental Factor	Protection Targets	Overview of Protection Targets
1	Ecological Environment	terrestrial flora	terrestrial plant within project's permanent land occupation and temporary land occupation
		aquatic life	aquatic life in Pipa Lake Basin
		wild animal	Project-affected wildlife

1.8.4 Social Environmental Protection Targets

Social environmental protection targets of this project are shown in Table 1-16.

Table 1-16 List of Social Environmental Protection Targets

Serial No.	Impact Factor	Protection Targets
1	excavation of the pipeline network	travel and safety of residents, schools, hospitals along the existing roads as well as business down the street and municipal service facilities like water and electricity supply.
2	land occupation by project	local economy, residents affected by land acquisition

2 Project Description

2.1 General situation of the engineering

2.1.1 Components

(1) Project name: World Bank-Financed Yugan Water Environment Management Project

(2) Construction unit: Leading Group Office of Yugan County on World Bank-financed Jiangxi Poyang Lake Basin Key Towns Comprehensive Pollution Treatment and Ecological Safety Improvement Project

(3) Location of construction site: Yugan County, Shangrao City, Jiangxi Province, and the geographical location is shown in the attached Map 1.

(4) Project components: The project includes engineering measures which contains the Pipa Lake sewage interception and sewage pipe networks sub-project, Pipa Lake water diversion sub-project, sediment dredging sub-project, ecological restoration of water body and guarantee of water quality sub-project, domestic garbage collection and transfer sub-project, water environment monitoring system sub-project and other non-engineering measures.

Project components and construction content are shown in Table 2-1.

Table 2-1 Project Components and Construction Content

Project name	Sub-project	Content	Type	Location
Sewage pipe project around Pipa Lake	Sewage pipeline network	A DN300-DN400 sewage pipeline of 5,562.8m is proposed to be built around Pipa Lake. And a new integrated prefabricated pumping station of 3,500m^3/d shall be built near the existing combined sewage pumping station.	new	around Pipa Lake
Pipa lake water diversion project	Water diversion and activation project	An integrated prefabricated pumping station of 7200m^3/d shall be built in the mouth of the diversion channel. A sluice will be built in the outlet channel of Pipa Lake and 3 defective sluices will be replaced.	Reconstruction	around Pipa Lake
Pipa lake outlet channel	Dredging the bottom silt of	dredging silt of the 30,000m^3 in the outlet channel of Pipa Lake	new	in the outlet channel of Pipa Lake

Project name	Sub-project	Content	Type	Location
dredging project	channels			
Garbage collection and transfer project	Lakeside garbage treatment	Garbage transfer stations in front of the No.2 Middle School and in Huanhu Donglu in Pipa Lake Basin will be closed and the garbage transfer station of the Municipal Public Utility Administration Bureau shall be transformed into a garbage collection point and a new garbage collection point will be built.	Reconstruction	around Pipa Lake
Pipa lake water ecological restoration and water quality guarantee project	water ecological construction in Pipa lake	Landscape engineering of 40,000m^2, submerged plant of 3.6X$10^9$$m^2$, floating-leaved plant of 7.2X$10^7$$m^2$, emerging plant of 2,412m^2, and water area of strengthened purification of 3000m^3 will be built; 8 aerating apparatus, 8 immobilized microbiological incubators, and 2 aquatic plant cleaning docks will be set up; and 2 weed-cutting launches (with a load of 5t) will be purchased.	new	around Pipa Lake
	ecological revetment construction	It is proposed to build plant eco-concrete slope protection of 2100m, ecological engineering material slope protection of 1816m, and natural plant gentle slope protection of 1297m, and improve existing slope of 2165m, wooden trestles of 1817m^2, trails of 18583m^2, fences of 4265m and grassed swales of 5231m.	new	around Pipa Lake
Water environment monitoring and control system	Water environment monitoring system premises	improve relevant equipment	use existing rooms	Yugan Bureau of Environmental Protection
	Automatic Water environment monitoring station	7 monitoring sites will be set up in Pipa Lake and Huhui River for the automatic water quality monitoring.	new	Pipa Lake
Cost	About RMB 232,50,600 in total, including USD 25 million (RMB165 million, 1 USD = 6.6 RMB) loan of World Bank and RMB 67,500,600 of counterpart funding.			

2.1.2 Project alternatives

2.1.2.1 Sewage pipe network project

This project aims to improve drainage network in Pipa Lake Basin and protect

the water environment quality of Pipa Lake. The population of this region will reach 9,160 in 2023. The sewage outlet which leads directly to the lake at present is proposed to link with Municipal pipeline networks. Pave DN300-DN400 main sewage pipe with a total length of 5562.8m along both sides of Pipa Lake and north of the Lake outlet ditch. The Pipe is made of glass reinforced plastic sand. Build an integrated prefabricated pumping station with scale of 3500t/d.

The sewage amount is predicted through the combination of per capita comprehensive index method, land area comprehensive index method, classified water utilization prediction method and water consumption calculation method. Sewage amount calculated through different prediction methods is shown in Table 2-2.

Table 2-2 Summary of Sewage Amount Calculation through Different Prediction Methods

Prediction Year / Prediction Method	2023	2030
Per capita comprehensive index method ($10,000m^3/d$)	0.23	0.26
land area comprehensive index method ($10,000m^3/d$)	0.11	0.11
Classified water utilization prediction ($10,000m^3/d$)	0.14	0.18
Average sewage amount ($10,000m^3/d$)	0.16	0.19

Results show that average daily sewage amount is 1600 m^3/d in the near term, in the long term 1900 m^3/d.

2.1.2.2 Diversion works

1. Current situation of water diversion works

Pipa Lake is the central lake and City Lake in Yugan County, Shangrao City of Jiangxi Province. In 2003, in order to solve problems of water quality pollution, Yugan County Water Resources Bureau carried out Pipa Lake water diversion project.

The project links Pipa Lake and Huhui River. The source of clean water diversion is Huhui River. Pipa Lake can achieve daily refreshing of the lake water by diverting from the south and discharging to the north. Tasks of works are as follows: setting up inlet sluice at big barrage section of Xin River, arranging check sluice at Pipa Lake section of Huhui River (small barrage section of Xin River), and setting up Pipa Lake diversion channel and inlet sluice at the section 800m upstream the small barrage. Pipa Lake diversion channel is trapezoid section structure, and the bottom elevation is 14-15m. The bottom width of diversion channel is 4m and the side slope is 1:1.5. Cast-in-place reinforced concrete is used in bottom protection, and precast concrete blocks are employed for slope protection.

In addition to Pipa Lake water diversion works, Yugan County Water Resources Bureau built a new water pumping station beside the inlet sluice of big barrage to solve irrigation of agricultural lands which are at both sides of Huhui River banks. When the water level of Huhui River is low and water in Xin River cannot flow to Huhui River by gravity, the pumping station shall be opened to divert water. See the following figure for layouts of each sluice, pumping station and inlet channel.

Due to management of different departments involved, the Pipa Lake water diversion project has not worked properly since the implementation. Reconnaissance shows that water leaks exist in all sluices.

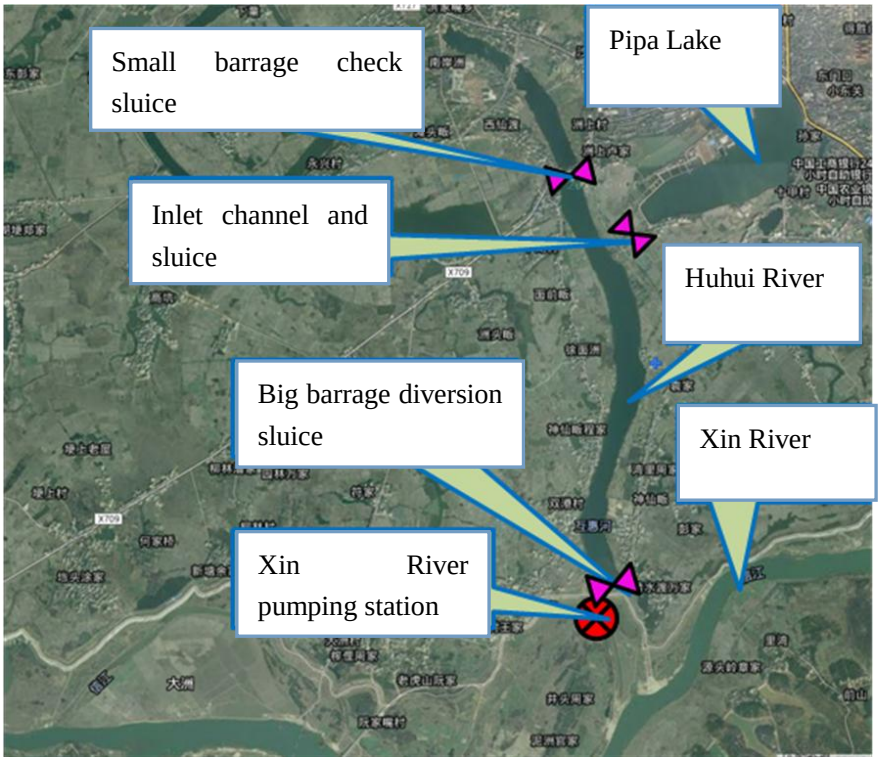


Figure 1-1 Layouts of Existing Sluices, Pumping station and Diversion Channel

2. The project plan

The project intends to improve water diversion works. In order to maintain the setting water level of landscape in Pipa Lake which is 16.60m, one integral prefabricated water pumping station shall be set up at the mouth of diversion channel. The scale of water pumping station is Q=7200m3/d, and the operation time in the whole year is 1,674 hours. A new sluice shall be built at the outlet channel of Pipa Lake, and three defective sluices shall be replaced. The three sluices are respectively big barrage diversion sluice, small barrage check sluice and sluice of Pipa Lake inlet channel. After the completion of water pumping stations and sluices mentioned above, they shall be operated and maintained by Yugan County Pipa Lake Management Committee.

(1) Diversion plan in wet seasons

The wet season is from March to June, when water of Huhui River reaches the highest level throughout the year. The plan intends to shut down the small barrage check sluice of Huhui River, open the big barrage diversion sluice on the upper reaches and divert water from Xin River to Huhui River so as to elevate the water

level of Huhui River (urban section) to 16.6m. The water-surface gradient between Huhui River and Pipa Lake can lead to supplementation of Pipa Lake water, and extra water will flow back into Huhui River through outlet channel. After hydraulic analysis, supplementing water in wet seasons is not necessary, and diversion in wet seasons is just for activating the water body in Pipa Lake. The aquatic vegetation, especially submerged vegetation will be cultivated and restored through ecological restoration technology, so as to improve the water quality and clean the water body.

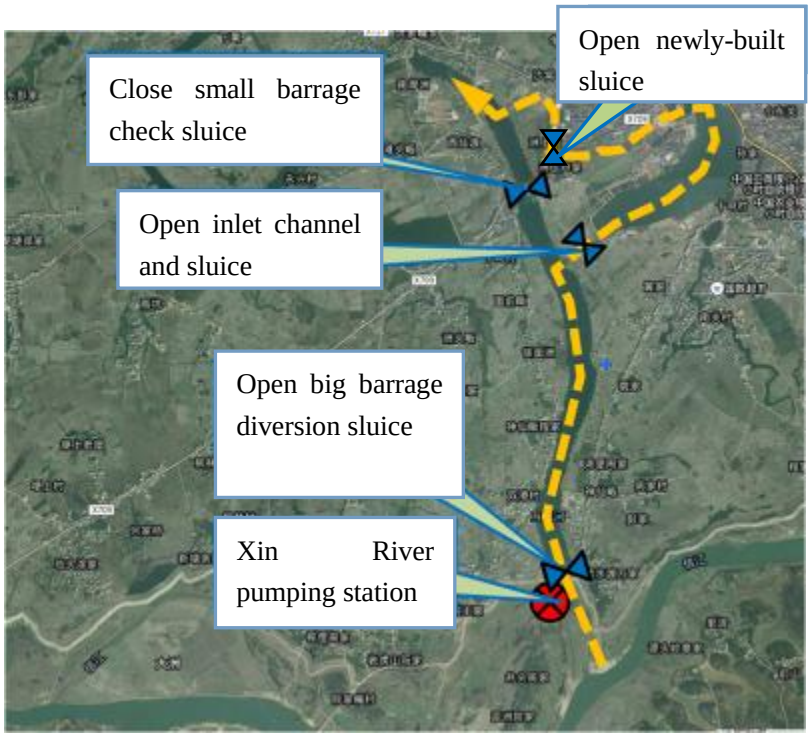


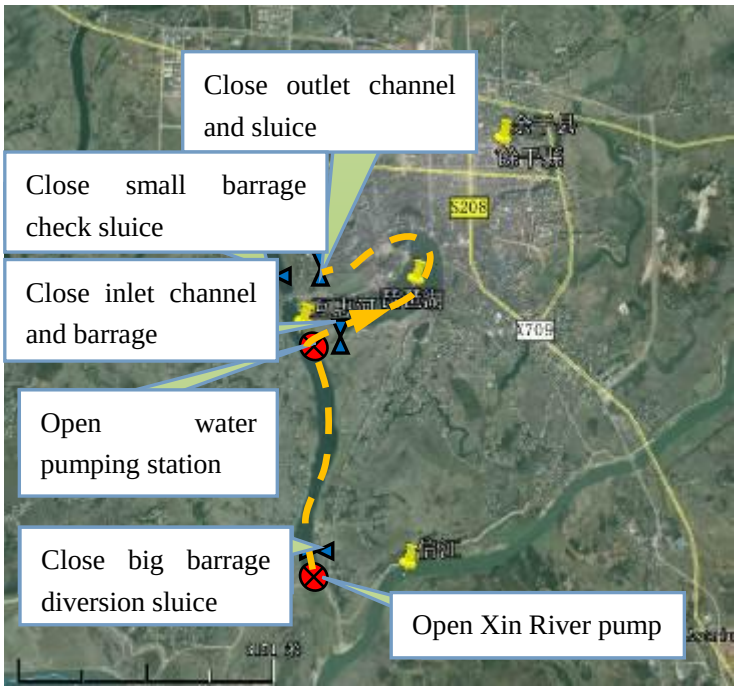
Figure 2-2 Map of Diversion Plan in Wet Season

(2) Diversion plan in dry seasons

In dry seasons, water in Xin River cannot flow into Huhui River by gravity. In order to guarantee irrigation of agricultural lands which are at the both sides of Huhui River banks, the county shuts down small barrage check sluice in dry seasons, and opens Xin River pumping station to divert water for Huhui River.

In dry seasons, the biggest degradation of water level of Pipa Lake is 0.70m. The Pipa Lake shall be supplemented in dry seasons to maintain the designed water level of 16.6m. The diversion plan of the project, utilizing Huhui River supplementation, closes diversion sluice of small barrage to elevate water level of Huhui River, closes inlet sluice, builds a new water pumping station at the head of Pipa Lake diversion

channel, and diverts water from Huhui River into Pipa Lake through water pumping stations. The newly-built sluice of outlet channel shall be closed, then there is only influent but no effluent in Pipa Lake. In this way supplementation and energy consumption can be reduced. The total annual supplementation is 502,200m^3, the largest necessary supplementation per month is 107,400m^3, and the largest daily supplementation is 3,464.5m^3. The water quality of Pipa Lake will be improved through water ecological restoration engineering under the project. See the following picture for diversion plan in dry seasons.



Map 2-3 Water Supplementing Plan during Dry Season

The working time of water pumping station per month in the whole year is listed in the following table.

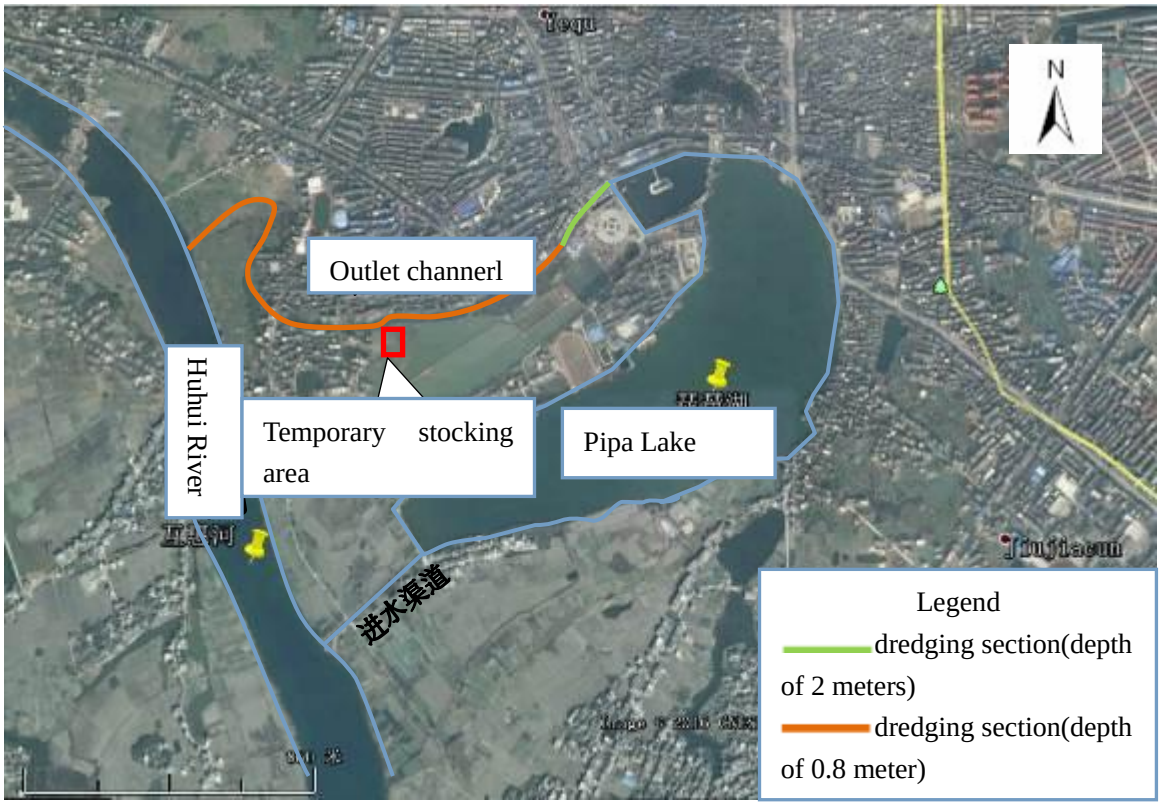
Table 2-3 Working Time of Water Pumping Station Per Month in the whole Year

Month	Water volumetric change in that very month (m^3)	Water level change in that very month (m)	Working time of water pumping station (h)
1	-45,936.3	-0.06	153
2	-19,663.5	-0.03	65.5
3	77,742.12	0.11	0
4	96,205.27	0.13	0
5	113,807.1	0.16	0
6	150,583.3	0.21	0
7	-15,084.3	-0.02	50.5
8	-84,113.4	-0.11	280.4

9	-102,333	-0.14	341
10	-107,412	-0.15	358
11	-65,620.5	-0.09	218.7
12	-62,040.2	-0.08	206.8
Total in the whole year	-63,865.41	0.7	1,674

2.1.2.3 Sediment Dredging

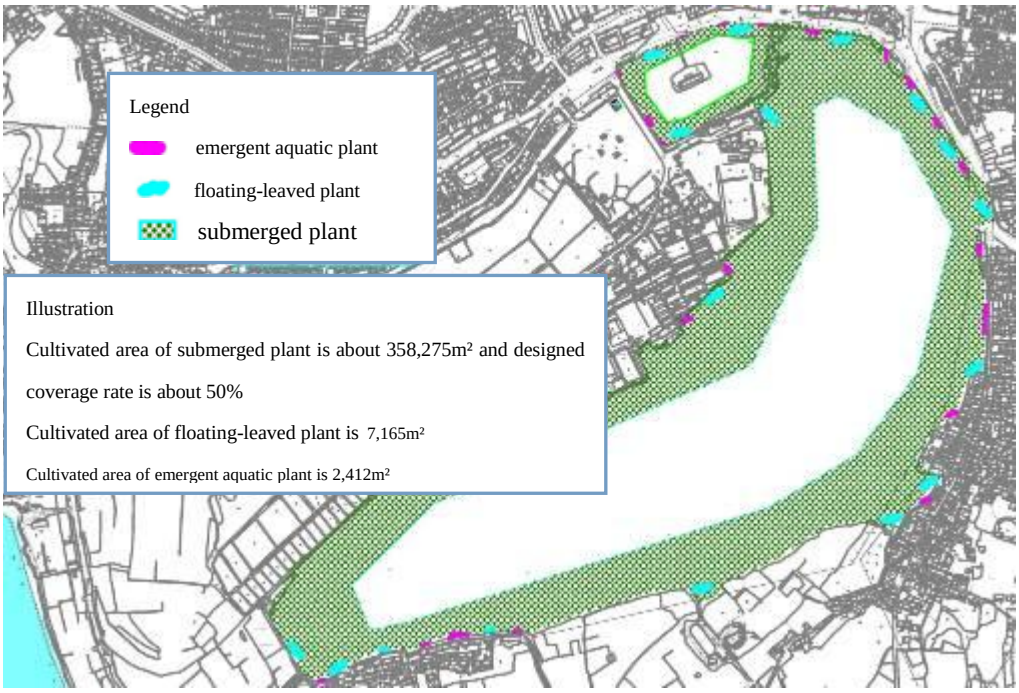
Combine the current water quality of Pipa Lake, water volume and the engineering practice effects in the past, in order to drain off floodwater, adjust water system and improve flow condition, this project intends to dredge heavily blocked Pipa Lake outlet channel. The proposed dredging volume is 30,000m^3, with upstream dredging length and depth respectively 2.0m and 300m, and downstream dredging length and depth respectively 0.8m and 2km. Dredging scope is shown in Map 2-4. Pipa Lake outlet channel dredging project adopts the environment-friendly cutter suction dredger to conduct underground excavation. Sediment is directly delivered to sludge dehydration treatment through dredge pipe. Buoy is adopted to pave dredge pipeline or concealed dredge pipeline along the lake. After purification, compression, homogenization and dehydration, sediment is proposed to be sent to woodland area of Xiaoganghe and Changganling of Yuting, located on the side of Xisan Road. For dehydration and drying of sludge, temporary stacking area is set at the vegetarian land, south of the downstream of the outlet channel, covering an area of 800m^2.



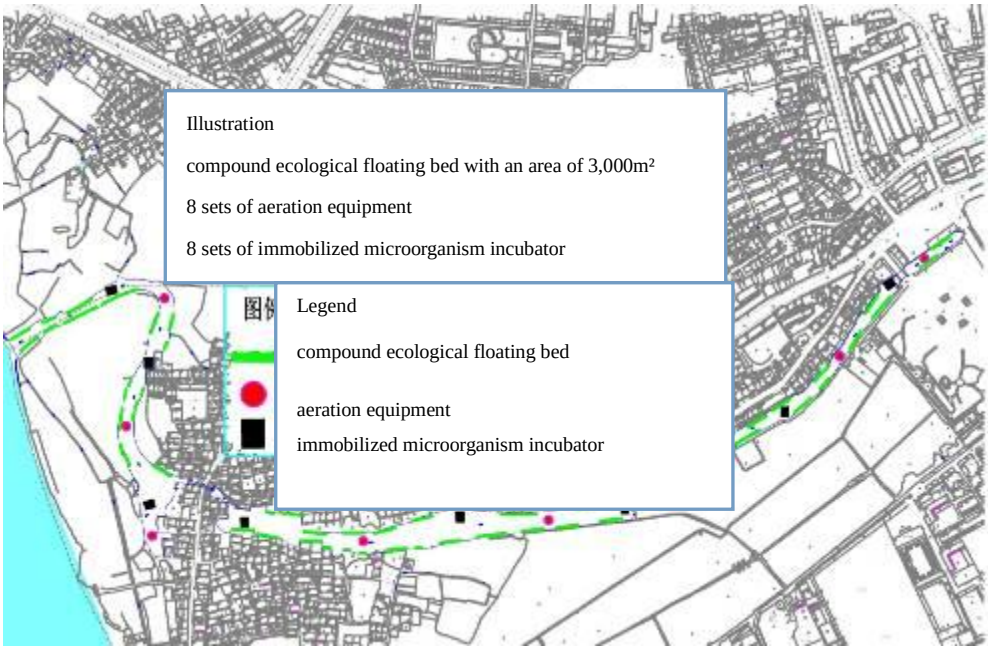
Map 2-4 Dredging Plan and Temporary Land Occupation

2.1.2.5 Ecological Restoration and Water Quality Control Program

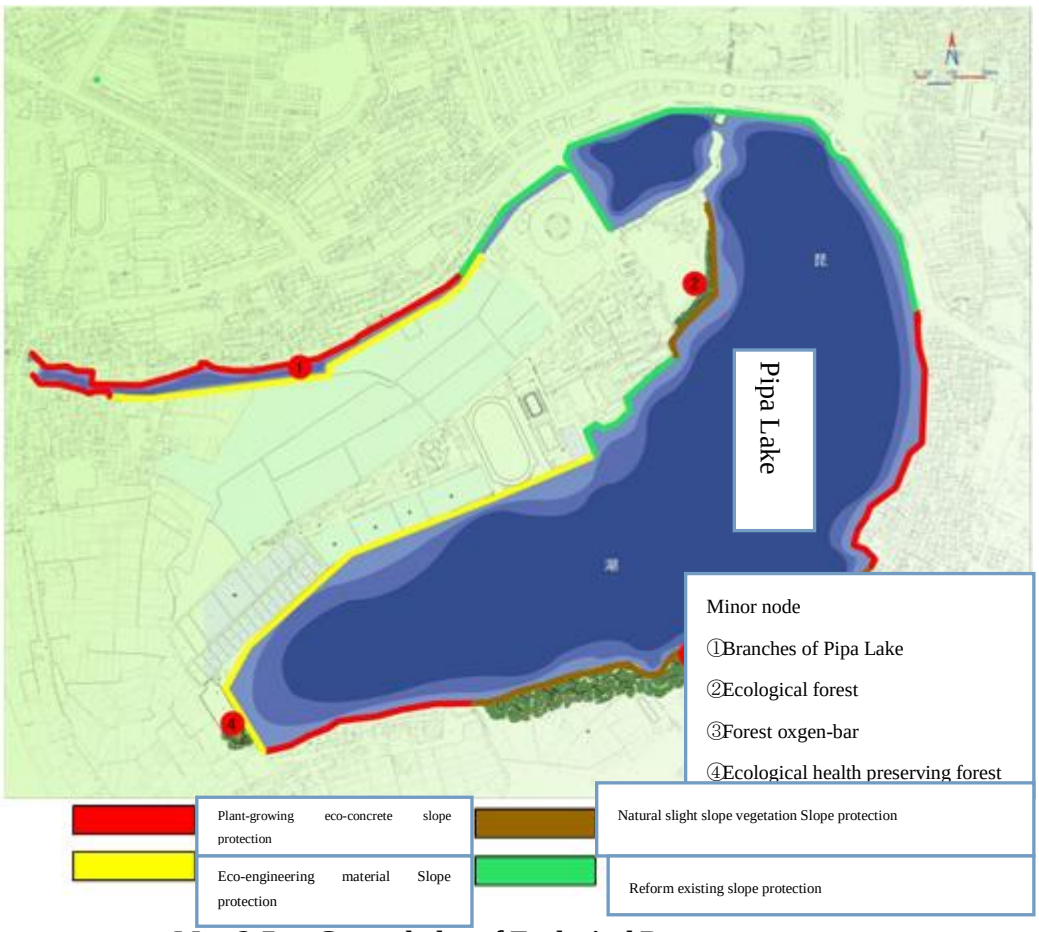
To improve water quality and purify water, plant and recover aquatic vegetation, submerged vegetation in particular, through ecological restoration technology. Detailed is shown below. Considering outlet channel of Pipa Lake adjoins urban built-up area, and is heavily polluted, the project plans to adopt to strengthen its purification.



Map 2-5 Construction Plan of Ecological System



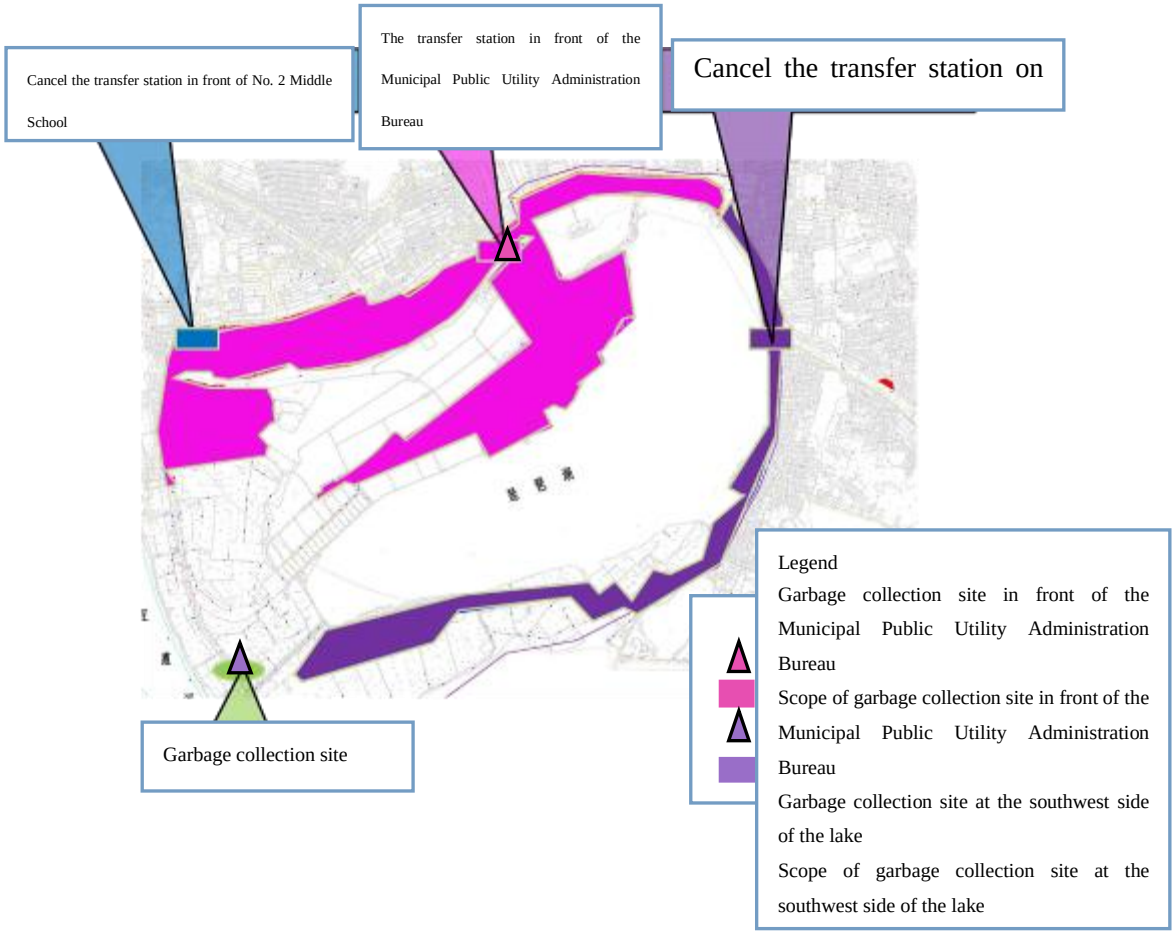
Map 2-6 River Channel Plane Layout



Map 2-7 General plan of Ecological Revetment

2.1.2.6 Domestic Waste Collection and Transfer Sub-project

With the scope of Pipa Lake basin, there are 3 transfer stations including one in front of No. 2 Middle School, one in front of the Municipal Public Utility Administration Bureau and one on Huanhu East Road, among which the first one is built underground with hostile environmental conditions, the second adjoins Pipa Lake, impacting the security of water ecological environment to certain extent. This sub-project plans to build a garbage collection and transportation system in Pipa Lake Basin. Garbage transfer stations in front of the No.2 Middle School and on Huanhu East Road will be closed and the garbage transfer station of the Municipal Public Utility Administration Bureau shall be transformed into a garbage collection point and a new garbage collection point will be built to the southwest of the lake region. Collected and compressed by compression-type garbage collection trucks, domestic waste in the lake region will be directly transferred to Yugan Garbage Landfill.



Map 2-8 Garbage Collection Plan

Current daily waste treatment volume of the three transfer stations in Pipa Lake Basin and predicted daily waste treatment volume in 2023 on the basis of population changes are shown in Table2-3. The calculation is based on per capita waste volume of 0.8kg per person per day.

Table 2-3 Prediction of Waste Transfer Volume (t/d)

Zone	Status quo daily waste transfer volume	daily waste transfer volume in 2023	Collection and transportation method after the project completion
Collection and transportation zone of the transfer station in front of Second Middle School	8	11.3	Waste is collected and transported to City Council collection spot, sorted by compression waste transfer
Municipal Public Utility	24	39.5	

Administration Bureau Collection and transportation zone			truck and transported to landfill.
Collection and transportation zone of the transfer station on Huanhu East Road	16	22.5	Waste is collected and transported to the new waste collection spot in the southwest of the lake district.
Total volume	48	73.3	

2.1.2.7 Scale of the main projects

Table 2-4 Scale of the Main Projects

Serial No.	Construction content	Specification	Scale	Notes
Sewage pipeline network sub-project				
1	Polyethylene (PE) twined structured wall pipe	DN300(Ring stiffness≧8kN/m^2)	2316.7m	buried depth of 2.5m, include inspection shaft, etc.
2	Polyethylene (PE) twined structured wall pipe	DN400(Ring stiffness≧8kN/m^2)	3246.1m	buried depth of 2.5m, include inspection shaft, etc.
3	Sewage inspection shaft	Φ1000	160 units	reinforced concrete
4	Integrated prefabricated sewage pumping station	scale: Q=3500m^3/d	1 set	include submersible centrifugal pump, crushing bar screen , shaft and pipe fittings, etc.
4.1	Submersible centrifugal pump	Q=3500m^3/d, H=7m，N=15kw	2 sets	use one and spare one
4.2	Crushing bar screen	Q=3500m^3/d ,N=3.7+0.4kw	1 set	
Garbage collection and transfer sub-project				
1	Dustbin	120L	349 units	include 9 kitchen waste dustbins

Serial No.	Construction content	Specification	Scale	Notes
2	Electric waste collector		4 units	load of 0.6t
3	Compression waste transfer truck		5 units	load of 0.6t
4	Tank car		2 units	
5	Sanitizer		2 units	
6	Pick-up point project		build a new one and reconstruct one	
Diversion works project				
1	Sluice	2.5m×3m	1 unit	Pipa Lake outlet channel
	Sluice	2.5m×3m	3 units	Replace and repair the existing sluice
2	Integrated prefabricated water diversion pumping station	Q=7200m^3/h	1 unit	Include submersible centrifugal pump, crushing bar screen, shaft and pipe fittings, etc.
2.1	Submersible centrifugal pump	Q=150m^3/，H=10m,N=7.5kw	2 sets	Used in two ways
2.2	Crushing bar screen	Q=300 m^3/h ,N=3.7+0.4kw	1 set	
Sediment dredging project				
1	River dredging		30000m^3	
Ecological restoration sub-project				
2.1	Ecological system construction(plant cultivation)			
	Submerged plant		358275m^2	150 plants/㎡
	Floating-leaved plant		7165m^2	7 plants/㎡
	Emergent Aquatic		2412m^2	16 plants/㎡

Serial No.	Construction content	Specification	Scale	Notes
	Plant			
2.2	Ecological system construction(bottom material processing)		1 set	
2.3	River channel strengthening purification(compound ecological floating bed)		3000m^3	
2.4	Aquatic plant collection wharf		2 units	
2.5	River channel strengthening purification(aerating apparatus)	power of single set: 1.5kw	8 sets	
2.6	River channel strengthening purification(immobilized microorganism incubator)	power of single set: 1.5kw	8 sets	
2.7	Weed-cutting launch	load of 5t; power of single set: 50kw	2 sets	
3	Ecological Revetment			
3.1	Plant-growing eco-concrete Slope protection		2100m	
	Grass grid slop protection material		6300m^2	
	C15 concrete firming foot		378m^3	
3.2	Eco-engineering material Slope protection		1816m	
	pine stakes with		21792m	

Serial No.	Construction content	Specification	Scale	Notes
	diameter of 12cm and length of 3- 4 m			
3.3	Natural slight slope vegetation Slope protection		1297m	
	Mould of earthwork		5188m^2	
3.4	Reform existing slope protection		2165m	
	Block stone barricade		10825m^3	
3.5	Wooden trestle		1817m^2	
3.6	Traveling pavement		18583m^2	
3.7	Guard bar		7378m	
3.8	Grassed swales		5231m	
3.9	Afforestation project		40000m^2	
3.10	Earthwork		110670m^3	

2.1.3 Implementation Schedule

The project is planned to be started in January, 2018, completed and accepted by the end of December, 2022, with a construction period of 5 years.

2.1.4 Project Investment

(1) Total Investment

The total investment amount is estimated to be 232.5006 million yuan, of which strengthening management of Poyang Lake Basin requires16.7301 million yuan, restoring lake and river environment and improving sewage management system 182.2503 million yuan, collecting and transferring solid waste 4.0117 million yuan and implementation support 4.5 million yuan.

(2) Financing

The project plans to apply World Bank loan of $ 25 million (RMB165 million, 1 USD = 6.6 RMB), and the counterpart funding of 67.5006 million yuan is from the

superior support and the local government's self-raised fund.

2.2 Project Analysis

2.2.1 Analysis of Pollution Sources during the Construction Period

(1) Wastewater during the Construction Period

Wastewater during the construction period mainly includes construction wastewater, domestic sewage from construction personnel and residual water generated by the desiccation of dredging sludge.

① Domestic sewage of construction

The construction personnel amounts 100 on average during peak construction period, working at different pipeline sections and garbage collection and transfer station. The water consumption of construction personnel is calculated as 50L/d person with discharging coefficient of 0.8, then the amount of domestic sewage generated by construction personnel is 4m^3/d, whose COD containing is calculated as 250mg/L, BOD_5 150mg/L, SS 200mg/L and NH_3-N 35mg/L, then the generated pollutants are COD 1kg/d, BOD_5 0.7kg/d, SS 0.8 kg/d and NH_3-N 0.14kg/d.

Domestic sewage generated during the construction period should be collected and disposed by existing local collection and treatment facilities, and cannot be discharged arbitrarily.

② Construction wastewater

Wastewater discharged during construction mainly includes three types: The First is muddy water (small amount in general) during pipeline excavation and generated by washing machinery and vehicles; The Second is wastewater generated at the construction site, by flushing sand and stones and other works. Main pollutants of wastewater are SS, petroleum and the like, which are used after precipitation treatment for reducing dust through spraying in the construction site.

③ Residual water generated by desiccation of sludge

Certain amount of wastewater generated during the dehydration of sludge will be discharged into Pipa Lake after it is medicated and disposed of SS.

(2) Waste Gas during the Construction Period

①Construction dust

The main waste gas pollution resource during the construction is dust, including dusts produced by transporting vehicles and dusts at the construction site (e.g. excavation of pipes and channels, earthwork stacking and loading and unloading of building materials, etc.).

According to relevant document literature, during the construction, the dust generated by vehicles accounts for more than 60% of total dusts, and is related to the road surface condition and vehicle speed. Under normal circumstances, the affected scope of dusts on construction roads generated by the natural wind is limited within 100m. Spraying water on roads 4 to 5 times per day helps to reduce about 70% of dusts in the air and limit the TSP pollution within the range of 20 – 50m, indeed a good way to reduce dust. Test results of spraying water are shown in Table 2-5.

Table 2-5 Test Results of Spraying Water to Reduce Dusts during Construction Period

Distance to Roadside (m)		5	20	50	100
TSP concentration (mg/m^3)	Not spray water	10.14	2.810	1.15	0.86
	Spray water	2.01	1.40	0.68	0.60

Another major dust source during construction is wind dust in open stacking area and bare area. Such dust will be affected by humidity and wind speed during construction. Therefore, water should be timely sprayed on roads and in the stacking area; construction during windy days are prohibited, and open-air stacking should be limited in order to reduce the dust.

②Machinery waste gas of construction

Waste gas can also be exhausted by vehicles or generated from fuel combustion during the construction, containing HC, CO, NOx, and other pollutants. Such waste gas is small in amount.

③Odor from sludge dredging

This project intends to dredge silt of about 30,000m^3 in the outlet channel of Pipa Lake. The environment-friendly cutter suction dredger is equipped with a specialized

environment-friendly cutter head. During dredging, the dredger uses the cutter head to dredge under a low vibration in an enclosed environment. The excavated silt will be discharged, via a high-power dredge pump on the dredger, into the enclosed silt pipeline and finally to the designated dumping area. The silt dumping area will generate a little malodorous gas.

(3) Noise during the Construction Period

Noise during the construction period mainly comes from material transporting, pipe and channel excavating, pipe loading and unloading, and operating machine during soil backfill, such as loader, bulldozers, excavators, heavy-duty trucks and the like. The noise is intermittent and sound value of high-noise machinery can reach about 75 – 90 dB (A). Therefore, construction without control will influence the surrounding environment.

Table 2-6 Source Strength of Main Construction Machinery Noise

Serial No.	Type of machine	Distance from the monitoring spot to machinery(m)	Maximum sound level
1	Loader	5	90
2	Road roller	5	81
3	Bulldozer	5	86
4	excavator	5	84
5	Large heavy-duty truck	—	86
6	Light heavy-duty truck	—	75

(4) Solid Waste

Solid waste generated during the construction period mainly includes construction personnel's domestic waste, construction waste, sludge generated during dredging outlet channel of Pipa Lake and waste in the dredging water, etc.

①The Impact of Construction Personnel Domestic Waste

Provided the amount of construction personnel is 100 with 0.5kg/p/d production of wastes, then the total domestic waste production volume is about 50kg/d. EA recommends that garbage collection bins and environmental protection billboards be

set up at the construction site, and the Sanitation Department be commissioned to transport the collected domestic waste.

②The Impact of Construction Solid Waste

Total volume of construction earthwork is estimated to be 110,670m^3, among which excavation volume is 55335m^3, backfilling volume 55335m^3. Excavated earthwork shall all be used for backfilling, and there shall be no spoils.

③Channel Dredging

Bottom sludge dredging project adopts the environment-friendly cutter suction dredger for underground excavation, integrating dredging, transporting and unloading. Dredging and treating volume is estimated to be 30,000m^3 in the dredging project.

④Dredging Waste

There are solid pollutants, such as waste and organism remain, etc., in outlet channels of the dredging area. Solid pollutants should be cleared in the process of dredging. The waste quantity of this part is small and the estimated quantity is 0.2t.

(5) Ecological Impact and Soil Erosion

The sewage interception and pipe network construction does not involve residential resettlement or demolition, but involves temporary land acquisition. A new waste collection spot shall be built on an existing piece of vegetable field. Vegetation damage may be caused during construction, thus leading to negative impacts on the ecological environment. Therefore, necessary afforestation such as engineering measures and phtyto measures should be adopted for the exposed ground and slope surface to reduce environmental impact and prevent soil erosion.

2.2.2 Analysis of Pollution Sources during the Operation Period

(1) Waste gas

①Sewage interception and pipeline network along the bank of Pipa Lake

In normal situation, sewage collection pipeline network is closed, with basically no odor emission. Small amount of odor emits when opening the sewage well lid for pipeline maintenance. The odor emission is small in amount and rarely occurs, causing little impacts on surrounding environment.

②Domestic garbage collection and transfer project

Domestic waste contains all kinds of readily fermentable organic matters. Especially when the temperature is high in summer, domestic waste will emit smelly foul gas, which mainly contains odorous gas like NH_3 and H_2S, etc. Odor pollution impacts environment mainly through sense of smell. Odor pollutants are foul gas that mainly comes from waste transfer vehicles and waste collection stations. At the meantime, dust pollution occurs in the process of waste transportation.

(2) Wastewater

Wastewater during the operation period mainly includes leachate generated in waste transfer vehicles and domestic sewage from water environment monitoring premises.

① Leachate from waste compression and transfer vehicle

Waste leachate is the water generated by waste in the process of fermentation and decomposition. Water contained in the waste and water generated in fermentation and decomposition will ooze in the process of compression. Water generated in fermentation and decomposition is less than water contained in the waste, which has a high concentration of organic pollutants and NH_3-N. Generally speaking, the volume of leachate generated during compression account for 1% of the waste volume. Transfer volume of this project is 73.3t/d, therefore leachate volume is 0.73 t/d, annul leachate volume is 266 t/a, with pH 4 to 5, COD 2500 mg/L, BOD_5 1000 mg/L, SS 1000 mg/L and NH_3-N 200mg/L.

Leachate generated in compression-type transfer vehicle is stored in container and transferred to Yugan waste landfill for treatment.

② Flushing wastewater

Waste collection and transfer vehicle should be washed to reduce odorous pollutants. Washing wastewater volume generally accounts for 10% of waste volume. Therefore washing wastewater volume of this project is 7.3 t/d, volume of a year is 2664.5 t/a, with pH 6 to 8, COD 280 mg/L, BOD_5 250 mg/L, SS 300 mg/L and NH_3-N 30mg/L. After collected in wastewater collection pool of waste collection station, washing wastewater will be discharged to Yugan sewage treatment plant for treatment through municipal sewage pipeline network. Concentration of pollutants in

washing wastewater is subject to Level B of *Standards of Water Quality for Sewage Discharged into Urban Sewer* (GJ343-2010). See details in Table2-6.

Table 2-6 Wastewater Generated in Waste Transfer

Polluting source	Volume of Wastewater (t/a)	Concentration of water pollutants (mg/L)					Proposed disposal measures
		pH	COD	BOD_5	SS	NH_3-N	
Washing wastewater	2664.5	6 – 8	280	250	300	30	collected washing wastewater will be discharged into Yugan sewage treatment plant through municipal sewage pipeline network.
Level B of *Standards of Water Quality for Sewage Discharged into Urban Sewer* (GJ343-2010)	/	6.5–9.5	500	350	400	45	/

③ Domestic Sewage from Water Environment Monitoring Premises

Five new staff joined Water Environment Monitoring Premises, working 255 days a year. Provided domestic water volume is calculated as 50L per person per day, then the total volume is 0.25m^3/d. Set the drainage rate as 80%, then domestic sewage volume is 0.2 m^3/d，51t/a. Wastewater will be discharged into Yugan sewage treatment plant through municipal sewage pipeline network.

(3) Solid waste

Solid waste generated during the operation period mainly includes domestic waste of Water Environment Monitoring Premises personnel and waste liquid from

laboratory.

① Domestic waste

Collected domestic waste will be transferred by environmental sanitation department to Yugan waste landfill. See details in Table2-7.

Table 2-7 Generation Situation of Domestic Waste

Location	No. of People	Number of working days in a year (day)	Per capita volume (kg/person·d)	Daily volume (kg/d)	Yearly volume (t/a)
Water Environment Monitoring Premises	5	255	0.5	2.5	0.6

②Wastewater from Water Environment Monitoring Laboratory

Wastes will be generated in the water environment monitoring and control central laboratory during its operation, such as acid (HW34), alkali (HW35), and organic solvents (HW42), which belong to hazardous waste. Based on data from labs of similar scale, about 300kg of said liquid waste will be produced. After collection, the wastes will be sent to qualified hazardous waste treatment units for disposal, and arbitrary discharging is not allowed.

(4) Noise

①Waste transfer item

During the operation period of waste transfer sub-project, noise mainly comes from waste compression and transfer vehicle and electric collection vehicle, with source strength of about 80dB (A) to 85dB (A). See control measures in table below.

Table 2-9 Main Noise Sources and Control Measures (dB (A))

Serial No.	Source	Number	SPL source strength dB(A)
1	Electric waste collector	4 units	80
2	Compression-type waste transfer truck	5 units	85
3	Tank car	2 units	80
4	Sanitizer	2 units	80

②Pump station

See Table 2-10 for details of noise from pumping station and its equipment.

Table 2-10 Main Electric Equipment

Single unit	Equipment	Quantity	Noise level	Noise Reduction Measure
Sewage pumping station	pump	2(use one and spare one)	60 – 70	choose low-noise equipment, and vibration & noise reduction measures and regular maintenance should be conducted
	crushing bar screen	1	70 – 85	
Water diversion pumping station	Pump	2	60 – 70	
	Crushing bar screen	1	70 – 85	

2.3 Production and Predicted Emission of Major Pollutants

Table 2-11 Production and Predicted Emission of Major Pollutants

Item \ Content		Emission Source (No.)		Name of Pollutant	Production Concentration and Volume	Emission Concentration and Volume
Water Pollutant	Construction Period	domestic Sewage		Volume of Wastewater COD, BOD_5, SS, NH_3-N	4.8m_3/d 1.2kg/d, 250mg/L 0.72 kg/d, 150mg/L 0.96kg/d, 200mg/L 0.18 kg/d, 35mg/L	disposed by local domestic sewage treatment facilities, without arbitrary discharging
		construction wastewater	muddy waters	SS	little, fugitive emission	
			dehydration wastewater	SS	add coagulant for sedimentation treatment and then discharge into Pipa Lake	
	Operation Period	garbage collection and transfer sub-project	Leachate	Volume of Wastewater COD, BOD_5 SS, NH_3	266t/a 2500mg/L，0.67t/a 1000mg/L，0.27t/a 1000mg/L，0.24t/a 200mg/L，0.05t/a	collected waste leachate will be transferred to Yugan sewage treatment plant
			Washing wastewater	Volume of Wastewater COD, BOD_5 SS, NH_3	2664.5t/a 280mg/L，0.75t/a 250mg/L，0.67t/a 300 mg/L，0.8 t/a 30mg/L，0.08t/a	Discharged into Yugan sewage treatment plant through municipal pipeline network
		domestic sewage of Water Environment Monitoring Premises		Volume of Wastewater COD, BOD_5 SS, NH_3	51t/a 250mg/L，0.013t/a 220mg/L，0.011t/a	Discharged into Yugan sewage treatment plant through municipal

Item \ Content		Emission Source (No.)	Name of Pollutant	Production Concentration and Volume	Emission Concentration and Volume
				200mg/L，0.010t/a 25mg/L，0.0013t/a	pipeline network
Atmosphere Pollutants	Construction Period	construction dust	TSP	little, fugitive emission	little, fugitive emission
		waste gas from fuel combustion	HC, CO, NOx	little, fugitive emission	little, fugitive emission
		Odor in sludge stocking yard	NH3, H2S	little, fugitive emission	little, fugitive emission
	Operation Period	garbage collection sites	NH_3, H_2S, dust	little, fugitive emission	little, fugitive emission
Noise	Construction Period	construction machinery	SPL	75 dB(A)~90Db(A)	
	Operation Period	equipment noise, transportation vehicles	SPL	60dB(A)~85dB(A)	
Solid waste	Construction Period	construction	construction waste	/	/
		daily life	domestic waste	50kg/d	Transported by Sanitation Department
		sludge	sludge	30000 m_3	30000 m_3
		Waste in dredging area	waste	0.2t	0.2t
	Operation Period	daily office work	domestic waste	0.6t/a	collected waste will be transferred to Yugan waste landfill
		waste liquid from Water Environment monitoring laboratory	waste acid (HW34), waste alkali ((HW35), and waste organic solvents (HW42)	300kg/a	disposed by qualified institutes

3. Environmental Status Quo

3.1 Natural Environment

3.1.1 Geographical Location

Located at the northeast of Jiangxi Province, 116°13′45″ -116°54′24″ E and 28°21′36″ -29°3′24″ N, Yugan County is on the southeast bank of Poyang Lake and

at the downstream of Xin River. The whole county features an S-N length of 87km, E-W width of 38km, presenting a long and narrow shape from south to north, with total area of 2331km². As a major agriculture county in western Shangrao City, Yugan County borders Wannian County in the east, Yujiang County and Dongxiang County in the south, Jinxian County, Xinjian County and Nanchang in the west, Boyang County in the north. It is separated from Duchang County by Poyang Lake. Location of the project is shown in Map1-1.

3.1.2 Topography

Topography of the county basically consists of low hills and lakeside plain. Hills in southeast slowly tilt to the northwest, transiting to the lakeside plain. Altitude above sea level is usually 150m to 250m, Limei Ridge being the highest hill with altitude of 290m above sea level, and the lowest point being Emperor's Hat in the north, only 13m high above sea level. Central part of the county jurisdiction is plain, southeast part low hill and northwest part lake. 40% of the county area is covered by water, 30% by mountain, 20% by farmlan, 10% by road and afforestation, living up to its name of the land of honey and milk. The county seat is located at Hegusong Plain, downstream of Xin River. Except for Donshan Hill, which is on higher ground, other places are flat or low, with numerous lakes surrounded by fertile fields and vegetable fields.

3.1.3 Weather and Climate Conditions

Located at subtropical area, Yugan County features moderate and moist climate, with abundant sunlight and rainfall, long frost-free period, obvious monsoon and four distinctive seasons, beneficial for crop growth. Annual mean temperature is 17.8℃ in most years. The coldest month is January, with mean temperature of 5.2℃, and extreme minimum temperature of －14.3℃. Mean temperature of the hottest month is 29.7℃ with extreme maximum temperature of 40℃. In the past 10 years, the temperature in winter has gradually increased, with heavy frost, heavy snow, extreme freezing weather rarely seen.

(1) Temperature: Located at the humid monsoon climate zone of subtropical area, Yugan County features warm spring, hot summer, cool autumn, cold winter, temperate

climate, four distinctive seasons, ample rainfall and sunshine and long frost-free period, which are all beneficial for the growth of crops. Annual mean temperature is 17.8℃ in most years. The coldest month is January, with mean temperature of 5.2℃, and extreme minimum temperature of －14.3℃. Mean temperature of the hottest month is 29.7℃ with extreme maximum temperature of 40℃. In the past 10 years, the temperature in winter has gradually increased, with heavy frost, heavy snow, extreme freezing weather rarely seen.

(2) Sunshine: The annual average sunshine duration for years is 1,872 hours and the rate of sunshine is 42%. The total sunshine radiation quantity is 100.29 kilo calories/cm^2, with annual mean frost-free period of 256 days.

(3) Rainfall and evaporation: the average annual precipitation is 1586.4mm. Rainfall concentrates in April, May and June, accounting for 40%-50% rainfall of the whole year. Monthly average precipitation is over 200mm; Yearly evaporation is 1557.7mm. Evaporation from July to November is more than precipitation, featuring obvious summer and autumn drought. Yearly average relative humidity is 81%.

(4) Wind: The wind from the north dominates the urban areas throughout the year and southerly winds reign in summer with a yearly average wind speed of 3.5m/s. Located at northeast of Jiangxi Province where is dominated by strong winds, Yugan experiences 57% of strong wind in April, July and August. Year 1964 saw the maximum wind speed of more than 40m/s (>level 12), resulting in heavy destruction to urban areas.

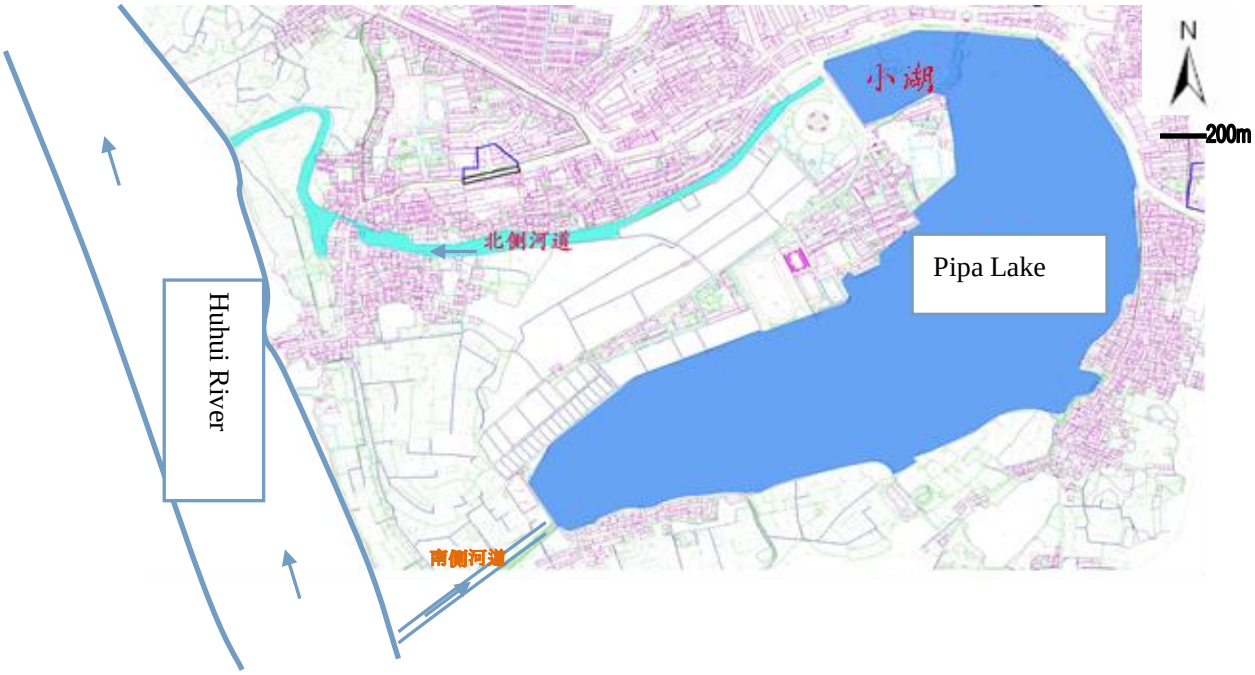
3.1.4 River System and Hydrology

The Five River Basin of Jiangxi Province consists of Gan River, Fu River, Xin River, Rao River and Xiu River. The Five River Basin gathers most of surface runoff in Jiangxi, which finally runs into Poyang Lake. Yugan is located Xin River Basin. Weilv, downstream of Xin River, divides into east and west tributaries in Yugan and both finally flow into Poyang Lake. The east tributary is called East Big River, via Mabeizui, running along Xinrui, Lianyu and Xinfeng dikes to Hujia Gulf and finally to Poyang Lake; the west tributary is called West Big River, running into Poyang Lake via Maple Harbor and Ruihong. The middle and upstream of Xin River are vulnerable

to rainstorm and flood. The Lakeside region bears the jacking and intrusion of Yangtze River, suffering from flood and waterlogging.

Huhui River, a tributary of Xin River, is located at northeast of Yugan County. Year 1950 witnessed the interception of east tributary of Xin River, making it capable of flood storage and drainage. The intercepted area starts from Zhou family of Jingtou in the south, reaching Shikou to the north and running into Poyang Lake. It is 54km long, 90-120m wide with an area of 168 km^2, allowing no navigation.

Located at the center of urban area of Yugan County, Pipa Lake was a tributary of Xin River. Located in ancient Ganyue, it got name of Yue creek and Yue water. During Yuan Dynasty, to prevent the water from flooding neighboring area, a river was dug to connect it with Xijin; gradually this area formed a lake and got the name of City Lake for being adjacent to towns. Later it became Pipa Lake because its form resembles the musical instrument pipa. With development of so many years, Pipa Lake has become the central lake of Yugan County and the only lake in the city. See water system of Pipa Lake in Map3-1.



Map 3-1 Pipa Lake water system

3.2 Social environment

(1) Administrative Boundary

Affiliated with Shangrao City of Jiangxi Province, Yugan County governs five towns (including Ruihong Town, Huangjinbu Town, Shikou Town, Gubu Town and Wuni Town) and 11 townships (Kangshan Township, Dongtang Township, Datang Township, Lusigang Township, Santang Township, Hongjiazui Township, Baimaqiao Townhsip, Jiangbu Township, Fenggang Township, Daxi Township and Yangbu Township).

In the light of the supporting and leading function of central towns to regional development, cities and towns in Yugan can be divided into three classes, namely county territory town, sub-center town and common town.

Total population inside county territory is 1.0655 million by the end of 2014. Since 1995, comprehensive population growth rate has been 14.94‰ in years, among which average natural growth rate is 13.04‰ and average mechanic growth rate is 1.9‰. With the accelerated urbanization development of Yugan, prospective urbanization rate is predicted to surpass growth of non - agriculture industries. Therefore the ratio of non - agriculture industries and urbanization in the short term and mid-long term is estimated to be kept at 1:2.4 to 1:2.5, urbanization rate of Yugan County in 2015 was 40.54% and rate in middle and long term are respectively 47.93% and 59.83%.

2. Economic position

As the production base of Jiangxi commodity grain and waterfowl, Yugan County is also the major base of commodity grain in the country. Value-added of agriculture and husbandry rank second while value-added of fishery ranks the first, presenting obvious agricultural advantages. Since reform and opening up, industry has risen up at a fast pace and become the strong pillar of the county’s economic

development. Rapid economic growth momentum has been maintained. The local GDP of 11.27 billion Yuan was realized in 2014, calculated at comparable price, growing by 9.2%, in which, value-added of the primary industry totaled 3.44 billion Yuan, increased by 2.6%, value-added of the secondary industry totaled 4.12 billion Yuan, increased by 10.9%,value-added of the third industry totaled 3.71 billion Yuan, increased by 13.7%. Per capita regional GDP is 12,524 yuan. The structure of the three industries was improved and the ratio is 30.6:36.5:32.9. The proportion of tertiary industry to GDP has increased by 2.2%, compared with that of last year.

3.3 Ecological Environment

Pipa Lake is the central lake of Yugan County. There are mainly wastelands, vagetable fields and residential districts beside the lake. The lake region is influenced by direct discharge of domestic sewage from surrounding villages, waste pollution, agricultural irrigation and aquaculture industry. The water quality in Pipa Lake is worse than Category V. Aquatic plants in Pipa Lake are mainly chlorophyta and cyanophyta. Fishes in the lakes are commonly seen species like grass carps and crucian carps. Benthic invertebrates are general species. There are no fish spawning grounds, feeding grounds or wintering grounds in the lakes. There are no precious and rare aquatic creatures in Pipa Lake, so the lake is not a key natural habitat.

Aquatic creatures in Huhui River (urban section) are main general aquatic creatures: Fishes are mainly black carps, chubs, bighead carps and so on; clams, mussel and crabs are commonly seen benthic invertebrates; there are no fish spawning grounds, feeding grounds or wintering grounds in the lakes. There are no precious and rare aquatic creatures in Huhui River, so the lake is not a key natural habitat. The river is greatly influenced by urban residents' life and sand excavation activity of sand dredgers.

3.3.2 Aquatic Ecology

1. Aquatic Plants

As for the composition of the phytoplankton in the assessed area, chlorophyta takes the dominant position and is followed by bacillariophyta; Dominant species

include treubaria bern and ankistrodesmus under chlorophyta and navicula under bacillariophyta.

2. Aquatic Animals

(1) Animal Plankton

Pipa Lake is the central lake of Yugan County. There are mainly wastelands, vegetable fields and residential districts beside the lake. The lake region is influenced by direct discharge of domestic sewage from surrounding villages, waste pollution, agricultural irrigation and aquaculture industry. The water quality in Pipa Lake is worse than Category V. Aquatic plants in Pipa Lake are mainly chlorophyta and cyanophyta. Fishes in the lakes are commonly seen species like grass carps and crucian carps. Benthic invertebrates are general species. There are no fish spawning grounds, feeding grounds or wintering grounds in the lakes. There are no precious and rare aquatic creatures in Pipa Lake, so the lake is not a key natural habitat.

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(2) Benthic Invertebrates

Commonly seen ones include cipangopaludina chinensis, limnoperna lacustris, hyriopsis cumingii, unio douglasiae, chironomid larvae and water earthworm, which are mainly distributed in water bodies with many organic matters.

3.4 Current Situation of Land Use

According to the status survey, current situation of land use in project area can be seen in Table 3-1

Table 3-1 Current Situation of Land Use of the Project Area

Serial No.	Project type	Location	Land Use Type

1	Sewage pipeline network	Urban area	Construction land
2	Reconstruction of waste transfer station	Municipal Public Utility Administration Bureau garbage transfer station	Construction land
3	Garbage collection sites	Southwest of Pipa Lake	Wasteland

3.5 General Situation of Drainage

3.5.1 General Situation of Drainage

Pipa Lake is located at the old district of the county seat, equipped with no sound drainage system. New north district is under early construction period, sewage pipeline network is constructed according to the sewage plan in *Overall Plan for Towns of Yugan County (2010-2030).*

No.3 combined sewage pumping station was constructed at the square in front of Former Municipal Public Utility Administration Bureau with a scale of 2000t/d. Outlet tube is connected with existing DN600 sewage pipe of Yangshuigou Street. DN400 sewage pipe was laid on Huanghu Road section east of the Lake. Combined rain and sewage slab culvert was set on Huanghu Road section west of the Lake. Sewage is directly discharged into rivers, polluting the water quality of Pipa Lake.

Map 3-2 Sewage Drainage of Pipa Lake Basin

3.5.1.2 Sewage Treatment Plant

Currently Yugan County has two sewage treatment plants. One is the town sewage treatment plant and the other is Industrial Park sewage treatment plant. The collected household sewage of the project would finally be discharged to the town sewage treatment plant. Due diligence has been implemented to the county sewage treatment plant for the assessment. See Chapter V for details.

3.6 Current Situation of Solid Waste Treatment

Up to now, domestic garbage in Yugan county seat has been cleared and disposed by Municipal Public Utility Administration Bureau of Yugan County. The disposal mode is throwing away garbage at fixed point→dustbin(or simply built site for piling up)→garbage transfer station→garbage disposal station. And the garbage is collected in bags and stored in garbage houses. There are altogether nine garbage transfer stations in county seat. See following map for details. In Papa Lake Basin, there are three garbage transfer stations respectively in front of No.2 Middle School, in front of Municipal Public Utility Administration Bureau and in Huanhu Donglu, among which No.2 Middle School station is built underground with hostile environment and no deodorant facility, and Huanhu Donglu station adjoins Pipa Lake.

One domestic garbage landfill has been built in Yugan County so far. It is located in Tangwu of Huangjinbu Town, 30km away from county seat and 3200m away from G206, and takes charge of domestic garbage treatment of the whole county. After completion of this project, domestic garbage shall be transported to this site for landfill treatment. This report conducted due diligence investigation into the landfill. See chapter five for details.

Picture 3-3 Current Situation of Waste Transfer Station of Yugan County

Picture 3-4 Current Situation of Waste Collection in Pipa Lake Basin

3.7 Environmental Quality Status

3.7.1 Current Situation Assessment of Ambient Air

In order to understand the ambient air quality status of the project-located area, this report cited the ambient air quality monitoring and evaluation results of Yugan County in the first quarter of 2016, issued by the Shangrao Municipal Environmental Protection Bureau. See table 3-2 for details.

Table 3-2 Ambient Air Quality Monitoring and Evaluation Results of Yugan County in the First Quarter of 2016(unit: ug/m^3)

County name	Annual average of SO_2		Annual average of NO_2		Annual average of PM_{10}	
	current quarter	the same period of last year	current quarter	the same period of last year	current quarter	the same period of last year
Yugan County	31	44	23	45	31	44
GB3095-2012 Category II	60		40		70	

Table 3-2 indicates that the ambient air quality of Yugan County in the first quarter of 2016 continues to maintain a good state and the ambient air quality meets the Category II standard.

3.7.2 Current Situation Assessment of Surface Water

3.7.2.1 Current Situation of Pollution in the County

The EPD of Jiangxi Province provided the situation of wastewater pollutants of Yugan County from 2011 to 2015, as shown below.

Table 3-3 COD Discharge Volume of Yugan County from 2011 to 2015(t)

Year	Industrial source	Agricultural source	Urban Life source	Others	Total
2011	337.25	3541.745	6809.119	0	10688.114
2012	422.21	3444.8413	6747.93	0	10614.9813

2013	150.21	3346.335	6847.209	0	10343.754
2014	80.33	3321.6047	6917.29	0	10319.2247
2015	383.53	3133.9225	6791.97	10.8	10320.2225

Table 3-4 NH_3-N Discharge Volume of Yugan County from 2011 to 2015(t)

Year	Industrial source	Agricultural source	Urban Life source	Others	Total
2011	10.23	333.148	803.712	0	1147.09
2012	37.14	310.6891	797.7	0	1145.5291
2013	20.56	294.69	809.38	0	1124.63
2014	11.511	282.4057	830.91	0	1124.8267
2015	39.74	272.3156	759.69	1.26	1073.0056

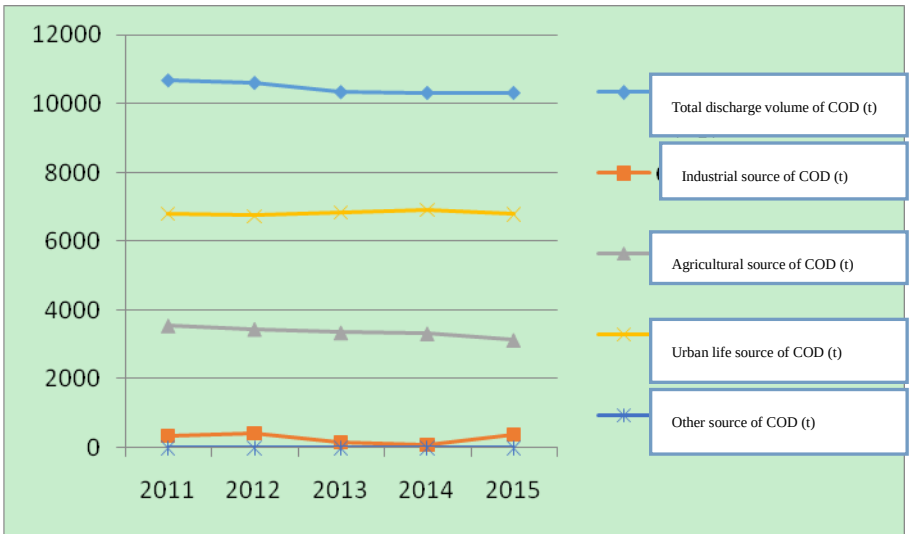


Chart 3-5 Tendency Chart of COD Discharge Volume of Yugan County from 2011 to 2015

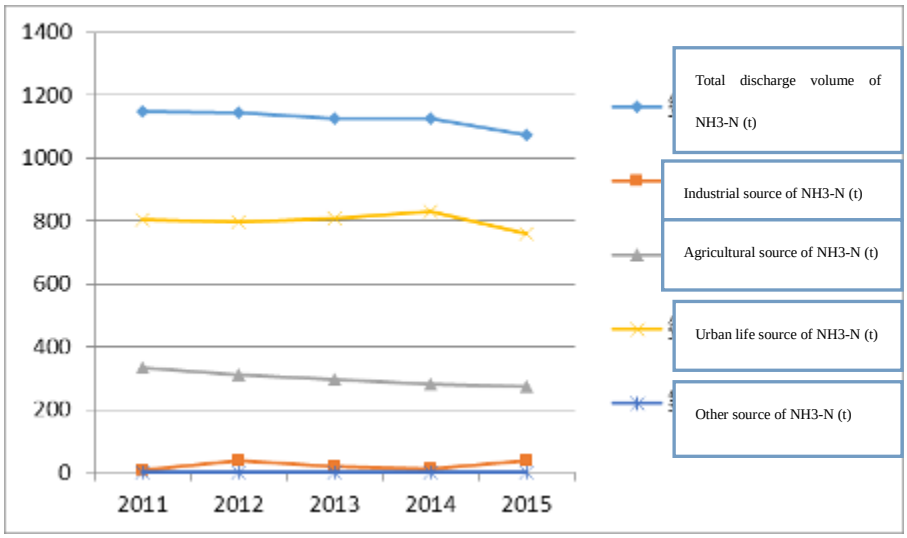


Chart 3-6 Tendency Chart of NH_3-N Discharge Volume of Yugan County from 2011 to 2015

From the above data, it can be seen that urban domestic sewage is the major polluting source of Yugan County wastewater, agriculture and industry come the second. Although wastewater collection and treatment system has been built in Yugan county seat, there is no sewage pipeline around Pipa Lake, which causes the direct discharge of domestic sewage into the Lake, and serious non-point source pollution occurred. This project shall focus on protection of Pipa Lake water environment and ecological restoration, building sewage pipeline around the Lake and taking water ecology restoration measures. Besides, in view of the defective garbage collection and transfer system around Pipa Lake, this project proposes to improve garbage collection and transfer so as to reduce garbage discarded into the Lake.

3.7.2.2 Pipa Lake Basin Pollution Sources

According to field survey and analysis, the water quality in Pipa Lake is worse than Category V, and the major polluting sources include the following：

1. Direct discharge of domestic sewage into the Lake is fairly common, causing accumulation of organic pollution in the lake body;

2. Vegetable fertilization caused N and P to drain into the Lake with surface runoff, aggravating the eutrophication of water body;

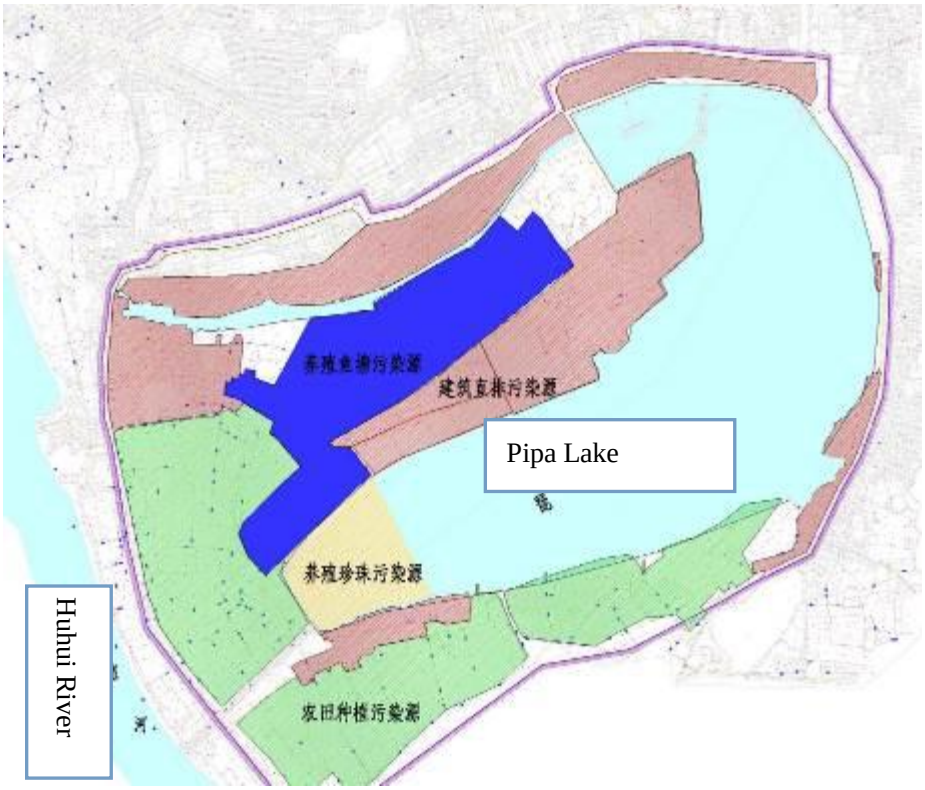
3. The rainwater pipeline is defective, causing initial rainwater carrying a large

number of pollutants to drain into the Lake with surface runoff and pollute the lake;

4. Disordered management of domestic waste resulted in a variety of plastic bags and bottles, twigs, etc. floating on the lake, natural ecological landscape of the lake being seriously threatened, its aesthetic value and ornamental value greatly reduced;

5. The development of aquaculture in surrounding ponds damaged the natural features of the lake, and a large number of fish bait thrown into the lake aggravating the eutrophication of the lake to certain extent. According to investigation, pearl cultivation in the lake has been banned.

Picture3-7 Status of Point and Non-Point Source Pollution of Pipa Lake Basin



Map 3-8 Distribution of Polluting Sources Surrounding Pipa Lake

3.7.2.3 Pollutants Load Discharge Volume Entering Pipa Lake

Table 3-5 Summary of the Pollutants Discharge Volume from Different Sources into Pipa Lake in 2014

Type of polluting sources	Volume of pollutants entering the lake(t/a)		
	COD	TN	TP
Total domestic sewage load entering the lake	116.44	20.49	1.3
Farmland planting	1.78	0.71	0.09
Aquaculture	0.169	0.149	0.012
Surface runoff pollution	68.1	3.17	0.18
Total	186.49	24.52	1.59

From the above data, it can be seen that domestic sewage contributes the largest volume to total COD volume discharging into Pipa Lake, with a contribution rate of

about 62.50%; surface runoff pollution the second, with a contribution rate of 36.50%. Everyday life pollution contributes the largest volume to total TN discharge volume, with a contribution rate of 83.60%; surface runoff pollution the second, with a contribution rate of 12.90%. Everyday life pollution contributes the largest volume to total TP discharge volume, with a contribution rate of 81.70%; surface runoff pollution the second, with a contribution rate of 11.70%.

3.7.2.4 Water Quality Status

EPB of Yugan County has provided monitoring statistics of Pipa Lake Water Quality from 2012 to 2015 for four times and set up 6 monitoring points. The monitoring points are shown in the following map, and the monitoring results are presented in the following table.

Map 3-9 Distribution of Water Quality Monitoring Points of Pipa Lake

Table 3-6 Monitoring Results Statistics of Pipa Lake Water Quality

Monitoring sites and time		Monitoring results(mg/L)			
		COD	BOD_5	TP	TN
SW1	2012.05.28	18.9	5.1	0.058	0.752

	2013.05.24	19.9	6.3	0.089	1.021
	2014.06.13	28.7	7.6	0.173	1.642
	2015.05.13	29.7	9.9	0.24	2.123
SW2	2012.05.28	19.2	5.2	0.064	0.842
	2013.05.24	19.7	6.3	0.097	1.025
	2014.06.13	29.2	7.7	0.183	1.587
	2015.05.13	33.6	9.7	0.29	2.192
SW3	2012.05.28	19.8	5.6	0.068	0.851
	2013.05.24	21.2	6.2	0.095	1.115
	2014.06.13	28.9	7.8	0.179	1.652
	2015.05.13	36.1	9.8	0.31	2.314
SW4	2012.05.28	20.7	6.3	0.095	1.012
	2013.05.24	22.3	6.9	0.127	1.345
	2014.06.13	33.5	8.4	0.197	1.854
	2015.05.13	41.6	10.8	0.47	2.923
SW5	2012.05.28	20.4	6.2	0.094	1.026
	2013.05.24	22.4	6.7	0.125	1.352
	2014.06.13	33.2	8.7	0.188	1.589
	2015.05.13	37.3	10.4	0.43	2.624
SW6	2012.05.28	20.2	6.1	0.088	1.034
	2013.05.24	22.2	6.5	0.135	1.365
	2014.06.13	32.2	8.6	0.189	1.832
	2015.05.13	37.9	9.9	0.43	2.781
Category III in GB3838-2002		20	4	0.05	1.0
Category IV in GB3838-2002		30	6	0.1	1.5
Category V in GB3838-2002		40	10	0.2	2.0

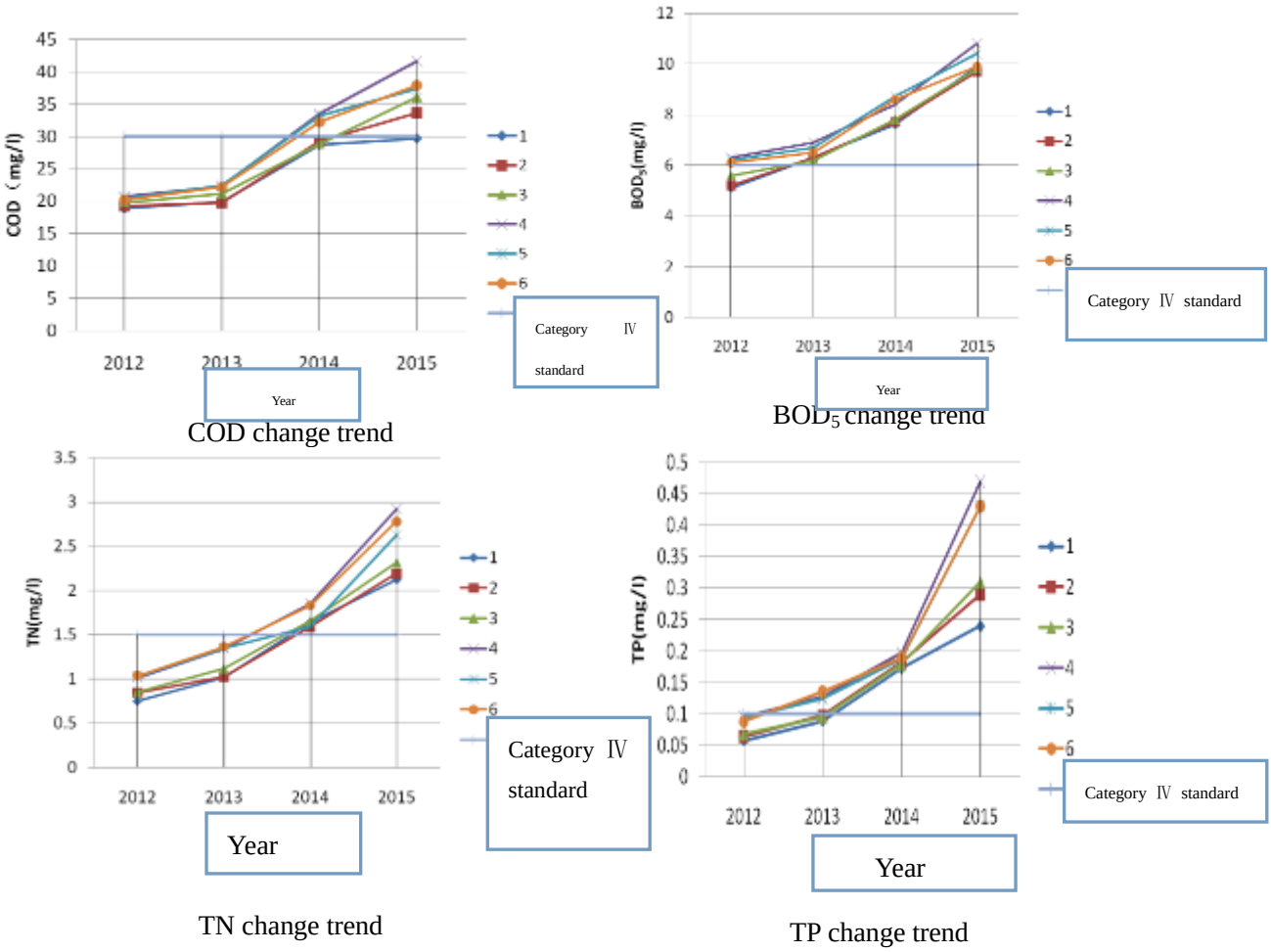


Figure 3-10 Concentration Change Trend in Six Monitoring Points of Pipa Lake from 2012 to 2015

Tables above indicate that water quality index of Pipa Lake, including COD, BOD_5, TP, TN basically meet the IV standards in Surface Water Environment Quality Standards (GB3838-2002) in 2012. None of the indexes meet the Category III and IV standards in *Surface Water Environment Quality Standards (*GB3838-2002). Its water quality is worse than Category V and the water quality becomes worse year by year. According to above analysis and investigation, major reason for the poor water quality of Pipa Lake is the direct discharge of domestic sewage, the second reason is surface runoff and agricultural non-point source pollution.

The water quality in Huhui River is within the scale of Category V to water worse than Category V. Water quality on the upper reaches of Pipa Lake is Category V, but lower reaches of Pipa Lake is worse than Category V.The river is greatly influenced by urban residents' life and sand excavation activity of sand dredgers. The

current water quality distribution map is in below.

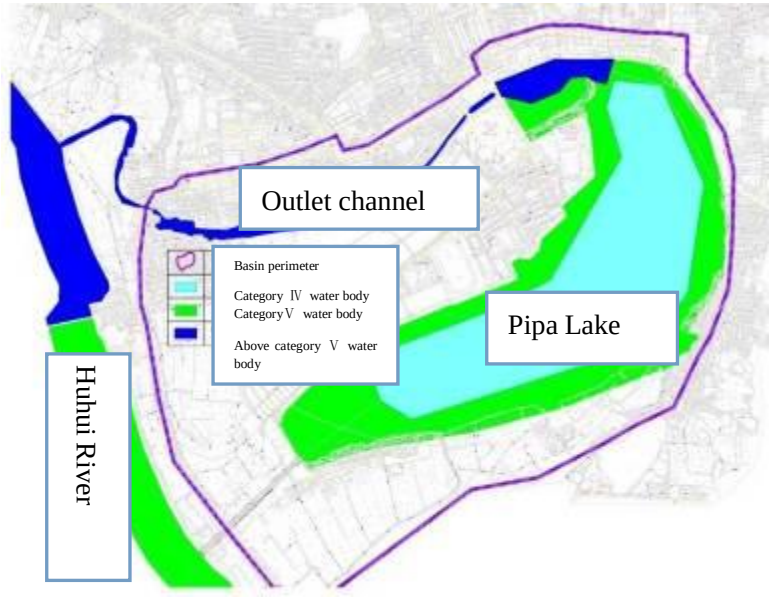


Figure 3-11 Water Quality distribution map of Huhui River and Pipa Lake

3.7.3 Current Situation Assessment of Acoustic Environment

For a comprehensive understanding and analysis of the current situation of the acoustic environment quality of the project-located area, the report conducted actuality monitoring of acoustic environment quality of the project-located area

Type of sound level meter: HS5618A integrating sound level meter;

Monitoring date: May, 10th, 2016;

Meteorological condition for outdoor measuring: no rain, no snow, no thunderbolt, wind power less than level 4 (5m/s);

Three noise monitoring sites were arranged, and the monitoring results are shown in Table 3-6.

Table 3-7 Monitoring Results of Current Acoustic Environmental Quality (Unit:dB(A))

Serial number of monitoring sites	Monitoring sites	Monitoring data		Standard	Assessment
		Daytime	Nighttime		
N1	Pipazhou Community	55.5	48.9	Category Ⅱ in *Acoustic*	up to standard

N2	Location of sewage pumping station	56.8	49.5	*Environment Quality Standards* (GB3 096-2008): 60 db in the daytime and 50 db in the nighttime	up to standard
N3	Location of water diversion pumping station	53.6	46.3		up to standard

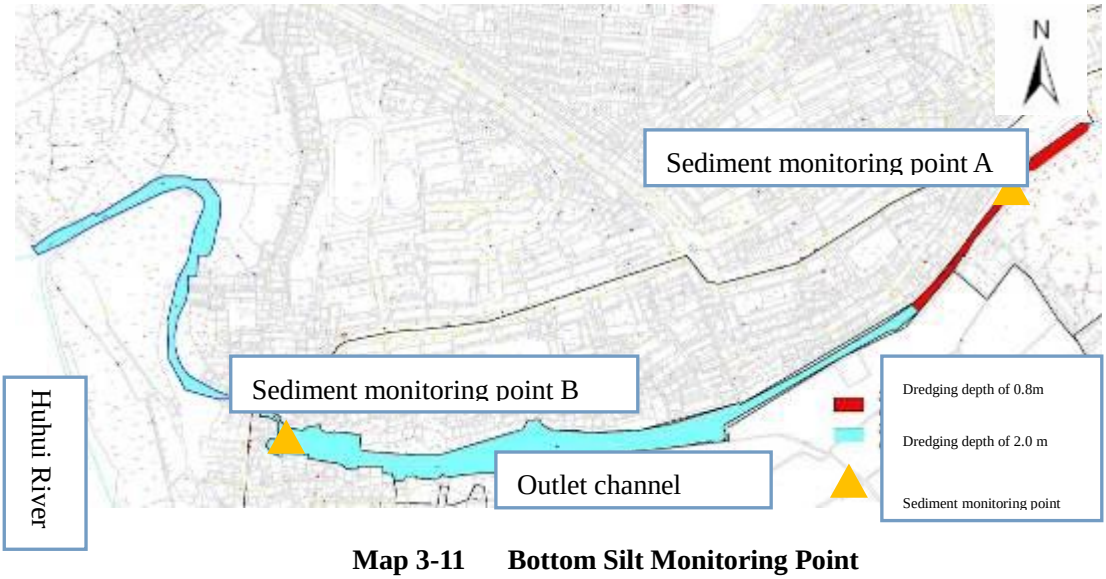
Site monitoring results show that the acoustic environment quality of the project-located area meets the Category Ⅱ standard limit in *Acoustic Environment Quality Standard* (GB3096-2008).

3.7.4 Current Situation Assessment of Channel Sludge

To investigate the siltation conditions of the Pipa Lake Channel, School of Environmental Resources and Chemical Engineering of Nanchang University was commissioned to detect the sediment of the channels. The sampling was conducted on June 6, 2016. Details are shown below:

1. Monitoring Selecting Principe and Plan

As Pipa Lake is short, there is no industrial polluting source around it. Thus only two monitoring sites respectively at the upstream and downstream are set. The locations of the sites are shown in the following map.



Map 3-11 Bottom Silt Monitoring Point

2. Sample Collection Method

Samples are collected following aquatic sediments requirements in *Specifications for Water Environment Monitoring (SL219-2013)*, and processed and monitored following requirements in *Technical Specifications for Soil Environment Monitoring (HJ/T166-2004)*.

1) Sampling

Use tubular sediment sampler to collect and then conserve the sample in a sealed and light-proof glass container below 4 ℃, labeling outside the sample name and number.

2) Sample Pre-treatment

Open-air drying is conducted. Take out sludge samples (generally not less than 500g) and quarter and reduce into 100g; put the sample on a plate for open-air drying; shape the dried sample into a thin layer of 2-3cm; timely crush and turn over the thin layer to remove stones and animal and plant remains.

Screening: crush the sample with a wood stick in order to go through 2mm nylon mesh; grind it with an agate mortar in order to go through 0.49mm nylon mesh for later use.

3) Monitoring Analysis Method

See sediment monitoring factors and detection and analysis method in Table 3-9.

Table 3-8 Sediment Detection Item and Analysis Method

Monitoring Factor	Monitoring Instrument	Monitoring Method	Origin of Method
Cu	Atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17138-1997
Zn	Atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17138-1997
Pb	Graphite furnace atomic absorption spectrophotometer	Graphite furnace atomic absorption spectrophotometry	GB/T17141-1997
Cd	Graphite furnace atomic absorption spectrophotometer	Graphite furnace atomic absorption spectrophotometry	GB/T17141-1997

Cr	Atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17137-1997
Ni	Atomic absorption spectrophotometer	Flame atomic absorption spectrophotometry	GB/T17139-1997

3. Results of Monitoring and Evaluation

Testing indicators and results are shown in Table 3-10

Table 3-9 Test Results of Pipa Lake Channels Bottom Silt (mg/kg Dry Sludge)

Item	pH	Cu	Zn	Pb	Cd	Cr	Ni	Moisture Content
Sediment monitoring point A	7.21	26.4	928.9	16.25	Non detected	170.4	8.9	90%
Sediment monitoring point B	7.45	16.75	1216.9	Non detected	Non detected	151.9	10.6	90%
Category Ⅱ Standard in *Soil Environment Quality Standards (GB15618-1995)*	6.5–7.5	100	250	300	0.3	200	50	/
Standards for Control of Pollutants in Sludge for Agricultural Use (GB4284-84)	≥6.5	500	1,000	1,000	20	1,000	200	/
Level B Standard in *Standards for Soil Environment Quality Assessment of Exhibition Land Use* (Temporary) (HJ350-2007)	/	600	1,500	600	22	610	2,400	/
Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant (CJ/T362-2011)	5.5–8.5	1,500	3,000	1,000	20	1,000	200	60%
Standards for Sludge Disposal	-	4300	7500	840	85	-	420	/

and Utilization (40 CFR Part 503) (United States)								
Guidelines for Sludge Utilization in Agriculture (Directive 86/278 / EEC) (European Union)	-	1000 – 1750	2500–4000	750–1,200	20–40	-	300–400	/

Test results show that at the Pipa Lake outlet channel Point A and Point B, the bottom sludge monitoring items including copper, lead, cadmium, chromium and nickel all meet the Category Ⅱ standard (pH between 6.5~7.5) in *Soil Environment Quality Standards* (GB15618-1995) and requirement in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84) (pH≥6.5).

At point A, the test result of Zinc is 928.9mg/kg, which exceeds the Category Ⅱ standard in *Soil Environment Quality Standards* (GB15618-1995), which is 250mg/kg and pH between 6.5~7.5, but meets the requirement in *Standards for Control of Pollutants in Agricultural Sludge* (GB4284-84), which is 1000mg/kg. At point B, the test result of Zinc is 1216.9mg/kg, which exceeds Category Ⅱ standard (pH between 6.5~7.5) in *Soil Environment Quality Standards* (GB15618-1995), but meets Category B standard in *Standard of Soil Quality Assessment for Exhibition Sites* (HJ350-2007), in which the Category B standard is 1500mg/kg, standard in *Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of Sludge Used in Forestland (*CJ/T362-2011) (3000mg/kg), standard in *Sludge (Use in Agriculture) Regulations* (Directive 86/278/EEC) (2500mg/kg ~4000mg/kg), and standard in *Guidelines for the Utilization and Disposal of Wastewater Sludge* (40CFR Part 503) (7500mg/kg). According to previous comparison and analysis of those standards, it is believed that Pipa Lake outlet channel bottom silt does not belong to hazardous waste and can be treated as common solid waste, and is proposed to be used in forestland.

According to Category II Standard in *Soil Environment Quality Standards* (GB15618－1995), Zn concentration of bottom silt exceeds the standard value, which is mainly caused by wastes generated in urban small-scale electroplating factories of

1980s and 1990s, which no longer exist in the urban area now.

4. Alternatives Analysis

Comparison and analysis of alternatives of the project mainly involve three aspects: first is the analysis of Zero-Alternative; second is the comparison of water diversion and transfer alternatives; third is the comparison of dredging method. General principles are as follows:

1) Quantification: try to quantify the project environmental impacts of each alternative.
2) Comprehensive comparison: comprehensively compare and analyze based on environment, technique, economy, society and other aspects.
3) Suitability: the selected plan should comply with the relevant development planning requirements and standards, and be adapted to local conditions.

4.1 Comparison and Analysis of Zero-Alternative

Comparison and analysis on whether to have a plan were conducted in the project EIA from the aspects of environmental and socio-economic gains and losses. The results are shown in Table 4-1.

Table 4-1 Comparison and Analysis of Zero-Alternative

Category	Alternative with the project	Zero-Alternative
Major advantages:	(1) Comply with technical policies of national urban domestic sewage treatment and pollution control; (2) Comply with Poyang Lake Ecological Economic Zone Planning; (3) Help to protect water quality of Poyang Lake Basin. By 2023, the estimated annual reduction of pollutant into Poyang Lake Basin water bodies include TN: 17.89 t, TP: 2.4t and COD: 132.3t; (4) Further improve the urban infrastructure	(1) maintain current conditions, e.g. vegetation will not be destroyed and so on; (2) Do not change the land use value (no land occupation); (3) No damage to vegetation, no dust or other environmental impacts during the construction.

	facilities.	
Major disadvantages:	(1) Land occupation: land acquisition and temporary land occupation; (2) Damage to vegetation during the construction period; construction noise impact and impacts on social environment; (3) Waste gas and sewage generated during the operation period might have impacts on environment.	(1) Untreated sewage directly flow into surface water, which will severely pollute the surface water; (2) The backward condition of existing drainage system cannot be fundamentally resolved. (3) Collection of domestic garbage is not properly arranged. Some garbage is dumped in the wrong place, thus affecting the appearance and living environment of the city and influencing water and ecological environment security.
Comprehensive analysis	From the social and environmental perspectives, it is better to implement this project than without it.	

As seen in Table 4-1, although no environmental impacts exist if there were Zero-Alternative, the direct discharging of sewage into the nearby water bodies will no doubt cause severe environmental pollution; and although certain impacts will be caused were this plan implemented, negative impacts can be avoided and mitigated by adopting related environmental protection measures. Moreover, the environmental impacts during construction lasts only a short time, but there are long-term benefits brought by project construction and operation. In particular, the project can help to protect and improve water quality of Poyang Lake Basin and level up urban infrastructures. Therefore, from the perspective of promoting socio-economic development and environmental protection, it is better to implement this plan than without one. In other words, the project is necessary.

4.2 Comparison and Selection of Water Diversion Technical Plans

According to the hydrologic survey, in this area, March, April, May and June are

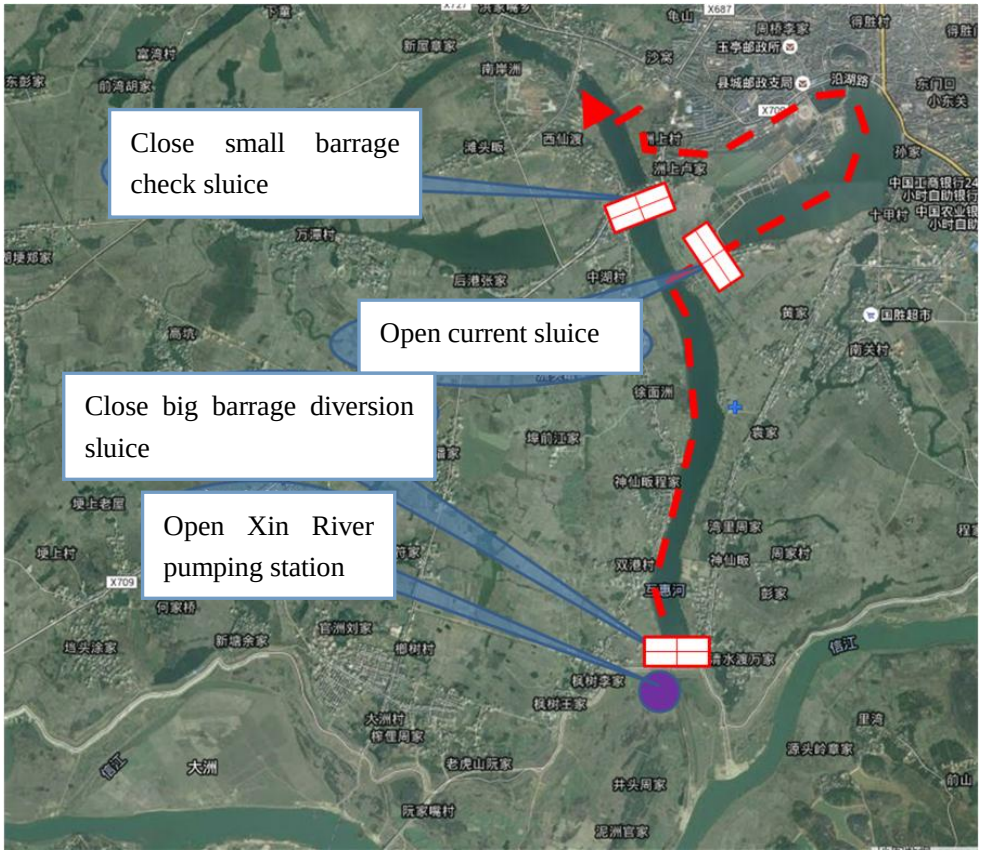
the flood season when the water level of Huhui River is the highest in the whole year. Though it once exceeded 18.0m, the water level seldom reached 17.0m during flood season, and 15.0m in the rest months in the past few years. The normal water level of Pipa Lake is 16.6m, though it once reached 17.8m. In flood season, the water level of Pipa Lake usually exceeds the normal level due to rainwater and the inflow of surface runoff. The average elevation of inflow channel bottom from Huhui River to Pipa Lake is about 15.00m. Based on the above statistics, it can be found that it is almost impossible to use the natural water level difference of Huhui River during the flood season to achieve the natural water cycle of the whole year. After analyzing the annual water balance calculation of Pipa Lake Basin, it is found that only from March to June, precipitation exceeds the amount of evaporation and infiltration and Pipa Lake itself cannot achieve the water balance at other months. According to on-site survey, the water level of Pipa Lake once lowered to 0.60m during the dry season. Therefore, to meet the planned water level of 16.60m of Pipa Lake, transferring water from elsewhere is needed, thus water diversion plans are formulated.

1. Pipa Lake Diversion Plan One

(1).Wet season: the river level of Huhui River is the highest during wet seasons. In transferring clean water, first, close the small barrage check sluice of Huhui River, and let upper stream water flow from Xin River to Huhui River from the big barrage diversion sluice; next, escalate the water height of Huhui River (urban section) to 16.6m; then water will flow back into Huhui River from the outlet channels after replenishing the Pipa Lake through the hydraulic gradient between Huhui River and Pipa Lake. See Map 4-1 for the plan drawing.

(2) Dry season: The water level of Xin River is relatively low during dry seasons. The lowest water level of Meigang Station in the upper stream of Xin River was about 16.97m, that of Huhui River (in the urban area of Yugan County) was about 14.0m. Therefore, it is impractical to transfer water directly through the diversion sluice of the big barrage. Instead, we need to divert water from Xin River through the big barrage divertion pumping station. In transferring clean water, first, close the small barrage check sluice of Huhui River, and let upper stream water flow from Xin River

to Huhui River from the big barrage diversion sluice; next, escalate the water height of Huhui River (urban section) to 16.6m; then water will flow back into Huhui River from the outlet channels after replenishing the Pipa Lake through the hydraulic gradient between Huhui River and Pipa Lake to promote the water circulation in the Pipa Lake.



Map 4-1 Drawing of Water Diversion Plan One during Dry Seasons

2. Pipa Lake Diversion Plan Two

(1) Water replenishment plan during wet seasons is the same as Plan One.

(2) Dry season: build a new water pumping station at the head of the inlet channels of Pipa Lake to transfer water. In transferring clean water, first, close the small barrage check sluice of Huhui River; next, pump water from the pumping station at the head of inlet channels of Pipa Lake, as the water depth of Huhui River (in the urban area of Yugan County) is 5～6m during normal-water-level seasons. The Huhui River (from the big barrage diversion sluice to the check sluice of small barrage) is mainly supplemented by closing the big barrage and drawing water from

Xin River.

Both water diversion plans during wet seasons use gravity flow to supplement water. Plan one uses existing pumping station during dry seasons to pump water from Xin River to Huhui River and let water flow to Pipa Lake through gravity by escalating the water level of Huhui River; Plan two builds a new pumping station at the head of the inlet channels to directly pump water from Huhui River to Pipa Lake.

3. Comparison and Confirmation of Technical Plans

The comparison of these two plans is shown in table below:

Table 4-1 Comparison of Two Plans

Item	Plan One	Plan Two
Wet season	close the small barrage check sluice of Huhui River, let upper stream water flow from Xin River to Huhui River from the big barrage diversion sluice and replenish Pipa Lake through the hydraulic gradient between Huhui River and Pipa Lake	The same as Plan One
Dry season	close the small barrage check sluice of Huhui River, let upper stream water flow from Xin River to Huhui River from the big barrage diversion sluice and replenish Pipa Lake through the hydraulic gradient between Huhui River and Pipa Lake	build a new pumping station in front of the inlet channels to replenish Pipa Lake's water and close the big barrage sluice to divert water via existing pump
Engineering Measures	dredge the inlet and outlet channels of Pipa Lake and replace defective sluices	build a new pumping station of Pipa Lake, replace defective sluices; no need to dredge the inlet channels
Management convenience	not convenient	convenient
Environmental	It has few impacts on the environment; the	no need to dredge the inlet

Item	Plan One	Plan Two
Impacts	dredging volume is 50000m^3	channels; it has few impacts on the environment with a dredging quantity of 30000m^3
cost	It costs less at the primary stage, but has higher operational cost as it needs to replenish the water of Huhui River covering a area of about 50ha	It costs more at the primary stage, but its operational cost is lower.

In terms of cost, Plan one needs not to build a new pumping station, but has to pump water to Huhui River. In contrast, water is directly pumped from Huhui River through the newly built pumping station in Plan Two. The volume of pumped water in Plan One is larger than that in Plan two, Plan one also costs more in operation; in terms of environmental impacts, the dredging volume of Plan one is larger. Thus, Plan two is recommended.

4.3 Comparison and Selection of Pipa Lake Sludge Dredging Plans

In recent years, there has numerous sludge dredging projects in ports, fairways, inland rivers and lakes, resulting in much development of dredging technology and equipment capacity, yet few ships and facilities are able to enter middle and small river courses or rural rivers. See Table 4-3 for the comparison and selection of the most common sludge dredging technologies used in middle and small river courses.

Table 4-2 Comparison and Analysis of Dredging Plans

Technical plan / Parameter	Plan One Drainage dredging	Plan Two Underwater dredging	Plan Three Environment-friendly dredging
Application Condition	Small watercourse that has no function of flood protection and waterlogging drainage, and bears no shipping traffic	Applied more often in middle and small sized watercourses with thick excavated mud and barriers in construction area, with	Large and medium-sized lakes and reservoirs; generally used for environment-friendly dredging in rivers, lakes

Technical plan / Parameter	Plan One Drainage dredging	Plan Two Underwater dredging	Plan Three Environment-friendly dredging
		purposes of expanding flood-discharge river section.	and reservoirs.
Typical technology	Dry-excavation dredging	Grab dredging	Environment-friendly cutter suction dredging
Construction Method	Construct temporary cofferdam at construction section of river channel, and conduct dry-excavation after draining channel.	The dredging equipment should be installed on the ship, which functions as an operation platform on the water for sludge excavation by dredging equipment. The sludge excavated should be discharged to the storage yard through the pipeline transportation system.	The environment-friendly cutter suction dredger is equipped with a specialized environment-friendly cutter head. During dredging, the dredger uses the cutter head to dredge under a low vibration in an enclosed environment. The excavated silt will be discharged, via a high-power dredge pump on the dredger, into the enclosed silt pipeline and finally to the designated dumping area.
Advantages	Thorough dredging is easy to be guaranteed with a high quality; low requirement on equipment and technique; low	Free from influences caused by the wastes and stones in the river channel, it is flexible and suitable for the excavation of hard	①The dredging equipment should bear a high positioning accuracy and precision of excavation to avoid over-dredging or the

Technical plan / Parameter	Plan One Drainage dredging	Plan Two Underwater dredging	Plan Three Environment-friendly dredging
	moisture content of sludge generated; easy for follow-up treatment	earthwork or such mixed with many impurities and wastes; in addition, the construction technique is simple, equipment is easy for organization, the project investment is economical and the construction process is free from the influence of the weather.	opposite, and to avoid damaging the original soil. During dredging, try to prevent any impact on the aquatic environment;② ensure that the dredging will not produce disturbance and expansion of the water body, ensure not to cause second pollution, reduce turbidity of the water body and control construction machinery noise so as not to disturb people's normal life.
Disadvantages	The construction cost increases for construction of the temporary cofferdam because the water in the river channel needs to be drained; what's more, many river channels only can be under construction during the non-flood season. As a result, the	Due to the weaker sensitivity of the grab dredger to the extreme soft bottom silt, the circumstance of "when the harder earthwork in the lower layer of the riverbed is excavated, lots of bottom silt of the surface layer, especially the float silt, will	Small rivers with small work amount are not applicable.

Technical plan / Parameter	Plan One Drainage dredging	Plan Two Underwater dredging	Plan Three Environment-friendly dredging
	construction time is limited, and is easily to be interrupted; meanwhile, the slope and the ecological system of the river channel will be easily impacted.	be left behind" will easily occur; and the float silt of the surface layer will easily return to the waters after being stirred.	

From the above table, it can be seen that it is impractical to dredge dry sludge of Pipa Lake after building a cofferdam and thoroughly draining water from the river course as is described in Plan One; compared with Plan Two, Plan Three has higher dredging rate and fewer impacts on the environment without causing the secondary pollution to the water body. Thus, Plan Three is recommended.

5. Environmental Impact Analysis and Mitigation Measures

5.1 Environmental Impact Analysis during the Construction Period and Mitigation Measures

5.1.1 Impacts of Dredging on Water Quality

5.1.1.1 Impact on Water Environment during the Construction Period

Environment-friendly dredging method will be adopted in this project. The environment-friendly cutter suction dredger is equipped with a specialized environment-friendly cutter head. During dredging, the dredger uses the cutter head to dredge under a low vibration in an enclosed environment. The excavated silt will be discharged, via a high-power dredge pump on the dredger, into the enclosed silt pipeline and finally to the designated stocking yard, exerting little negative impact on water quality during dredging.

Based on the above analysis, bottom sludge is not hazardous waste but common solid waste. Sludge will be dried in the storage yard, using the centrifugal dewatering system which is a complete, effective, automatic dewatering treatment technology composed of driers, screw pumps, conveyors, etc., that can achieve continuous production. Purified and concentrated mud will be sent through screw pumps to separating element where mud is gradually separated from water. The residual water will be discharged after flocculant agent-feeding treatment, having few impacts on water quality.

Dewatered sludge should be cleared timely and should be covered with tarpaulin in temporary storage to prevent rainwater backflow from polluting the water.

5.1.1.2 Construction Wastewater and Domestic Sewage

Wastewater generated during the construction period mainly includes domestic sewage of construction personnel and construction wastewater. Main pollutants of domestic sewage include COD, BOD_5, SS, NH_3-N, altogether 4.8m^3/d; Construction wastewater mainly includes muddy water (small amount in general) generated during pipeline excavation or by washing machinery and vehicles, and that generated at the construction site, by flushing sand and stones, mixing and pouring concrete and other

works, including SS, petroleum and the like. Domestic sewage from construction personnel should be disposed via surrounding existing residential sewage treatment system, and cannot be discharged arbitrarily. After precipitation, the construction wastewater can be used for dust reduction , which bears little impacts on the water environment.

5.1.1.2 Mitigation Measures

1. Dredging

Environmental dredging shall be conducted, and construction time shall be shortened as much as possible to reduce disturbance to water bodies. Through flocculation treatment, up-to standard residue water from dehydrated silt shall be discharged into Pipa Lake.

The wasteland on the south side of the downstream outlet channel can be used as sludge dumping area, and the dam should be set around the yard. In general, the section form of dam is sloping. Woven-bag-shaped soil dam, rolling type soil dam and so on can be used. Impermeable materials should be laid on inner sides of dumping area and dam.

Water outlets should be set up in the dumping area. Water outlets should be as far away from mud outlets as possible. For the sake of taking full advantage of the sludge storage space, water outlets should be set in the corner of the storage yard. Sludge volume, area and geometrical shape of the storage yard and drainage outlets outside the storage yard, etc. should be taken into overall consideration. The project should meet the need of residual water monitoring and the need of emergency processing to residual water which does not meet the requirement of emissions.

Emergency processing facilities of residual water should be set up, including the accident reservoir, the emergency chemical addition equipment and so on. With the permission of the construction site, emergency accident reservoir should be set up around the dumping area. In accordance with the specific condition of the construction site, the designed reservoir should store remaining water for 2-4 hours. Certain anti-seepage measures also should be taken for the reservoir. In circumstances of accident or emergency, if there is residual water that does not meet the standard, the

reservoir can be used as the site for emergency storage and treatment.

Cleared dredged silt should be moved in time. Adding tarpaulins when dredged silt is temporarily piled up, so as to prevent water from washing and flowing back to Pipa Lake and resulting in water pollution.

(2) Construction Wastewater and Domestic Sewage

Wastewater generated by processing sand and gravel, after being disposed by settling pond, can be used for mixing concrete and watering to reduce dust, and cannot be discharged into nearby water bodies; slurry generated during construction should be disposed in the settling pond via mud pump and to be solidified through drainage and evaporation, and the slurry cannot be discharged into nearby water bodies; wastewater generated from washing machinery and equipment, after disposed by oil-separating sedimentation tank, can be used for watering the construction site to reduce dust, and cannot be discharged into nearby water bodies.

Drainage should be taken into full account in terms of the layout of the construction site, which should also be away as far as possible from the river. Prevent pollutants from entering the river when operating the facilities, especially avoid leakage via land or surface water during the rainy season.

During construction, the on-site ground should be kept clean. Prevent wastewater or pollutants from entering the ditches which leads to infiltration of wastewater.

If on-site oil storage is needed, then anti-seepage treatment must be conducted in the warehouse. Measures should be carried out for storage and use in order to avoid phenomena of evaporating, emitting, dripping leaking, or polluting water bodies.

Try to construct the infrastructure in the non-flood season to reduce influence of shallow groundwater level on the construction.

Domestic sewage from construction personnel should be disposed via surrounding existing residential sewage treatment system, and cannot be discharged arbitrarily. Anti-seepage and anti-loss measures should be conducted in accordance with relevant requirements for temporary garbage storage room.

5.1.2 Impacts on Ambient Air during the Construction Period and Mitigation

Measures

5.1.2.1 Impact on Ambient Air during the Construction Period

(1) Dusts Produced by Transporting Vehicles

According to relevant document literature, during construction, the dust generated by vehicles accounts for more than 60% of total dusts. Dusts generated by vehicles, after completely drying, can be calculated according to following empirical formula:

$$Q = 0.123(V/5)(W/6.8)^{0.85}(P/0.5)^{0.75}$$

In which: Q —— dusts generated by vehicles, kg/km·unit;

V —— vehicle speed, km/h;

W —— vehicle load, t;

P—— the amount of dust on road surface, kg/m^2

Table 5-1 shows the dust amount generated by a truck of 10t when passing a 1km road under different pavement cleanliness and different driving speed. It is thus clear that under the same conditions of the road surface cleanliness, the faster the speed, the greater the amount of dust; while under the same vehicle speed, the dirtier the road surface, the greater the amount of dust. Therefore, limit driving speed and keep the road surface clean are the most effective ways to reduce dusts generated by vehicles.

Table 5-1 Dusts Generated under Different Vehicle Speed and Different Road Surface Cleanliness(kg/unit·km)

Amount of Dusts / Vehicle Speed	0.1 kg/m^2	0.2 kg/m^2	0.3 kg/m^2	0.4 kg/m^2	0.5 kg/m^2	1.0 kg/m^2
5(km/m^2)	0.0511	0.0859	0.1164	0.1444	0.1707	0.2871
10(km/m^2)	0.1021	0.1717	0.2328	0.2888	0.3414	0.5742
15(km/m^2)	0.1532	0.2576	0.3491	0.4332	0.5121	0.8613
25(km/m^2)	0.2553	0.4293	0.5819	0.7220	0.8536	1.4355

Meanwhile, spraying water on roads 4 to 5 times per day helps to reduce about 70% of dusts in the air, indeed a good way to reduce dust.

(2) Dust at the Construction Site

Another major source of the dust during construction is wind dust in open stacking area and bare area. Due to construction needs, open stacking is adopted for construction materials. At some construction sections, the topsoil needs manual excavation and temporary stacking, hence generating dusts when the weather is dry and windy. The amount of dusts may be calculated according to empirical formula in the stacking area:

$$Q = 2.1(V_{50} - V_0)^3 e^{-1.023W}$$

In which: Q —— the amount of dusts, kg/t•y;

V50 —— wind speed at the space 50m above the ground, m/s;

V0 —— wind speed for blowing away dusts, m/s;

W —— moisture content of the dust, %.The wind speed for blowing away dusts is related with particle size and moisture content. Therefore, reduce open stacking, guarantee a certain moisture content and minimize bare ground are effective means to reduce wind dust. Diffusion and dilution of dusts in the air are related to wind speed and other weather conditions, as well as to the dusts settling velocity. Dust settling velocities of different particle diameters are shown in Table 5-2. According to the table, dust settling velocity mounts rapidly with the increasing particle diameter. The settling rate is 1.005m/s when the particle diameter is 250μm, thus it is reasonable to consider that when dust particles are larger than 250μm, the main influence sphere is limited close within downwind area, and the real impact resource of the external environment are tiny dust particles.

Table 5-2 Dust Settling Velocity of Different Particle Diameter

Particle Diameter (μm)	10	20	30	40	50	60	70
Settling Velocity (m/s)	0.003	0.012	0.027	0.048	0.075	0.108	0.147
Particle Diameter (μm)	80	90	100	150	200	250	350
Settling Velocity (m/s)	0.158	0.170	0.182	0.239	0.840	1.005	1.829
Particle Diameter (μm)	450	550	650	750	850	950	1,050
Settling Velocity (m/s)	2.211	2.614	3.016	3.418	3.820	4.222	4.624

(3) Exhaust Gas of Construction Machinery and Transporting Vehicles

Bulldozers, excavators, trucks and other construction machinery will produce a certain amount of exhaust gas during operation, containing HC, CO, NOx and other pollutants which cause a certain degree of impact on the ambient air. Small amount of exhausts and low concentration of pollutants will be discharged by vehicles when under deceleration. Transporting vehicles, bulldozers, excavators and other vehicles should slow down the speed when passing by villages or entering the construction site, in order to reduce the impact of vehicle exhaust. Furthermore, regular repair and maintenance should be conducted to ensure vehicles' normal function and to reduce exhaust emissions.

(4) Odor from sludge dredging

The proposed dredging silt of the 30,000m^3 in the outlet channel of Pipa Lake. The environment-friendly cutter suction dredger is equipped with a specialized environment-friendly cutter head. During dredging, the dredger uses the cutter head to dredge under a low vibration in an enclosed environment. The excavated silt will be discharged, via a high-power dredge pump on the dredger, into the enclosed silt pipeline and finally to the designated dumping area. The silt dumping area will generate a little malodorous gas.

5.1.2.2 Mitigation Measures

Waste gas generated during construction mainly includes dusts at the construction site and exhaust produced by construction machinery and transporting vehicles as well as odor of sludge stocking yard. Following measures will be adopted to protect the ambient air during the construction period:

(1) Adopt advanced construction techniques; use wet process for crushing gravels and concrete; be equipped with dust collection device; control vehicle speed and exhaust emission from cars and coals; spray water at the construction area when needed (4 to 5 times a day is available); construction teams should use liquefied petroleum gas, electricity and other clean energy; enhance afforestation of the construction site and strengthen labor protection for construction personnel. All these will reduce the negative impacts on ambient air.

(2) At the inner side of entrance and exit for vehicles transporting materials and

spoil, a car washing platform should be established, surrounded by barriers to prevent leakage of wastewater from washing cars. Before leaving the site, the tires and body of vehicles must be washed in the washing platform. Any sludge is not allowed to be attached to vehicles' surface. Materials and spoil should not exceed the upper edge of the vehicle ledge during transportation, and the vehicle hopper should be covered with a tarpaulin or be sealed.

(3) Concrete mixing station and asphalt mixing station cannot be set inside the construction site; use commodity concrete and asphalt.

(4) Transporting vehicles, bulldozers, excavators and other vehicles should slow down the speed when passing by villages or entering the construction site. Furthermore, regular repair and maintenance should be conducted to ensure vehicles' normal function and to reduce exhaust emissions.

(5) Set up dust-proof barriers around the work area, especially at places close to residential areas, hospitals and schools.

(6) Try to minimize the generation of dust and particulate matter in order to avoid impacts on surrounding residential and business practices; focus on protecting vulnerable populations (such as children, the elderly, etc.).

(7) Deodorant should be regularly sprinkled on the sludge dumping area to reduce the influence on the ambient air.

(8) Transfer the sludge after the desiccation.

5.1.3 Impacts on Acoustic Environment during the Construction Period and Mitigation Measures

5.1.3.1 Impacts on Acoustic Environment during the Construction Period

5.1.3.1.1 Analysis of Impacts on Acoustic Environment during the Construction Period

Construction noise disappears with the completion of construction, but because the noise is strong, it will have serious impacts on the surrounding acoustic environment, like the hospital, school and other important sensitive spots. As a result, it is necessary to control the construction noise. Due to the constant location changes of pipeline construction facilities, the number of equipment in operation in the same

construction phrase varies at different time accordingly. Thus, it is difficult to predict the noise level at construction sites boundary. According to the point noise attenuation model below, noise level of different construction machines at different distances can be calculated.

$$LP = LPO - 20Lg(r/ro) - \Delta L$$

In which, LP—the sound pressure level r (m) away from the construction noise source, dB(A);

LPO—the sound pressure level ro (m) away from the construction noise source, dB(A);

ΔL—amounts of attenuation (spreading attenuation excepted), dB(A). The outdoor noise source ΔL is calculated as zero;

Without considering the noise attenuation amounts of trees and buildings, the predicted results of noise level of different construction machines at different distances (without adding present level) is shown in the following table.

Table 5-3 Predicted Value of Noise of Construction Machinery at Different Distances Unit: dB(A)

Serial No.	Type of machine	Predicted value of noise								
		5m	10m	20m	40m	50m	80m	100m	150m	200m
1	Loader	90	84.0	78.0	72.0	70.0	66.0	64.0	60.5	58.0
2	Road roller	81	75.0	69.0	63.0	61.0	57.0	55.0	51.5	49.0
3	Bulldozer	86	80.0	74.0	68.0	66.0	62.0	60	56.5	54.0
4	Excavator	84	78.0	72.0	66.0	64.0	60.0	58.0	54.5	52.0
5	Large loader	86	80.0	74.0	68.0	66.0	62.0	60	56.5	54.0
6	Light loader	75	69.0	63.0	57.0	55.0	51.0	49.0	45.5	43.0

The above table indicates, noise from construction machines 50m away can meet the *Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011) (70 dB(A) during daytime and 55 dB(A) during nighttime) during daytime, but fails to meet the standard at 200m during nighttime. Thus, the construction noise has relatively great impacts on areas within 50m away from the

construction site. The impacts are much serious during nighttime when the influence range covers 200m. However, its impacts are short-term and temporary as the construction noise stops upon the completion of the construction. Since this project does not involve construction at night and there is no hospital, school, kindergarten or other key sensitive points within 50m, this project can minimize the impacts of noise on the environment after taking certain measures.

5.1.3.2 Mitigation Measures

Noise during the construction period mainly comes from material transporting, pipe and channel excavating, pipe loading and unloading, and soil backfilling during the operation of machinery, such as bulldozers, excavators, gravel mixing station, heavy-duty trucks and the like. Following measures will be adopted to protect the acoustic environment during the construction period:

(1) Set up warning signs and use low-noise equipment at acoustic environment sensitive sections; control noise source, media of noise transmission, and traffic noise; offer construction personnel anti-noise earplugs; reasonably arrange construction time, etc.

(2) Reasonably arrange construction time pursuant to *Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011). Simultaneous operation of a large number of high-noise equipment and construction at sensitive time should be avoided whenever possible. Try to arrange daytime operation of high-noise equipment and reduce nighttime transportation. Construction at night (22:00 - 6:00) is prohibited. Construction activities that must be carried out at night should be approved by relevant local department of environmental protection and negotiation in advance with local residents should be conducted. In addition, noise reduction measures should be implemented (such as installing sound barriers) to minimize the impact of construction noise on local residents.

(3) The speed of all construction vehicles outside the work site must not exceed 25 km/h.

(4) The speed of vehicles inside the construction site must not exceed 15 km/h.

(5) Try to keep the noise lower than 90 decibels of the machinery and equipment.

(6) More stringent measures should be carried out in sensitive areas (including residential areas, hospitals, nursing homes, etc.) to prevent harsh noises.

5.1.4 Solid Waste Impacts during the Construction Period and Mitigation Measures

5.1.4.1 Solid Waste Impacts Analysis during the Construction Period

Solid waste generated during the construction period mainly includes construction personnel's domestic wastes, spoils and sludge generated during construction and waste in dredging area.

(1) The Impacts of Construction Personnel Domestic Waste

During the construction period, the domestic waste production volume is about 50kg/d, mainly including organic waste, which is prone to rot and fermentation. Arbitrary discarding of such waste may pollute the water environment. At the same time, mosquitoes tend to propagate due to fermentation, hence producing smelly odor and polluting the environment. Therefore, the EIA institutes recommend that garbage collection bins be set up in the construction site during the construction period, and the Sanitation Department be commissioned to transport the collected domestic waste.

(2) The Impacts of Construction Waste

It is calculated that the construction amount of earthwork in this project reaches 110,670m^3, including excavated earthwork of 55,335m^3 and filling soil of 55,335m^3. As all excavated soil is filled back, there is no dumped soil.

If no reasonable arrangement for earthworks, then random distribution of waste earthworks or spoils will occur along both sides of the construction area, occupying a considerable amount of urban land and making it difficult to control soil erosion in the affected area. Besides, this will have a severe negative impact on surrounding ecological environment, making it difficult to restore and re-use the occupied land. Moreover, this will have negative impacts on surrounding landscape.

(3) Impacts of Sludge

①Sludge Components

According to monitoring data and the above analysis, the bottom silt of Pipa

Lake outlet channel does not belong to hazardous waste but belong to general solid waste which can be used for woodland.

② Dredging Technique

Environmental-friendly cutter suction dredger is recommended for Pipa Lake outlet channel dredging project. In this plan, sludge will be directly transported to the sludge dewatering treatment plant through exposed or underground dredging pipes which are laid out through buoys along the lake.

③Location of Temporary Stacking Area

As the moisture content of sludge is 90%, a temporary dump site is needed to dewater and dry the sludge. The dump site, which covers about 800m^2, is located in the vegetable plot at the southern side of the outlet channels. See figure below.

Map 5-1 Yugan County Dehydration Temporary Stacking Area

④Sludge Desiccation

The dredged sludge will be dried in the dehydration area. Centrifugal dewatering system is adopted. This is an effective, continuous-production dewatering and drying system of high automation, consisting of drying machines, screw pumps, conveyors

and other equipment. After extracting impurities, the concentrated slurry will be discharged into the separation unit, and slurry particles will be gradually separated from the water. The dried soil will be transported via conveyor to the temporary stacking area, and the remaining water will be discharged after dosing and flocculation. The dehydration rate can reach 50%.

⑤Sludge treatment

It is predicted that this project will dredge sludge of 30000m^3 with a moisture content of 90%. If its density is calculated as 1.0kg/L, the dry sludge will weigh 3000t in total. It is proposed to transport the dry sludge to Changgangling forest land and Xiaoganghe forest land near the Xisanlu Road of Yuting Town. The former is 10km away from Pipa Lake, covering 46ha while the later is 5km away from Pipa Lake, covering 80ha. Both lands belong to the collective land of Yuting Town. Pursuant to Standards for Woodland Sludge Disposal by Urban Sewage Treatment Plant (CJ/T 362-2011), the amount of sludge for woodland use should not exceed 30t/hm^2. The woodland area of Changkeng Village and Xiaoganghe is about 126ha, thus the amount of applied sludge may reach 3780t. Therefore, it is feasible to transport the sludge to Changkeng Village and Xiaoganghe for woodland use. See *Letter of Acceptance for Sludge* in Annex I.

According to the design manual of USA Environmental Protection Agency (land application of municipal sludge), the use of forest land is divided into surface application and injection application. Such silt is applied to the surface. For the sake of preventing the public from entering into the forest land, fences and warning signs should be set up after silt is mixed with soil. As the project applied area is small, the stir is not suggested, while earthing and virescence should be taken to prevent soil form erosion.

(4) Impacts of Waste in the Dredging Area

There are solid pollutants, such as waste and organism remain, etc., in outlet channels of the dredging area. Solid pollutants should be cleared in the process of dredging. The waste quantity of this part is small and the estimated quantity is 0.2t. EIA proposes the unified collection of such waste by installing waste collection boxes

on the construction site, and solid pollutants should be handed over to the environment and sanitation department. Moreover, cleared wastes should be transported to Yugan waste landfill by the environment and sanitation department and be treated in here.

5.1.4.2 Mitigation Measures

(1) Temporary dump site

①Reasonably arrange temporary stacking areas of earthworks and stones which should be away from environment sensitive spots like residential spots and schools, etc, and set at windward or crosswind direction of the prevailed summer wind of the urban and residential area.

②Scientifically arrange the construction site and minimize land occupation. Temporarily occupied area will be restored according to its original land use type after construction is completed.

③When temporary stacking is needed, waterproof, windproof and other measures should be conducted. Temporarily stacking earthworks and stones should be compacted, ground and covered with felt cloth.

④Set up earthen drainage ditch around the construction site on the basis of its terrain conditions. And set up an earthen grit chamber at the outlet of the ditch, slowing down the water and settling sand.

⑤During the process, sealed transportation should be ensured and scattering be avoided.

(2) Construction waste slag

Comprehensive classification and recycling of recyclable wastes (scrap iron, scrap steel and materials packing bags sold to scrap yards; waste bricks used as materials for road base) should be conducted. Wastes that cannot be recycled should be timely transported to the designated construction waste dump site. During the process, sealed transportation should be ensured and scattering be avoided. When temporary stacking is needed, waterproof, windproof and other measures should be conducted.

(3) Domestic Waste

Inside the construction area, garbage bins for domestic wastes which have daily clearing, collection and classification should be set, and transportation of wastes be commissioned to the Sanitation Department.

(4) Dredging Outlet Channel Sludge

The environment-friendly cutter suction dredge will be adopted for underwater excavation construction. Centrifugal dewatering and drying treatment system will be adopted for the sludge. When moisture content is below 60%, the dried sludge can be used for woodland use in Changganling and Xiaoganghe. The woodland in which sludge is applied cannot be used for growing vegetables, grains or other crops. Enclosure should be set up to reduce water and soil erosion.

The wasteland on the south side of the downstream outlet channel can be used as sludge dumping area, and the dam should be set around the yard. In general, the section form of dam is sloping. A cofferdam made of soil in woven bags or grind debris can be built and the inner side of the cofferdam shall be laid with impermeable materials.

Setting up water outlets, residual water treatment and emergency tank on the dumping area. Meanwhile, the anti measure should be taken. Through flocculation treatment and after meeting relevant requirements, residue water from dehydrated silt shall be discharged into Pipa Lake.

Tarpaulins should be added on the top of dumping area in rainy season to prevent from the washing of rainwater.

Deodorant should be regularly sprinkled on the dumping area to reduce the influence on the ambient air.

Cleared garbage and silt shall be removed in a timely manner so as to shorten temporary land occupation period as much as possible;

It is proposed to transport the dry sludge to Changgangling forest land and Xiaoganghe forest land near the Xisanlu Road of Yuting Town and use the dry sludge on surfaces of both forest lands. Moreover, earthing and virescence should be taken to prevent soil from erosion.

Fences and warning signs should be set up on the construction forest land, in

order to prevent the public from entering into the forest.

Minimize temporary land occupation; timely remove the sludge. Rehabilitate temporarily occupied land to cropland after completion.

(5) Waste in the Dredging Area

In order to collect waste in area, the construction unit should set up waste collection boxes on the construction site. The collected waste should be cleared and transported to Yugan waste landfill by the environment and sanitation department and be treated in here.

5.1.5 Ecological Impact during the Construction Period and Mitigation Measures

5.1.5.1 Ecological Impacts during the Construction Period

Ecological impacts during construction mainly include following three aspects:

(1) Impacts on Animals and Plants inside the Construction Area

Poultry are major animals, commonly seen animals and plants in the construction area, and no wildlife of key protection, their concentrated habitats or precious plants were found.

Drainage pipe network of this project will be set mainly along urban roads, causing little impact on the regional vegetation. Garbage transfer station and monitoring laboratory occupy no new area. Automatic monitoring spot mainly occupies wasteland. No ancient or precious trees were found among the construction area, and temporarily occupied area will be restored according to its original land use type after construction is completed. Therefore, it causes little impact on the regional vegetation.

Impacts of construction activities on animals are temporary. Due to the small construction scope and limited time, the impact will not last. With the completion of the project and restoration of local vegetation, animals can live in this area again, scarcely impacted.

(2) Impacts of sludge dredging on aquatic life

Pipa Lake, located in the urban area of Yugan County, is an area of frequent human activity. Areas along the lake are mainly vacant land, vegetable plots and villages. Due to the emitted pollution from neighboring villages and Furongshan

Industrial Park, the water quality of the lake is worse than Category V, especially in the eastern side of the lower stream where this project intends to dredge sludge. According to surveys, most aquatic organisms in Pipa Lake are common species. No fish spawning site, feeding ground, wintering ground or precious aquatic life is found and Pipa Lake is not an important natural habitat.

This project will dredge sludge of about 30,000m^3 in outlet channels, without involving sludge of the lake. It will use environmental friendly cutter suction dredger to dredge sludge. With the construction of the cofferdam, some benthos will disappear. Yet, the ecosystem of the outlet channel will be gradually restored upon the completion of sludge dredging, without causing serious ecological deterioration or changes of Pipa Lake.

(3) Impacts of Water and Soil Erosion

During construction, the setting of construction site will destroy the surface vegetation, increasing soil erosion modulus. Temporary stacking will bury the surface vegetation, and the stacked spoil and sludge woodland for wood use will form a new soil erosion area, causing soil erosion in the rainy season.

Only limited and temporary damage will be caused by the construction to the ecology and landscape. Therefore, as long as construction personnel are under good management, and restoration work is well conducted after the construction is completed, the impacts of construction on the ecology and landscape are acceptable.

5.1.5.2 Mitigation Measures

(1) Scientifically arrange the construction site and minimize land occupation. Temporarily occupied area will be restored according to its original land use type after construction is completed.

(2) Strengthen propaganda and education, and forbid disafforestation and wild animal hunting. During construction, if any rare and endangered wild plant, tree and endemic plant were found, measures like report to relevant departments or on-site protection should be conducted; construction noise should be controlled to minimize its impacts on animals.

(3) Topsoil should be excavated and stacked layer by layer. After the construction

is completed, timely remove temporary facilities, loosen the compacted soil, backfill the topsoil layer by layer and restore vegetation. Select suitable vegetation for restoration based on local climate features, side slope gradient and geological conditions.

(4).Water and Soil Erosion Control

①Rationally choose the construction period and try to avoid the rainy season or construction in raining days; set up construction enclosure surrounding the work site to prevent construction materials and wastes from leaking into the surface water.

②Set up earthen drainage ditch around the construction site on the basis of its terrain conditions. And set up an earthen grit chamber at the outlet of the ditch, slowing down the water and settling sand.

③Combine key control with surface protection, and engineering measures with phtyto measures. Emphasize in engineering measures to realize its quick effect and guarantee function. Phtyto measures are auxiliary ones for soil and water conservation, conserving soil and water in a long term and stable manner, meanwhile afforesting and beatifying ambient environment.

④Protect leaf layer and organic matters of the land surface and backfill them to the damaged areas to promote the growth of native plants.

⑤Cover the eroded barren areas with native grasses and trees, or harden the soil surface of such areas.

⑥Proper erosion control measures should be conducted before the rainy season, in order to better carry out the next works; corresponding erosion measures should be prepared at each construction point upon the completion of their subprojects.

⑦In all construction sites, there should be sedimentations control facilities to slow down the water, change the flow direction and settle silts before vegetation is restored. Such facilities include material piles, stone pathways, settling pits, straw bales, hedgerows and sludge piles, etc.

⑧Use ditches, berms, grass fences and stone piles and other measures to prevent the water from rushing into the construction site or interfering on-site work.

⑨Maintain and continue to adopt erosion control measures till vegetation is fully

restored.

⑩ Spray water on earthen roads, excavation areas, filling areas and earthwork areas if necessary to reduce wind erosion.

5.1.6 Social Environmental Impacts during the Construction Period and Mitigation Measures

5.1.6.1 Social Environmental Impacts during the Construction Period

(1) Impacts of Land Occupation

Currently the temporary land occupation mainly involves urban roads, which will be restored to the original land use type after the construction is completed, hence causing little impact on regional land use.

(2) Impacts on Municipal Facilities and Services

The pipeline project mainly involves curb sides, sidewalks, non-motorized vehicle lanes and existing cover plate channels. During construction, drainage, electric power, fuel gas and bus lines may be interrupted, influencing residents' lives.

(3) Impacts on Commercial Streets

During pipeline construction, the traffic obstruction caused by road excavation will have some impact on normal operation of street shops, such as hindering customer's access and inconvenience to commodity loading and unloading.

(4) Impacts on Traffic and Safety

The pipe network construction has a great impact on traffic. Although sections can be divided during construction, temporary stacking of certain amount of earthworks are inevitable, influencing the nearby traffic. If slotting were adopted when the pipeline needs to pass across the road, vehicles may easily be blocked on the road, greatly influencing the traffic. Therefore, when geological and soil conditions are permitted, adopt pipe jacking method will reduce the impact of road excavation. But in this case, the road's bearing pressure (bearing weight) decreases and heavy-duty trucks are not accessible in a short period of time, which will influence the downtown traffic. Pipe network of this project is mainly set along banks of Pipa Lake and the north of Pipa Lake outlet channel, causing little impact to traffic.

To further reduce impacts brought by pipeline network construction, the civil

works contractor should carefully plan and speed up the construction in which pipe jacking should be adopted whenever possible. Meanwhile, the contractor should negotiate with local department of traffic control and formulate traffic management plan and inform the affected residents in advance. At the construction site, signs should be set up and staff be designated to ensure smooth traffic. Besides, further strengthen construction management, shorten the construction time and other measures should be adopted to prevent traffic congestion. Besides, further strengthen construction management, shorten the construction time and other measures should be adopted to prevent traffic congestion.

5.1.6.2 Mitigation Measures

1. Mitigation Measures for Land Occupation

Scientifically arrange the construction site and minimize land occupation. Temporarily occupied area will be restored according to its original land use type after construction is completed.

Reasonably arrange temporary stacking areas of earthworks and stones which should be away from environment sensitive spots like residential spots and schools, etc.

2. Mitigation measures for pipeline construction impacts on municipal services like traffic, water and electricity supply

1) Inform the public of service interruption (including of water, electricity, fuel gas, and public traffic lines) at least five days ahead by putting up a notification at project site, public traffic stops, as well as affected residential areas and enterprises;

2) With good construction organization, guarantee construction safety and ensure the schedule to shorten construction duration, finishing as quickly as possible for restoring municipal services.

3. Mitigation Measures for Impacts on the Business down the Street

Enclosure should be set up at the side facing commercial shops. A pedestrian aisle should be reserved to guarantee normal operation of shops down the street.

4. Mitigation Measures for Impacts on Traffic and Safety

1) Before construction, the civil works contractor should negotiate with local department of traffic control and formulate traffic management plan. On construction nameplate, the construction unit should provide information on the construction and engineering schedule, traffic detours and interim public traffic lines, and relocation, etc.;

2) A warning board should be set up at each entrance of construction section, in front of each intersection, bend, lane change and traffic aisle, etc., indicating location of the construction area, speed limit, height limit and other limits.

3) In principle, construction at night (22:00–6:00) is prohibited. Construction activities that must be carried out at night should be approved by relevant local department of environmental protection and negotiation in advance with local residents should be conducted. In addition, noise reduction measures should be implemented (such as installing sound barriers) to minimize the impact of construction noise on local residents.

4) In order to reduce traffic pressure on surrounding roads, except in special circumstances, vehicles transporting earthworks should try to avoid urban traffic peak, and nighttime transporting is preferred. Other construction vehicles' entering and leaving the construction site should be adjusted accordingly depending on factors influencing the traffic such as season, weather, holiday, or emergency, etc.

5) For works with construction period of more than 30 days, construction site boundary should be enclosed according to local conditions; the enclosure shall be at equal to or more than 2.5m/ 3m at construction site of common areas/ key areas respectively;

6) The enclosure set up should be straight, orderly, clean, beautiful, and damage-free, and the appearance should be harmonious with surrounding environment;

7) The enclosure constructed on road should be within 5m range of visibility at crossroads. Straight and rigid enclosure of metal mesh panel should be set up without blocking the visual line of drivers and pedestrian, and in the precondition of guaranteeing traffic safety. Within 5m range of visibility, it's forbidden to stack any

article.

8) In case the enclosure is equal to or less than 5m from residence, or the construction point is equal to or less than 15m from sensitive buildings like residence, hospital and school, etc., proper measures should be taken to lower the noise, such as raising the enclosure, etc., and the enclosure in sensitive areas should be up to 3m high; and the scope of 5m outside the enclosure should be kept clean.

9) Never stack materials, tools, and earthwork, etc. within the scope of 1m inside the enclosure.

10) Never use the enclosure as retaining wall or the support of other facilities and equipment;

11) Try to minimize impacts on nearby residents and vehicles when the construction involves entrance of a community. In this case, construction on one side should be adopted and be completed as quickly as possible. Topsoil should be timely backfilled when the construction is completed. When the construction cannot be completed within one day, steel plate should be laid above the ditches and channels to ensure normal passage and safe.

12) Set up a full-time “Traffic Picket Post,” namely a full-time traffic safety and safe construction team, responsible for ensuring the implementation of traffic safety measures and their management and maintenance during construction, maintaining traffic order around construction roads, and assisting in resolving traffic problems during the construction period.

13) During the construction period, working vehicles and personnel should strictly comply with traffic laws and regulations, and be subject to traffic management departments. Accept the supervision and inspection of the traffic management department and the project owner. If any problem were found that would affect the traffic, rectification should be conducted immediately.

14) Ensure that safe construction and anti-disturbing measures are well adopted, in particular the adoption of measures like dust control, noise control, sludge and earthwork management; contact with affected units and communities to get their understanding and support, in order to ensure smooth construction.

15) List coordinating traffic measures as content in the formulation of construction organization design. Before construction, actively contact with the Transportation Department and introduce and report the project overview, construction plan, general layout as well as transportation plan of construction materials and earthworks, and ask for the Department's support and guidance to improve the transportation plan and formulate detailed rules for implementation.

16) In case hidden well cover is opened or raised for construction on urban roads maintained open to traffic, folding construction curb fender should be adopted at the boundary of construction area;

17) Never use red and white flag, safety isolation rope, or other materials to replace the construction curb fender.

18) The setting of construction curb fender should surely make the long-side section of channel steel on the foundation face towards construction area; in case construction passageway is set up between construction curb fender and construction area, the passageway should be equal to or more than 0.6m wide;

19) In case the external surface of buildings (structures) is painted, refurbished, or cleaned, construction curb fender should be used as fully-closed enclosure at the boundary of construction area, and various mechanical equipment, tools, and materials should be placed within the scope of enclosure;

20) Never remove construction curb fender before the road construction takes interim passing measures or the engineering is completed;

21) In key areas, road pipeline should be constructed by means of "excavating a section, paving a section, and renovating a section", and the whole pipeline should never be excavated simultaneously.

22) For construction occupying urban road, the construction unit should observe relevant regulations of public security, traffic department, and road administration department, handle relevant examination and approval formalities, and set up interim road according to specifications;

23) The construction unit should observe the license regulations on construction period strictly, and should never execute construction by occupying road or exceeding

the licensed construction period;

(24) If the construction needs to occupy urban road or may have influence on vehicles' or residents' travel, temporary passageway shall be set in accordance with relevant regulations, especially for the hospital to provide convenience for safety traffic of ambulances. After setting temporary passageway in the construction section near a kindergarten or school, the construction site shall be strictly enclosed so as to prevent babies or children from entering the construction areas.

(25) If the construction needs to occupy a sidewalk, it would be necessary to set a firm, smooth and continuous pedestrian access road with side security enclosure at the side of the access door for the neighboring commerce, enterprise, office building or residential houses to ensure pedestrians' safe travel.

(26) The construction unit should adopt sheet flattening method for construction in case the ditch or pipeline slot is excavated on urban roads which are used as traffic roads, and the work cannot be completed on the very day;

27) The supporting and consolidation scheme should pass safety argumentation, and be reported to construction unit for approval; the steel plate covering road should be at least equal to or more than 0.03m thick. The edge of the steel plate and metal slope rack adopted should be burnished to remove sharp edges and burrs, in order to ensure the safety of personnel and vehicles;

28) Metal shape should be adopted for supporting and consolidating the lower end of covering steel plate in case the excavation width of ditch (pit) is equal to or more than 0.8m;

5.1.7 Health and Safety Impacts during the Construction Period

This is a small project without much construction personnel, but the on-site living conditions and sanitary conditions are relatively poor, and workers should work in high intensity. All these may easily lead to epidemics. To ensure construction safety, comprehensive physical examination should be conducted to all construction personnel and persons suffering from infectious diseases cannot enter the construction site; regular physical examination should be conducted to canteen staff, who have to get timely treatment and be removed from the cafeteria if suffering from any epidemic

disease, in order to prevent the spread of epidemics. In the construction site, centralized water supply facilities should be established, otherwise, municipal water supply should be adopted. Besides, the construction site should provide sanitation facilities and medical staff. Labor protection for construction personnel should be strengthened to maintain their health and safety and to ensure a smooth construction.

5.2 Analysis of Ecological Environmental Impacts during Operation Period

The construction of this project not only protects aquatic environmental quality of project area, but also improves its basic infrastructure, imposing certain positive impacts. However, wastewater, solid waste and noise generated by the project exert certain impacts on ecological, acoustic, aquatic and atmospheric environment of project area. Impact analysis is presented below.

5.2.1 Positive Impacts

In 2023, after the completion of the project, the implementation of the overall plan will stop the decreasing trend of water quality of Pipa Lake. After the implementation of pollutant emission reduction measures, structural discharge of pollutants will decrease and the pollutant load into lake will be cut down. After the operation of the project, sewage collection rate of Pipa Lake region will reach 100%, COD into lake will be cut down by 132.3t/a, TN 17.89t/a, TP 1.3t/a and domestic collection rate will reach 80%.

Sewage interception and discharge along the bank of Pipa Lake and sewage collection pipeline network will be constructed and improved through this project, and connected to the main pipeline network of sewage treatment of the county to improve the hygienic level of the county. Construction of the project also optimizes water body of Pipa Lake, improving the 1750,000m^3-water body of Vquality of Pipa Lake. All of that helps to improve residents' living condition, build a livable city with blue sky, green land and clear water. At the meantime, investment environment will be improved, imposing a positive impact on regional economy. The project also involves strengthening the environmental management of Yugan's river and lake basins, and

establishing and formulating effective water quality monitoring system and public water quality reports. 132,000 people will directly benefit from the measures to improve the environment, among which 66,000 are women.

5.2.2 Analysis of Impacts on Aquatic Environment during the Operation Period and Mitigation Measures

5.2.2.1 Analysis of Impacts on Aquatic Environment during the Operation Period

1 Sewage pipeline network

(1) Normal Working Condition

Presently water quality of Pipa Lake is worse than V category. Through the construction of sewage discharge pipeline network, sewage collection volume will reach 1,600m^3/d by 2023, and 1,900m^3/d in the long term. It is predicted that yearly COD into lake will be cut down by 132.3t/a, BOD 66.15t/a, TN 17.89t/a and TP 1.30t/a, thus gradually improveing the water quality of Pipa Lake.

(2) Abnormal Working Conditions

As the pipeline is buried underground, during the sewage transporting, if anti-seepage measures of pipe joints were poor or sewage pipeline were ruptured, then leakage may occur hence having great negative impacts on groundwater environment and sanitation on the ground. Therefore, appropriate engineering and management measures must be adopted to mitigate the impacts if accidents occurred and to avoid accidents caused by pipes' breaking.

2. Diversion sub-project

(1) Impacts on Pipa Lake Water Quality

Through water supplementation and flowing water circulation, water exchange will be accelerated. At the same time, dredging Pipa Lake outlet channel bottom silt will reduce the pollution generated by endogenesis of Pipa Lake and therefore improve water quality of Pipa Lake. The effects of diversion in improving water quality somewhat lags behind. A period of time after completion of diversion project, the concentration of COD, TN and TP will be remarkably lower than before, which is beneficial for improving water quality of Pipa Lake.

(2) Impacts on Water Quality of Huhui River

The water quality in Huhui River is within the scale of Category V to water worse than Category V. Water quality on the upper reaches of Pipa Lake is Category V, but lower reaches of Pipa Lake is worse than Category V. The state quo of water in Pipa Lake is mainly water worse than Category V.

In wet seasons: In wet seasons from April to June, the project will divert water on the upper reaches and intercept water on the lower reaches through existing sluices to elevate water level in Huhui River, divert water by gravity to flow to Pipa Lake through inlet channel, open sluice of outlet channel, and then interlink effluent from outlet channel with Huhui River. After hydraulic analysis, the quantity of necessary water is small. Diversion in wet seasons is just for activating the water body in Pipa Lake. After activation of water body in Pipa Lake, the aquatic vegetation, especially submerged vegetation will be cultivated and restored through ecological restoration technology, so as to improve the water quality and clean the water body. The outlet channel is interlinked with Huhui River, which has no adverse impacts on water quality in Huhui River.

In dry seasons: In dry seasons, the biggest degradation of water level of Pipa Lake is 0.70m. The project intends to set up a water pumping station at Pipa Lake inlet channel to divert water from Huhui River, so as to meet the designed water level of 16.6m and the largest daily supplementation of 3,464.5m^3. After guaranteeing the designed water level in Pipa Lake through supplementation, the water quality of Pipa Lake will be improved through water ecological restoration engineering under the project. In dry seasons, newly-built sluice at outlet channel shall be closed, then there is only inlet but no outlet in Pipa Lake. Therefore it can reduce supplementation and energy consumption, and there is no adverse impacts on water quality of Huhui River.

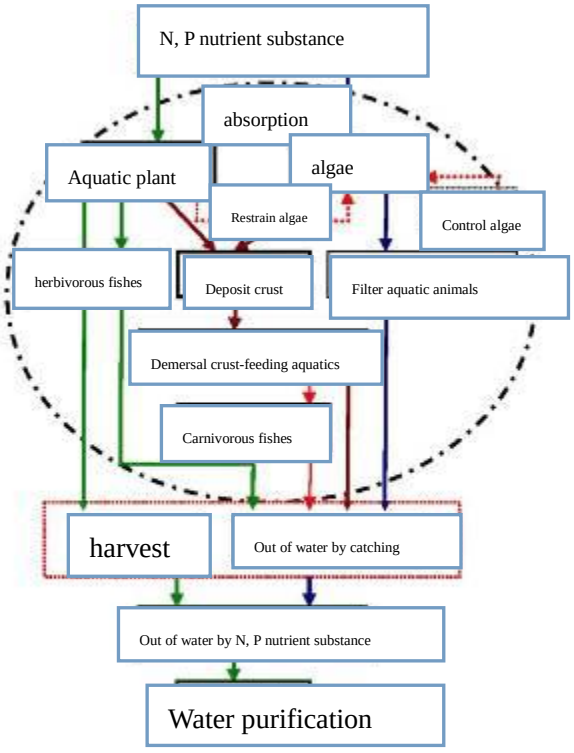
Huhui River is 54km long and 90~120m wide covering an area of 168km^2. This project mainly involves its section from Xinjiang pump station to the small barrage, a drainage area of 50 ha where the water is 5m deep. The greatest daily quantity of makeup water accounts for about 0.14% of the total water amount in Huhui River (from Xinjiang pump station to the small barrage). As the quantity of water intake is relatively small, it has few impacts on the water amount of Huhui River.

3. Aquatic Ecological Restoration Sub-project

The main content of water body ecological restoration of Pipa Lake includes ecological system restoration and construction of bank protection.

(1) Water ecological restoration system

The core of the design and construction of water ecological restoration system is to formulate, based on ecological theory, multi-layered system of aquatic organism, build food chain, degrade, fasten and transfer pollutants and nutrient and purify water quality through this process. Greening project covers an area of 40000m^2, newly build 3582752412m^2-submerged plants, 71652412m^2-floating-leaved plants and 2412m^2-emerged plants. See water ecological restoration mode in Map5-2



Map 5-2 Water Ecological Restoration Mode of Pipa Lake

Technical principles are as follow:

Plant and recover aquatic plant, submerged plant in particular, through ecological restoration technology to improve water quality and purify water body. Photosynthesis of the restored submerged plant will provide a large amount of dissolved oxygen to the sediment, enhancing the redox potential in sediment and facilitating the breeding of bentonic organism including insects, worms, snails and

shell fishes, and restoring diversity of water ecological system. At last orderly put original and local aquatic life like fish, shrimp, crab and the like, which can balance the productivity of submerged plant, optimize biodiversity of aquatic organism, help form a benign circulation of aquatic ecological self-purification system and fully recover aquatic ecological system. At the meantime, after the circulation of nutrient in ecological system, water becomes more purified.

From the perspective of substance, after a series of complicated process, nutrients like N and P will be removed from the water by reaping aquatic plants or catching aquatic animal like fish.

Meanwhile, this project proposes to further purify watercourse, set up compound ecological floating bed with an area of 3000m^3, add 8 sets of new aeration apparatus and 8 sets of new immobilized microorganism incubator. Compound ecological floating bed takes aquatic plant as main body; combining biological stuffing, it utilizes the symbiotic relationship among species, fully takes advantage of principle of water spatial niche and trophic niche, constructs highly-effective ecological system to reduce pollution load of water. That is, according to different design requirements, use tailor-made light biological carrier to assemble, compose and construct the needed area or geometrical shape; then put it into the damaged water, and put the aquatic or terrestrial plants that are screened, domesticated and has a strong power of absorbing organic pollutants in the water, into the prepared plant slot of floating carrier. The plants will grow in the environment similar to soilless culture. Roots of plant will naturally extend and float in the water absorbing and assimilating organic pollutants like ammonia, nitrogen and phosphorus, provide surviving and absorbing condition for fish, shrimp, insect and microorganism, and emit chemical compound restraining the growth of algae. Under the combined action of plants, animals, insects and microorganism, water quality is improved and water ecological system is recovered and reconstructed.

(2) Ecological slope protection

The decreased water quality of rivers caused by non-point pollutants is the key of Pipa Lake ecological environment issue. Non-point pollutants mainly come from the

defective municipal sewage pipeline network. The urban domestic sewage was discharged disorderly and directly, causing water pollution. Aquaculture industry hastens the numerous and disordered input of feed, causing the water pollution. Residents arbitrarily discard garbage and waste leachate is directly discharged into water, all causing water pollution. The ecological slope protection technology dominated by stereoscopic protection system of arbor, shrub and grass will greatly reduce pollutants into river, keeping pollutants in a relatively small amount. Planting numerous aquatic plants will greatly improve the self-cleaning capacity of rivers, recover aquatic life group and form aquatic ecological system with benign circulation, therefore controlling non-point pollution.

Bank slope is the material boundary that defines water space. Construction of ecological slope protection consists of oriented cultivation, recovery and reconstruction of wetland ecological system of river bank and lakeshore. Through building harmonious and stable wetland ecological system of river bank and lakeshore, guarantee the ecological safety of river bank and lakeshore and provide high-quality water for domestic life, industrial production and agricultural production.

Through water ecological system restoration and ecological bank protection, non-point source pollution can be controlled effectively, water quality of river and lake can be improved and water ecological system can be recovered. Generally speaking, the project will contribute to eliminating causes of water environment pollution, hence protecting the water environment.

4. Garbage Collection and Transportation

Garbage leachate and waste water generated from washing transportation vehicles and collection sites contain organic pollutants and high-concentration NH_3-N. If improper treatment were conducted in the process of garbage collection, storage and transportation, then the leachate and waste water may infiltrate into and pollute the groundwater. To reduce the pollution to water bodies, all transportation vehicles shall be sealed with leachate collection devices. During transportation, the garbage and leachate will not be exposed or left outside the vehicles; the leachate generated by compressors of transportation vehicles will be collected in the collection

tank in the vehicle and transported to and disposed by the leachate treatment system of Yugan County Landfill; wastewater generated in the collection sites or by washing transportation vehicles will be discharged via municipal sewage pipeline network into Yugan Sewage Treatment Plant, without polluting the water environment.

By providing sealed trash bins and through garbage collection and transportation and other measures, urban domestic waste will be categorized and collected properly, which will greatly improve old sanitation facilities, collection and transportation systems and related equipment, thereby reducing such phenomena as spilling of trash bins, spreading of sewage in garbage sites during raining days and the like.

5. Water Environment Monitoring Premises

The domestic sewage volume generated in Water Environment Monitoring Premises is 0.2m^3/d, 51t/a. The domestic sewage, via municipal sewage pipeline network, will be disposed and discharged by the sewage treatment plant after meeting standards.

The project involves both urban public facilities and environmental protection facilities. After implementation of the pipeline network project, direct discharge of urban sewage into rivers will be avoided. The sewage, via the sewage pipeline network, will be disposed and discharged by the sewage treatment plant after meeting standards; domestic garbage will be properly treated. All these will greatly reduce pollutants discharging into water bodies and help improve the water quality of Pipa Lake, thereby improving the ecological environment.

Generally speaking, the project will contribute to eliminating causes of water environment pollution, hence protecting the water environment.

5.2.2.2 Mitigation Measures

1. Sewage Pipeline Network Project

1) Timely clear the pipe network and replace the damaged pipes to avoid evaporating, emitting or leaking of sewage which will pollute the groundwater and nearby water bodies.

2) Pay attention to following points during maintenance and dredging:

①Surely set up warning signs and eliminate barriers from the surface of pool to

ensure the smoothness of traffic before cleaning inspection wells, and evacuate non-operating personnel before lifting the pool cover;

② Never use drilling steel and anus anvil, etc. to pry the cover on inspection wells, in order to avoid sparkle, combustion and explosion;

③Use electric machine to pump and drain sewerage, and check whether electric machine, power supply, line and knife switch have leakage or not to avoid electric shock;

④ Operating personnel should use natural ventilation to remove harmful gases such as CO, CO_2, H_2S, methane before dredging, and use instrument to detect, and conduct well operation after confirming harmless and safe;

⑤The operating personnel who enter the well should wear anti-static clothes. It is not allowed to enter the well with keys and hard metals;

⑥The operating personnel above the well should hold safety belts in hands and keep contact with the operating personnel who enter the well;

⑦After completion of dredging, restore the well cover and execute renovation; in case the works cannot be completed on the very day, operating personnel shall set up warning signs or protective enclosure here.

3) Pay attention to following points during maintenance and management:

① Inspection wells should be cleared periodically, inspected frequently, and repaired in time, in order to ensure the smoothness and soundness of sewage interception pipelines and inspection wells;

②Never pour garbage, pollutants, and impurities into inspection wells, or stack impurities or establish houses above inspection wells, or reconstruct pollution discharging pipeline arbitrarily;

③ Inspection wells should be covered tightly in order to prevent stink and accidents;

④Never use open fire nearby inspection wells;

⑤ Mud residue cleared off from inspection wells should be transported to specialized treatment plant specified by the county environmental health authorities, with relevant records made, in order to avoid cross contamination.

2. Garbage collection and transfer Project

All transportation vehicles are sealed;

Vehicles with compressors should be equipped with leachate collection tank, and the leachate should be transported to and discharged by the leachate treatment station of Yugan County Landfill after meeting standards;

Wastewater generated in the collection sites or by washing transportation vehicles, via municipal sewage pipeline network, will be disposed and discharged by Yugan Sewage Treatment Plant after meeting standards;

3. Water Environment Monitoring Premises

The domestic sewage generated in Water Environment Monitoring Premises, via municipal sewage pipeline network, will be discharged into and disposed by Yugan Sewage Treatment Plant.

5.2.3 Analysis of Impacts on Atmospheric Environment during the Operation Period and Mitigation Measures

5.2.3.1 Impacts on Atmospheric Environment during the Operation Period

In the course of normal operation, the pipeline network is fully enclosed, almost emitting no odor. A small amount of odor will be emitted only when it is needed to open the sewage well covers during pipeline inspection. As such condition is infrequent with a small amount of odor emitted each time, the impact on the surrounding environment is minor. Air pollution during garbage collection and transportation is mainly caused by pilings at garbage collection sites and the small amount of odor emitted during garbage transportation, mainly including ammonia, H_2S and dusts.

1. Garbage Collection Sites

The project involves reconstruction of Municipal Public Utility Administration Bureau garbage collection site and newly construction of one garbage collection site at the southwest side of the lake. Trash bins with good sealing property should be set up at the collection site. And it is not necessary to build garbage transfer station or set compression devices. Deodorant should be placed at the collection site for regular deodorizing. Daily washing should be conducted for trash bins. After taking above

measures, few pollutants with stench will be generated at garbage collection sites, and the impact on the environment will be minor.

2. Garbage Transportation Vehicles

Electric vehicles are not equipped with compressors, thus with less stench generation; compression type vehicles are equipped with a leachate collection tank, and will be washed every day. The garbage will be transported in a daily manner. Therefore, odor pollution caused by vehicles used for garbage collection and transportation will be minor.

In addition, dust pollution will be caused during garbage transportation. All garbage collection and transportation vehicles are fully enclosed with covers, which can eliminate the secondary pollution and solve throwing, emitting, dripping and leaking and other issues. Therefore, impacts caused by dusts and stench generated by garbage loading and transportation can be avoided.

5.2.3.2 Mitigation Measures

1. Wash garbage transfer vehicle and garbage collection sites on a regular basis to reduce odor pollutants.

2. Vehicles and contains capable of minimizing air emission during the process of waste reception, unloading, treatment and storage shall be selected;

3. Garbage collection stations and nearby roads shall be frequently cleaned, and sprinkled with water to control dust when necessary;

4. All of biological waste shall be rapidly cleaned and disposed on a daily basis;

5. Waste transfer vehicles should be sealed to prevent garbage from leaking and spilling;

6. Formulate and optimize the garbage transfer route to prevent the vehicle exhaust gas from affecting such sensitive points as the residential area, school and hospital on both sides of the route.

5.2.4 Analysis of Impacts on Acoustic Environment During the Operation Period and Mitigation Measures

5.2.4.1 Impacts on Acoustic Environment during the Operation Period

Noises during operation mainly come from pump station equipment garbage

trucks.

1. Equipment noise

The noise comes mainly from machinery like water pump and crushing bar screen, etc., mainly manifested as aerodynamic noise and mechanical noise.

Table 5-4 Major Noise Sources and Reduction Measures

Source		Intensity (dB(A))	Number of pump station	Synthetic sound pressure level	Noise Reduction Measure
Sewage pumping station	Submersible pump	60 – 70	2(use one and spare one)	58.8	Select low-noise type and set a rubber shock pad at the bottom and adopt flexible connections; vibration & noise reduction measures and regular maintenance should be conducted
	Crushing bar screen	75 – 85	1		
Diversion pumping station	Pump	60 – 70	2	60.4	
	Crushing bar screen	70 – 85	1		

(1) Prediction of Sound Pressure Level of Simple Sound Source

a) The formula for contribution value of equivalent sound level (L_{eqg}) generated by sound source during construction at the predicted position:

$$L_{eqg} = 10\lg(\frac{1}{T}\sum_{i} t_1 10^{0.1L_{Ai}})$$

In which,

Leqg—The contribution value of equivalent sound level generated by sound source at the predicted position, dB(A);

LAi—Sound level A generated by the sound source i at the predicted site, dB (A);

T—Time period calculated by the predication, s;

ti —Running time of sound source i in time period T, s;

b) The formula for the equivalent sound level (Leq) predicted at the predicted

position:

$$L_{eq} = 10\lg(10^{0.1L_{eqg}} + 10^{0.1L_{eqb}})$$

In which,

Leqg—The contribution value of equivalent sound level generated by sound source at the predicted position, dB(A);

Leqb—Background value at the predicted site, dB(A).

(2) Geometric Divergence Attenuation of Point Sound Source

The fundamental formula for non-directional point sound source is:

$$L_p(\mathrm{r}) = L_p(r_0) - 20\lg(r / r_0)$$

(3) Prediction for Sound Pressure Level of Multiple Sound Sources

The sound pressure level at the predicted position under multiple sources is the decibel sum of noise level of the noise for the receiver.

Formula: $$L_{P_T} = 10L_g\left(\sum_{i=1}^{n} 10^{L_{P_i}/10}\right)$$

In which, L_{P_T} —The total sound pressure level superposed at certain predicted position, dB(A);

L_{P_i} —The sound pressure level contributed by sound source i to certain predicted sites, dB(A).

(4) Forecast content

According to the distribution of the noise sources, prediction and calculation will be conducted on noise around the boundary of pumping stations and sensitive points. Then, compare the contribution values with implemented standards.

(5) Prediction Results and Analysis

Prediction results of equipment noise impacts on pumping station boundary are shown in Table 5-5.

Table 5-5 Pumping Station Noise Prediction After Operation (Unit: dB(A))

Prediction Point and	Contribution	Background	Superimposed	Exceed	Standard

Time		Value	Value	Value	Standards or Not	
Sewage	Day	44.5	56.8	57.05	No	60
pumping station	Night	44.5	49.5	50.69	No	55
Diversion	Day	46.4	53.6	54.36	No	60
pumping station	Night	46.4	46.3	49.36	No	55

According to the superposed results of noise prediction in the above table, during operation, acoustic environment of all pumping stations satisfy Category Ⅱ Standard in *Acoustic Environment Quality Standards* (GB3096-2008), causing little impact on ambient acoustic environment.

2. Noise of Transportation Vehicles

The sound level of garbage transportation vehicles is 80dB(A) -85dB(A). Without any protection facilities, the predicted values are shown below when line sound source is referred.

Table 5-6 Noise Value along Both Sides of Traffic Arteries

Distance (m)	5	10	15	20	25	30	35	40
Sound level (dB(A))	58	55	53	52	51	50.7	50	49

When calculated without any obstacles on both sides of the road and without considering the background noise, the equivalent continuous sound level at places 5m away from both sides of the road is 58dB(A). The equivalent continuous sound level at places 10m away from the road is 55 dB(A), and the daytime traffic noise meet category I standard (60dB(A)); there isn't nighttime transportation in proposed project. Therefore, the impact of traffic noise generated by garbage transferring vehicles on the environment is minor.

5.2.4.2 Mitigation Measures

(1) Make reasonable arrangement and use low- noise equipment.

(2) Set a rubber shock pad at the bottom and adopt flexible connections; vibration & noise reduction measures and regular maintenance should be conducted.

(3) Strengthen the management and maintenance of garbage transfer vehicle to reduce accident rate.

(4) Personnel who transfer garbage should receive professional training and take the job with certificate.

(5) Formulate and optimize the garbage transfer route to prevent the vehicle noise from affecting such sensitive points as the residential area, school and hospital on both sides of the route.

5.2.5 Solid Waste Impact Analysis during the Operation Period and Mitigation Measures

5.2.5.1 Impacts of Solid Waste during Operation Period

1. Domestic Waste

Solid waste during the operation period mainly includes domestic waste generated by personnel in monitoring laboratory. Waste output is 2.5kg/d，0.6t/a, which will be transferred by environmental hygienic personnel, thus having little impact on environment.

(2) Hazardous Waste

Waste acid (HW34), alkali waste (HW35), and waste organic solvents (HW42) generated in the Water Environment Monitoring System laboratory belong to hazardous waste, with the generation volume of 300kg/a. Such wastes will be collected and discharged to certified units for disposal, and will not be discharged arbitrarily.

5.2.5.2 Mitigation Measures

1. Domestic Waste

Collected domestic garbage generated in the project will be transferred to Yugan Garbage Landfill for dumping

2. Hazardous Waste

During operation, the water quality testing laboratory will produce waste acid (HW34), waste alkali (HW35) and waste organic solvents (HW42) which belong to hazardous waste. The produce volume is about 300kg, and prevention and control measures of which are as follows:

(1) Classify and collect hazardous wastes, and put them into impermeable and leak-proof sealed containers, each of which be labeled a clear color mark;

(2) Set up a temporary storage room for anti-seepage and leak-proof hazardous wastes, open-air storage of which is prohibited;

(3) The hazardous wastes should be collected, transported and disposed by certified units, and disposal fee should be paid;

(4) Implement hazardous waste transfer licensing system and transfer duplicate forms system;

(5) Discarding or discharging of hazardous wastes during transporting are prohibited; dumping and stacking at non-storage locations or mixing the hazardous wastes with domestic sewage or garbage are prohibited; collecting, storing, transporting and disposing without operation license or not in accordance with rules of the operation license are prohibited.

5.2.6 Environmental Impact Analysis during the Operation Period and Mitigation Measures

5.2.6.1 Analysis of Ecological Environmental Impacts during Operation Period

1. Impacts on amphibious animals, reptiles and beasts

After completion of the subproject, the original ecological environment would be partially restored and amphibians, reptiles and beasts would gradually return. Negative impact is minor.

2. Impacts on birds

After completion of the subproject, the improvement of water quality and restoration of ecological environment would provide unique and favorable environment for the migration of birds. Meanwhile, sufficient water and ample food in wetland would be ensured. It is predicted that bird population would increase over time after completion of the subproject.

3. Impacts on aquatic ecology

(1)Impacts on aquatic ecology in Pipa Lake

After the operation, the improvement of Pipa Lake water quality is beneficial to aquatic plants in the lake. The improvement of survival space is also conducive to survival. With the improvement of water quality, more and more places that is proper for aquatic animals' feeding and rest will be formed. Therefore, from the long term,

the project is beneficial to the survival of aquatic plants in Pipa Lake.

(2)Impacts on aquatic ecology in Huhui River

The water quality in Huhui River is within the scale of Category V to water worse than Category V. Aquatic creatures in Huhui River are main general aquatic creatures. There are no fish spawning grounds, feeding grounds or wintering grounds in the lakes. There are no precious and rare aquatic creatures in Huhui River, so the lake is not a key natural habitat. The river is greatly influenced by urban residents' life and sand excavation activity of sand dredgers.

The project intends to divert water from Huhui River to Pipa Lake, so as to achieve daily refreshing of Pipa Lake water by diverting from the south and discharging to the north. In wet seasons: from March to June, the project will divert water on the upper reaches and intercept water on the lower reaches through existing sluices to elevate water level in Huhui River, and divert water by gravity to flow to Pipa Lake. After hydraulic analysis, the quantity of necessary water in reality is small. Diversion in wet seasons is just for activating the water body in Pipa Lake. Both inlet channel and outlet channel are interlinked with Huhui River, which has small impacts on water quality in Huhui River. In dry seasons, the biggest degradation of water level of Pipa Lake is 0.70m. The project intends to set up a water pumping station at the inlet channel of Pipa Lake to divert water from Huhui River, so as to meet the designed water level being 16.6m. The total quantity of annual supplementation is 502,200m^3, the largest necessary supplementation per month is 107,400m^3, and the largest daily supplementation is 3,464.5m^3. Since the supplementation of Huhui River is mainly from Xin River, the county diverts water into Huhui River by existing water pumping station in dry seasons. Huhui River is 54km long and 90~120m wide covering an area of 168km^2. This project mainly involves its section from Xinjiang pump station to the small barrage, a drainage area of 50 ha where the water is 5m deep. The greatest daily quantity of makeup water accounts for about 0.14% of the total water amount in Huhui River (from Xinjiang pump station to the small barrage). After the project implementation, diversion from Pipa Lake in dry seasons will not have great impacts on water flow of Huhui River. After the project implementation,

diversion from Pipa Lake in dry seasons will not have great impacts on water flow of Huhui River. The project will neither intercept water flow of Huhui River, nor change hydrological regime of Huhui River. Therefore, there is no great impact on ecology of Huhui River.

4. Impacts on aquatic animals

After completion of the subproject, with the improvement of water quality, there will be more suitable foraging grounds and habitats for aquatic animals. From a long-term perspective, implementation of the subproject would facilitate the existence of aquatic animals.

5. Impact Analysis of Invasion of Foreign Species

The impacts of subproject implementation on biological invasive species include two conditions: the first, whether the subproject implementation may create conditions for biological invasion and cause new biological invasion; the second, whether the subproject implementation can cause further transmission and diffusion of existing alien invasive species. The above two problems are to be analyzed by combining subproject features, and from aspects such as transmission means of alien invasive species, factors affecting invasion of alien species, biological features of existing invasive species in the subproject areas and transmission mechanism, etc.

①Whether the subproject implementation causes new biological invasion

Standards for defining the invasive species: introduced to one non-source area through conscious or unconscious human activities; form the natural regeneration capacity in local natural or constructed ecosystem; caused obvious damage or impacts to local ecosystem or geographical structure. Alien species successfully invade mainly through two means: the first is the species introduced for the purposes of farming, forestry, husbandry and fishing production, ecological environment construction and ecological protection, etc, then developing into invasive species (conscious introduction); the second is the species introduced with trades, transportation, tourist and other activities (unconscious introduction).

The subproject is mainly constructed in urban waters; the subproject doesn’t involve the international trade, so no unconscious introduction because of the international

trade will be made; furthermore, the subproject has a small scale and won't cause large change of ecological environment and land utilization way, so no conscious introduction will be made. The subproject implementation won't cause new biological invasive species based on above analysis.

② Whether the subproject implementation causes further transmission and diffusion of existing alien species

Pursuant to *List of Invasive Species in China* (The first batch, the second batch and the third batch), and combine with the on-site survey, no foreign species is found in Pipa Lake and along the bank of Huhui River water system. Therefore, the possibility that the subproject implementation causes further transmission and diffusion of existing alien invasive species doesn't exist.

5.2.6.2 Mitigation Measures

1. Aquatic plants and terrestrial plants are designed as the major part. Taking biodiversity into account, adjust measures to local conditions, try to adopt local species and prohibit introducing foreign species.

2. After completion of construction, quantity and composition of organism species in the subproject areas shall be surveyed and monitored on a regular basis. Upon finding out evident increases in the quantity of a species, identification shall be conducted in a timely manner to judge whether it is a foreign species. If this species has potential invasion risks or has invaded, clearing, curbing or control measures shall be taken as soon as possible to reduce its negative impacts.

3. Strengthen management. Project owner should send special personnel to do the greening and managing work, formulate relevant rules and regulations to protect Zoujiazui wetland and its ecological environment.

5.2.7 Social and Environmental Impact Analysis during the Operation Period and Mitigation Measures

5.2.7.1 Social and Environmental Impact Analysis during the Operation Period

When the urban drainage pipe network reconstruction is completed and put into operation, it will effectively solve the current situation that the regional sewage are directly discharged into nearby water bodies without being collected and discharged

into the sewage pipes. After the reconstruction of garbage transfer system, garbage collection capacity shall be improved and collection amount greatly boosted. This can effectively solve such problems as garbage collection and deal with the situation of garbage surrounding cities and towns, granting Yugan County and its people with picturesque landscape and a good living environment. The proposed project, with significant social and environmental benefits, is a livelihood project conducive to the public.

At the same time, attention should be paid to the sanitation and deterioration of health conditions in garbage transfer stations. The increase of mosquitoes, flies, worms and mice is a common issue complained by nearby residents of garbage transfer stations. In particular, flies abound in summer as there are more waste fruits and vegetables. Spraying insecticide may significantly reduce flies in a short time, but the effect cannot last long. To prevent stations from becoming breeding places for mosquitoes and germs, the collection stations should be kept clean, the collection containers should be cleaned regularly, and insecticide should regularly be sprayed inside and outside the transfer stations to eliminate mosquitoes and other insects.

5.2.7.2 Mitigation Measures

1. Garbage collection stations shall make safe operation procedures for operation and maintenance, and operate according to the operation procedures;

2. The collection stations should be kept clean and the collection containers should be cleaned regularly; biological fungi will be sprayed to eliminate bacteria, mosquitoes and flies; light and liquid disinfection and sterilization system method will be adopted; regular cleaning, washing, disinfection and sterilization should be conducted for mechanical equipment and facilities to ensure that the surface is clean, without any dirt or leachate. Insecticide should regularly be sprayed inside and outside the transfer stations to eliminate mosquitoes and insects.

3. Administrative staff and operators of garbage collection stations shall receive the pre-job training to grasp technical process and technical requirements of Garbage Collection Stations as well as major technical indicators and operation and management requirements of relevant facilities and equipment;

4. Garbage Collection Stations shall be opened in strict accordance with the schedule time;

5. Operators shall randomly inspect waste content, and any hazardous waste and forbidden object are prohibited from entering the stations;

6. Collected materials and organic waste is classified for the purpose of easy collection and compost;

7. Messes are strictly prohibited from being piled up in garbage collection stations;

5.2.8 Occupational Health and Safety Impacts and Mitigation Measures during the Operation Period

5.2.8.1 Analysis of Occupational Health and Safety Impacts during the Operation Period

Stockpiling at garbage collection sites and transportation of domestic waste will produce gases with stench, mainly including ammonia, H_2S and other malodorous pollutants. The collection sites are small in scale, thus after taking appropriate measures, the emission concentration of ammonia and H_2S meets category II standard in *Emission Standards for Odor Pollutants* (GB14554-93), and dust concentration meets standard in *Comprehensive Atmospheric Pollutant Emission Standards* (GB16297-1996) (monitored concentration limits for fugitive discharge). But since the collection station staff need to work in an environment containing ammonia and H_2S, occupational health and protective measures should be adopted to fight against harmful gases.

5.2.8.2 Mitigation Measures

1. Garbage collection stations shall make safe operation procedures for operation and maintenance, operate according to the operation procedures and establish sound emergency rescue plan;

2. Administrative staff and operators of garbage collection stations shall receive the pre-job training to grasp technical process and technical requirements of Garbage Collection Stations as well as major technical indicators and operation and management requirements of relevant facilities and equipment;

3. Such measures should be conducted as good pre-service and periodic occupational health training, especially that on emergency rescue;

4. Pursuant to relevant state regulations, occupational health check should be provided to prior to, on and post-service workers working on or contacting with jobs with occupational hazards. Truthfully inform the workers of the test results and workers who have not received pre-service occupational health examinations cannot be designated to posts with or requiring contact with occupational hazards. Workers with occupational contraindications cannot be designated to the contraindicated posts;

5. The collection stations should be kept clean and the collection containers should be cleaned regularly; biological fungi will be sprayed to eliminate bacteria, mosquitoes and flies; light and liquid disinfection and sterilization system method will be adopted; regular cleaning, washing, disinfection and sterilization should be conducted for mechanical equipment and facilities to ensure that the surface is clean, without any dirt or leachate. Insecticide should regularly be sprayed inside and outside the transfer stations to eliminate mosquitoes and insects;

6. Operators shall randomly inspect waste content, and any hazardous waste and forbidden object are prohibited from entering the stations;

5.3 Due Diligence

5.3.1 Yugan Sewage Treatment Plant

Sewage collected by the project's pipeline network will be transported to Yugan Sewage Treatment Plant, whose due diligence is as follows.

1. Location

Located in Yujia, Xiaomaoxi, Yuting Town of Yugan County, Yugan Sewage Treatment Plant stands beyond the north side of Changwan Road, and adjoins Huhui River.

2. Service Area

It serves the urban area of Yugan County, with an area of 20km^2.

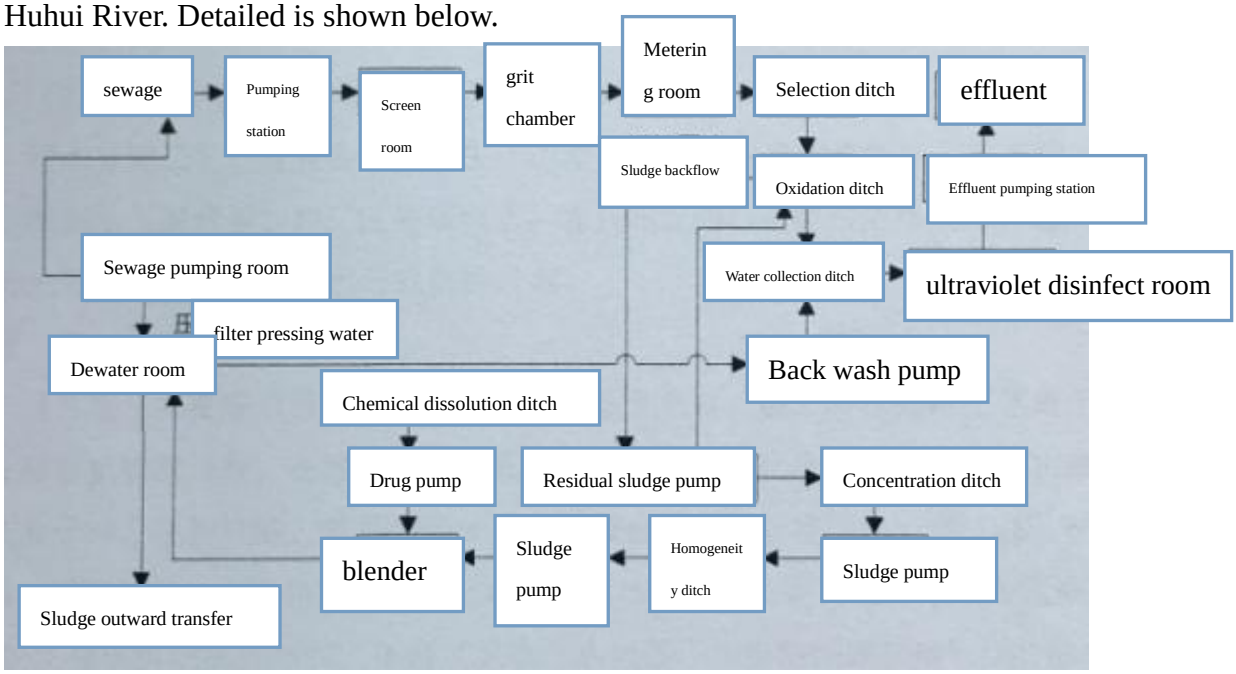
3. Design Scale and Operation Conditions

The plant's total scale is designed to be 40,000t/d, and its EIA (40,000t/d) has

already been approved (Jiangxi Provincial Department of Environmental Protection [2008] No.255). Phase I construction (20,000t/d) started in 2008 and was completed in 2009, and has passed the environmental acceptance (Jiangxi EIA [2015] No.17). See relevant documents in Annex II and III. The sewage treatment plant has now been put into operation and maintains good condition, with current actual amount of influent of 15,000m^3/d. The effluent quality meets category Category Ⅰ B standard in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (18918-2002). The treatment scale is estimated to reach 40,000m^3/d by 2020. Annual amount of sludge produced is 1100t/a and the moisture content of sludge is 78%. It meets the standard of dewatered moisture content of sludge lower than 80%, which is stipulated in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (GB18918-2002).The water will be collected in closed truck and sent to the place designated by County Sanitation Office for afforestation.

4. Sewage Treatment Technique

Sewage treatment uses improved oxidation ditch treatment technique, rotating disc aerator is applied in aeration and ultraviolet is adopted for disinfection of effluent. After reaching the required standard, the effluent will be discharged into Huhui River. Detailed is shown below.



Map 5-3 Technical Process of Wastewater Treatment Plant

5. Matching Analysis of Water Volume for Sewage Treatment

Yugan subproject intends to install trunk sewage interception pipeline along the shores of Pipa Lake, connecting the current outlets which discharge the sewage directly into the lake with the municipal pipeline network. The year 2023 will see the completion of the pipeline network project with a collection volume of 1,600m^3/d. In 2030, that figure will reach 1,900m^3/d. The current treatment scale of Yugan County Sewage Plant is 20,000m^3/d, which will reach 40,000m^3/d in 2020 as is planned. The current actual amount of influent is 15,000m^3/d, which meets the treatment demand even after the implementation of this project.

6. Impacts of Influent Quality on the Sewage Treatment Plant

Domestic sewage of Pipa Lake Basin will be collected by Yugan sewage pipeline network, and no wastewater from industrial zone will be involved. Therefore, the influent quality meets requirements of Yugan County Sewage Treatment Plant and impact of this project's sewage on the influent quality of Sewage Treatment Plant is minor.

7. Effluent Quality

Yugan County Sewage Treatment Plant adopts improved oxidation ditch treatment technique with biological nutrient removal function. The technique is currently functioning well, and the effluent quality meets category I B standard in *Pollutant Discharge Standards for Urban Wastewater Treatment Plants* (GB18918-2002). See the plant's influent and effluent quality in the table below.

Table 5-7 Inflow Water Quality and Effluent Water Quality of Yugan Sewage Treatment Plant (mg/L)

Item	BOD_5	COD	SS	NH_3-N	TN	TP
Inflow water quality	27.36	69.00	49.49	14.62	18.05	1.21
Effluent water quality	6.04	22.86	16.01	5.55	8.52	0.45
GB18918—2002 Category IB	20	60	20	8(15)	20	1

Note: values outside the bracket are control index when the temperature is higher than 12 ℃, while values inside the bracket are control index when the temperature is not higher than 12 ℃.

In summary, based on due diligence of Jishui County Sewage Treatment Plant, the treatment capacity and techniques of the Plant meet the needs of this project. The Plant's operation is now in good condition, thus sewage collected by the pipe network in proposed project will be effectively treated.

5.3.2 Yugan Domestic Waste Landfill

The wastes of Yugan County are proposed to be collected and transferred to the domestic waste landfill. The due diligence for the landfill includes the follows.

1. Location

Located in Tangwu, Huangjinbu Town, Yugan County, the landfill is about 30km apart from the county and 3,200m away from G206.

2. Construction Condition

Constructed in 2013 and completed in 2014, the landfill has obtained the approval for EA (Rao Huan Du [2014] No.51) (see Annex IV), and it is estimated the acceptance will be conducted in the latter half of 2016. The total storage of the project is 0.95 million m^3. During the service term, the average treatment scale shall be 237t/d, the actual treatment scale 163t/d, and the total waste to be treated 0.856 million tons.

3. Service Scope of the Landfill

The domestic wastes in the urban area of Yugan County

4. Treatment Technique

The treatment techniques adopted in the landfill include pavement in layers, back-and-forth compaction, unit operation and covering day by day. After being measured by the load meter, passing through the operation platform and the temporary passage, domestic waste from the county enters the operation unit of the landfill reservoir area for unloading. And then the pavement, compaction and covering will be conducted by the landfill operation machine. See the following figure for the treatment technique flow of the landfill.

The leachate treatment station adopts the technique of the pretreatment of the

regulating reservoir + MBR (membrane biological reactor) + RO (reverse osmosis).

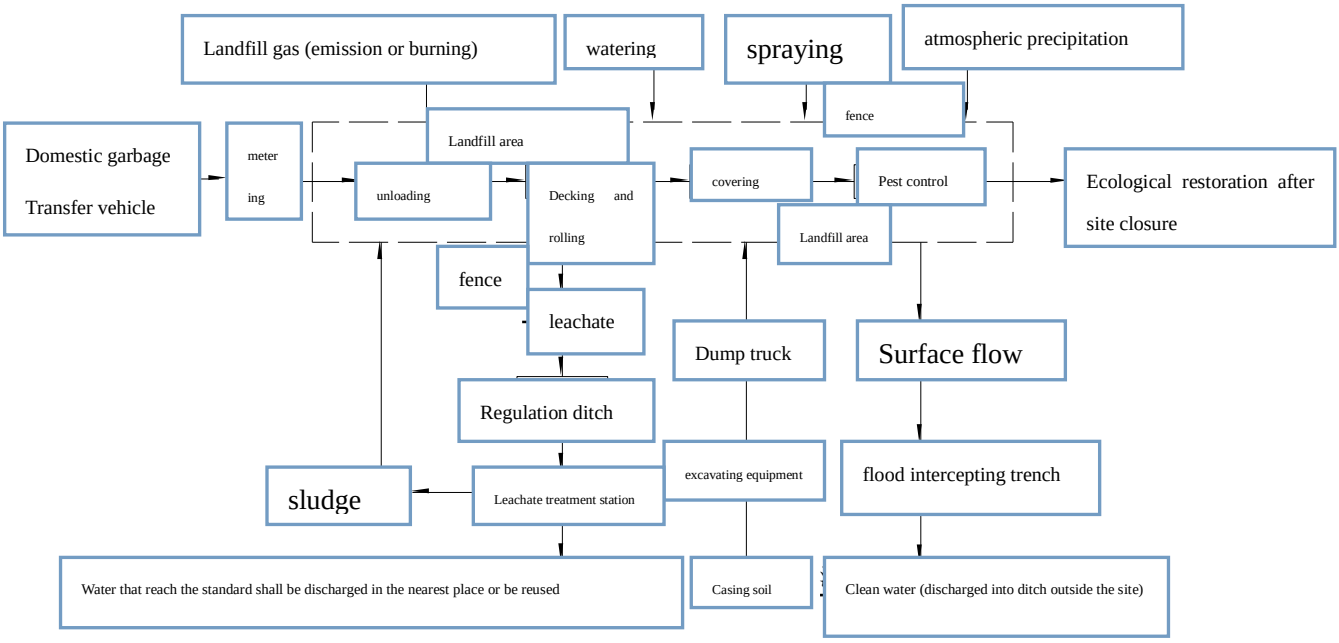


Figure 5-4 Treatment Technique Flow Diagram

5. Equipment Capacity

The present equipment configuration can cover the daily earth covering operation. See the following table for the equipment condition.

Table 5-8 Main Equipment of Yugan Domestic Garbage Landfill

Serial No.	Name	Specification	Quantity
1	crawler dozer	165HP	2 units
2	excavator	0.8m^3	1
3	dump truck	4.5t	2
5	tower loader	1.0m^3	1
6	Potion spraying truck	5t	1

6. Matching of Waste and Leachate Volume for Treatment

Yugan County sub-project mainly manages the uncontrolled emission of the domestic waste alongside Pipa Lake. After the completion of the project, the short-term volume of the transshipment is 73.3t/d. The service scope of Yugan County Landfill is the county area, now covering Pipa Lake area. At present the treatment

scale is 164t/d, the service term is 10.5 years, the designed scale during the service term is 237t/d and the total waste to be treated is 0.0856 million tons. The construction of the project does not add heavy load to the landfill, so the waste generated in the project can be treated in the landfill.

The leachate generated in compression type truck should be discharged into the leachate treatment station of the landfill for treatment. The present completed scale of the leachate treatment station is 100m^3/d, the present actual water intake is 70m^3/d and the leachate generated in the project is 0.73t/d. Therefore, the treatment station is capable of treating the leachate of the project.

In summary, according to the due diligence investigation to Yugan Domestic waste landfill, its treatment capacity, crafts, and treatment volume meets the requirements of project. When runs well, it will effectively solve the problem of garbage collection and transfer of Yugan subproject.

6 Environmental Risk Analysis and Mitigation Measures

6.1 Identification of Environmental Risks

According to pollution impact analysis, the results of main environmental risks identification are:

1. Pipeline Network sub-project

(1). As the pipe network is buried underground, during the sewage transporting, if anti-seepage measures of pipe joints were poor or sewage pipeline were ruptured, then leakage may occur;

(2). Health and safety of workers when conducting pipeline maintenance or repair works.

2. Garbage collection and transfer sub-project

Leachate and washing wastewater may leak in the process of collection and transportation or may leak when the vehicle is turned over in the process of transportation.

6.2 Impact Analysis of Environmental Risks Accidents

6.2.1 Pipeline Network Construction

1. Pipeline Leakage

The sewage which infiltrate into the underground will not only pollute surrounding soil and sanitation, but also have negative impacts on groundwater quality. According to the operation condition, the existing rainwater and sewage pipes are not likely to be broken, unless caused by long-time disrepair, aging, brutal construction or vandalism.

2. Health and Safety of Maintenance Workers

Such problems as pipeline blockage and accidents occurred in any structure should be resolved immediately. In these cases, workers need to enter sewage pipes, collection wells or sewage tanks, which tend to produce and accumulate toxic gas of high concentration like H_2S, methane and CO_2, etc. During repair, if protective measures were not conducted well, the workers may, due to poor ventilation, inhale

toxic gas and feel dizzy and hard to breathe, and even worse, death may occur; or explosion and other accidents may occur when methane meets any flame, thus threatening workers' safety.

6.2.2 Garbage Collection and Transportation Sub-project

If leachate and washing wastewater leaks in the process of collection and transportation and are not dealt with in time, underground water environment will be polluted. Odor generated in leachate and washing wastewater will have negative impacts on ambient air and social sanitary environment.

6.3 Risk Accidents Mitigation Measures

6.3.1 Pipeline Network Construction

1. Pipeline Leakage Prevention Measures

(1). Pipeline design should, according to the specific circumstances and characteristics of the city, select appropriate pipes and ensure the quality and duration of the pipes. Foundation of drainage pipes must meet the requirements of the mechanical design, otherwise appropriate treatment must be conducted. Foundation construction should be strictly in accordance with the required width, thickness and strength in the design drawings, and quality must be ensured.

(2). Before installing pipes, appropriate checks should be finished. On the one hand, carefully examine all pipes to avoid installing those with cracks or tiny holes into ditches; on the other hand, carefully check whether the centerline and edges of the pipe foundation and size and strength of the well foundation meet the requirements in the drawings; last, check whether the location of wells, well spacing, strength grade of concrete and juncture anti-leakage mortar reach the national standards.

(3). During pipe installation, cement mortar needed for junction plaster band should be produced in accordance with required mixture ratio. Protrusion will often be caused by extrusion at the joint of two pipes pipes. Timely treatment should be conducted for the protrusions in order to ensure smooth drainage. Otherwise, it will not reduce the water flow cross-section thus influence water flow speed, and even

cause wastes accumulation and blockage of pipelines.

(4). Ditch backfilling must be conducted after pipe socket concrete and junction plaster band mortar reach a certain strength, and cannot impulse the pipes directly with sands and gravels. In the sands and gravels, there should not be chunks of broken stones and bricks and other hard objects. On both sides of the pipe, compaction should be ensured after backfilling. Above the pipe top, backfilling should be conducted layer by layer and compaction should be ensured to make the filling bear the pressure as a whole. Thus the vault filling helps to disperse pressure and protect the pipes.

(5). During operation, the project owner should establish a fine system for pipeline supervision and management to timely clear the pipe network and replace damaged pipes to avoid evaporating, emitting or leaking of sewage which will pollute the groundwater and nearby water bodies.

2. Measures for Protecting Health and Safety of Maintenance Workers

Safeguard measures taken to protect personal safety of the operating personnel are essential to prevent harms from toxic gas. Ventilation measures which eliminate toxic gases and fill the working space with fresh air are the most effective ways to avoid poisoning. If adequate ventilation is not available, then entering into dangerous space should be avoided, otherwise the workers must wear protective equipment before necessary entering. Protective equipment include gas masks, air masks and so on. Detection instruments include gas detector and paper test.

6.3.2 Garbage Collection and Transfer Sub-project

1. Risk Prevention and Control Measures for Wastewater Leakage

(1). The sealable plastic drum must, with a good salability, have the physical strength reaching certain requirements;

(2) In order to ensure normal operation of the vehicles, the waste transportation vehicles should be under repair and maintenance regularly;

(3) Once leakage occurs in waste transportation vehicles, block off the leakage and suspend the warning mark immediately;

(4) All drivers must have the certificate and drive within limited speed. Fatigue driving is forbidden.

2. Personal Safety Precautions for Working Staff

(1) Prior to the transferring and disposal of the waste, operators and management personnel must obtain safety education. Safety operation specifications and management system should be formulated and with strict execution and frequent inspection.

(2) The mouth shads, gloves and other protective articles should be supplied in the landfill.

(3) The staff directly contacting the leachate and domestic waste should take physical examination and be injected with relevant vaccines (e.g. hepatitis A and hepatitis B).

6.3.3 Emergency Response Agency and Plan

For this project, emergency response to unexpected environmental risk accidents is related to multiple units and departments, including the Department of Environmental Protection, the Department of Public Security, health administrations, fire departments and other authorities. Emergency plans should immediately be launched pursuant to *Jiangxi Provincial Contingency Plans for Environmental Emergencies* if any risk accident occurred.

The project's emergency response agency consists mainly of PLG office and other emergency response teams. Emergency response teams include rescue team, liaison team, logistics team and vehicle team. Responsibilities of each team are shown below, and responsible agencies are shown in Figure 6-1.

(1) PLG organizes to formulate and ensure the implementation of emergency response plan according to the environmental risk conditions, takes charges for overall on-site command, and coordinates with external units.

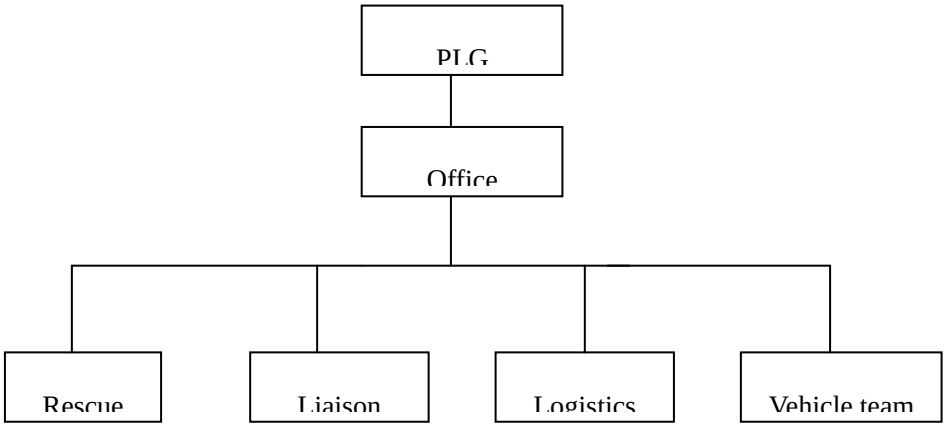
(2) PLG office is responsible for assisting the PLG on work distribution, supervision and inspection.

(3) Rescue team, under unified command of the PLG, is responsible for handling risk accidents and repairing relevant equipment, etc.

(4) Liaison team is responsible for coordinating work of rescue team, logistics team and vehicle team.

(5) Logistics team is responsible for assisting rescuing personnel in poisoning, providing them with appropriate first aids and care and getting them admission to hospital for observation and treatment. Besides, the team is responsible for conveying rescue related items.

(6) Vehicle team is responsible for deployment and use of vehicles, transporting poisoned persons to hospitals, and conveying rescue items, etc.



Map 6-1 Emergency Response Agencies

7 Industrial Policy Analysis

7.1 Industrial Policy Compliance Analysis

This project includes pipeline engineering architecture (E4852), water pollution control (N7721), environmental sanitary administration (N7820), which respectively belong to encouraged projects Category Ⅱ(Ⅱ. water conservancy: 7. dredging project for rivers, lakes and reservoirs, aquatic ecological system and underground water protection and restoration project), Category XXⅡ (XXⅡ. urban infrastructure: 9. urban water supply and drainage project, water supply source and water purification plant project), and Category XXXⅧ(XXXⅧ environmental protection and resources conservation: 20. comprehensive utilization, reduction, recycling, safety disposal treatment of urban waste and other solid waste) of *Catalogue for Guiding Industry Restructuring* (2011 Version) (Revised in 2013), and is in line with relevant national industrial policies.

7.2 Urban Planning Compliance Analysis

This project will reform the pipeline network around Pipa Lake of Yugan County, improve aquatic ecological environment and carry out domestic waste collection and transfer. Project construction is in accordance with *Overall Plan for Yugan County (2010-2030)* and *Special Plan for Yugan Urban Drainage Project (2010-2020)*.

8 Public Consultation and Information Disclosure

8.1 Objectives and Methods

The construction and operation of World Bank-financed Fengxin County Water Environment Management Project will have impacts on ambient environment, which is directly related to vital interests of the people close to the project site. Pursuant to the requirements in *Interim Procedures of Public Participation in Environmental Impact Assessment* (Huan Fa [2006 No. 28]), *Notice by Jiangxi Provincial Department of Environmental Protection on Further Strengthen Public Participation, Supervision and Management of EIA on Proposed Project* (Jiangxi EIA [2014] No. 145) and the Bank's OP4.01, two rounds of public consultation and information disclosure were carried out. The first round was carried out before the formulation of EIA outline, mainly for informing affected residents of a brief introduction to the project and its potential impacts on the environment, and asked for public opinion. The second round was conducted when the draft EIA report is finished, mainly for full report disclosure and public consultation on main content and conclusions of the report, in order to obtain public's understanding of and support for the construction and related mitigation measures.

Public consultation and information disclosure are a type of two-way information sharing between the project implementing agency and the public, an important component of EIA and play a critical role in improving decision-making. The purposes of public consultation and information disclosure are to: disclose relevant project information to the project areas and the public who are concerned about the project, keeping the public informed of the project's main content, its implementation and operation features and significant environmental issues or problems related to the project; help assessment staff identify issues or problems, confirm that all significant environmental issues or problems triggered by the project have been analyzed and assessed in the EIA; confirm the feasibility of environmental protection measures and implementation of optimal measures. Public consultations highlight the importance of

linkages and communications between all project-related parties with the public. It can directly reflect views of the public and enable decision-makers to timely identify potential issues or problems and timely revise and improve design so that concerns of the public can be adequately addressed, thereby contributing to further improvements and stronger rationality of the project's planning, design, environmental monitoring and management, as well as the most optimal coordination between the project's environmental, social and economic benefits.

8.2 Public Consultation

Two rounds of public consultation were carried out for the project, major forms of which contain on-site visit, questionnaire survey and discussion meeting. See relevant documents in Annex V.

8.2.1 First Round of Public Consultation

8.2.1.1 First Round of Public Consultation

See conditions of the first round of public consultation in the table below.

Table 8-1 Dates, Participants and Approaches of First Round of Public Consultation

Period	Approach	Date /Duration	Location	Participants	Contents
The first time	①on-site visit; ②questionnaire survey ③discussion meeting	December, 2015 and January, 2016	Yugan County	①On-site visit and participants of questionnaire survey: residents of Guankou village, Pipa Community and other sensitive points, and representatives from Yugan County Government, County Department of Transportation, County Department of Environmental Protection, County Sewage Treatment Plant and other units; ②Discussion meeting:	Inform affected residents of a brief introduction to the Project and its potential impacts on the environment, and ask for public views and suggestions.

Period	Approach	Date /Duration	Location	Participants	Contents
				Representatives from affected areas and units	

8.2.1.1 Feedback of Public Views

Public views in the first round of public consultation and feedback thereafter are shown in the table below.

Table 8-2 Public Views and Feedback Summary

Period	Approach	Public Concerns or Views	Feedback of Implementing Agency
1	①On-site visit ②Questionnaire survey ③Discussion meeting	(1) All expressed support to the project; (2) At present, water quality of Pipa Lake is poor. Domestic sewage is directly discharged into lake, causing a lot of garbage in lake. Construction is expected to start early and complete as soon as possible.	Response of the project owner and EIA institutes: thanks for public's understanding and support. The project will be further improved in its design and preparation work, trying to start early and complete as soon as possible.

8.2.2 Second Round of Public Consultation

8.2.1.1 Second Round of Public Consultation

See conditions of the second round of public consultation in the table below.

Table 8-3 Dates, Participants and Approaches of Second Round of Public Consultation

Period	Approach	Date/ Duration	Location	Participants	Contents
2	①on-site visit; ②distributing questionnaire;	May 2016	Yugan county	Representatives from Guankou Village Committee, Pipa Community Committee, County Urban Management	Conduct public consultation on main content and conclusions of the

Period	Approach	Date/ Duration	Location	Participants	Contents
				Authority, County Water Bureau, County Department of Transportation, County Department of Environmental Protection, County Sewage Treatment Plant and other units;	report, in order to obtain public's understanding of and support for the construction and related mitigation measures.

8.2.1.2 Feedback of Public Views

Public views in the second round of public consultation and feedback thereof are shown in the table below.

Table 8-4 Public Views and Feedback

Period	Approach	Public Concerns or Views	Feedback of Implementing Agency
2	①On-site visit; ②Distributing Questionnaire;	The public supported the project construction and accepted the proposed environmental protection measures.	Response of the construction unit and EIA institutes: appreciated understanding and support of the public and would strictly implement all environmental protection measures in the EMP.

8.3 Information Disclosure

8.3.1 First Round of Information Disclosure

See dates, locations and methods of the first round of information disclosure in the table below.

Table 8-5 Dates, Locations and Methods of Information Disclosure

Period	Method	Date/Duration	Location	Contents
1	On-site notice	January, 2016	Bulletin board of	Mainly about content of the project

Period	Method	Date/Duration	Location	Contents
			Yugan government	and its potential environmental impacts

8.3.2 Second Round of Information Disclosure

See dates, locations and methods of the second round of information disclosure in the table below.

Table 8-6 Dates, Locations and Methods of Information Disclosure

Period	Method	Date/Duration	Location	Contents
2	On-site notice	April, 2016	Guankou Village, bulletin board of Pipa Community	(1) Project overview; (2) environmental protection measures to be taken; (3) conclusions of the EIA draft; (4) location and method for accessing the full report
	Full report disclosure	April, 2016	Library of Yugan county	The full EIA report (draft)

Picture 8-1 Pictures of the First and Second On-site Notice

Picture 8-2 Full Report Disclosure

9 Resettlement and Social Assessment

The content below is a part of "Resettlement Plan for the World-Bank-Financed Jiangxi Poyang Lake Basin Water Environment Management Project" and "Social Assessment Report for World-Bank-Financed Jiangxi Poyang Lake Basin Water Environment Management Project" made by Hohai University.

9.1 Resettlement Plan

9.1.1 Impacts of Land Occupation

Six towns and townships in Poyang County, Shangrao City, are involved in land acquisition. This project involves permanent land acquisition and temporary land occupancy while no house demolition or minority communities are involved within the land to be acquired. The project impacts are illustrated in Table 9-1.

Table 9-1 Summary of the Project Impacts on Migrants

County Yugan	Project Name	Township and To	Village (in number)	Acquired Collective Land (hectare)	Acquired State-owned	Temporary Land Occupation (hectare)	Directly Affected Population	Indirectly Affected Farmer and Shop

		wn (in number)		Total	Paddy Field/Arid Land Included	Land (hectare)	Collective Land	State-owned Land	Household (by household)	People(by number of person)	Number (by household)	People(by number of person)
						3						
	Pollution Interception Pipeline project along Pipa Lake	1	1					49.55			100	375
	Garbage Collection and Transfer Project	1				4.5						
	Water Environment Monitoring System					3						

9.1.2 Measures to Reduce Impacts

In the planning and design stage, in order to reduce the impact of project construction on the local socio-economic and people's life, the design agency and owner of the Project had adopted several effective measures:

(1) In the planning stage, when optimized selection for schemes was conducted, much consideration was put into the impact of project construction on the local socioeconomic , which was set as a key factor in the optimized selection for schemes;

(2) Design was optimized. To reduce the demolition immigrants, existing national and local roads were used to connect planned construction area.

(3) The design was optimized to occupy wasteland and state-owned land and reduce the occupancy of arable land.

In the Resettlement and the implementation stage, when the land acquisition and resettlement are unavoidable, in order to reduce the impact of construction projects, the following measures will be taken:

(1) The collection of basic material shall be strengthened and thorough analysis shall be conducted concerning the current situation of local socioeconomic and future development. Practical resettlement action plan shall be established according to local situation. The people affected by the project shall be prevented from suffering loss for project construction.

(2) The public participation shall be actively encouraged and information disclosure shall be strengthened and surveillance by the masses shall be accepted.

(3) Internal and external monitoring shall be reinforced and effective and unblocked feedback mechanism and channels shall be established. The information processing cycle shall be minimized to ensure the various problems in project implementing process be settled in time.

(4) Project sites are arranged in a scientific way by occupying as less land as possible. When construction is completed, temporarily occupied area will be recovered as provided by its original land use type.

(5) Temporary storage area of earthwork is properly arranged so that it is far from environmentally sensitive points such as residential quarters, schools and the like.

9.2 Social Assessment

9.2.1 Social Assessment

Social assessment of this project consists of items below:

(1) Generally, the project is of high economic and social benefit, consistent with medium or long-term development plan for representative counties of each sub-project. Meanwhile, it will have positive impacts on improving regional environment and boosting regional economic and social development.

(2) Most farmers/residents of representative counties will benefit directly from the project, since the project has extensive covering rate and inclusive beneficiaries.

(3) Disadvantaged groups will be direct beneficiaries of the project. Generally, the project has little adverse impact on their livelihood, but create some jobs for them to live a better life.

(4) Because the project is in line with the region's customs, culture and religion, there is no relevant risks.

(5) Project management system of high enforcement capability provides institutional guarantee for the project's smooth operation and implementation.

The project will alleviate pollution in Poyang Lake Basin and improve living, ecological and social environment for residents in the project area. Purposes of the project are in line with China's plan of utilizing foreign investment and pollution control. Local governments of various levels and beneficiary groups are all supportive to the project.

Sewage treatment and ecological restoration projects have been spreading in China's provinces for years. The technology is relatively mature. Moreover, the project areas have conducted similar pollution control projects and formed full-time technological teams, boasting a good working foundation. And staffs of project offices of all levels are experienced in project management. All of these are favorable for successfully completing the project .

Implementation of the project will bring favorable social benefits, including: improving people's living environment and their livelihood; creating more jobs for vulnerable groups and farmers; decreasing incidence of disease and improving people's health conditions, promoting rural urbanization and transforming farmers into urban residents, and facilitating industrial restructuring and green economic

development.

Any project may encounter risks in the implementation. This project will face risks in the construction, difficult land acquisition and subsequent maintenance. Therefor, the project has to pay attention to the development of beneficiary groups and also attend to social equity. Undoubtedly, a more integral project design and high-quality project management will reduce potential social risks and prevent negative social impacts in the area.

9.2.2 Suggestions

Due to differences and complexity of project contents in various cities or towns and distinct economic and social development, we have to face potential risks brought by project construction. Those risks can be avoided through two methods. Firstly, optimize engineering design on the basis of no extra quantity. Secondly, owners should consult with stakeholders before, during and after the project construction to know their needs and desires, and communicate with different departments. To this end, the social assessment group proposes the following suggestions:

1. General Advice

(1) Optimize the design

Project owners and feasibility study agencies should minimize the scale of land acquisition and demolition in design, and adopt advanced measures of environmental protection to avoid secondary pollution brought by environmental projects;

(2) Conduct participatory activities

Major stakeholders should be involved in the design, implementation, management and supervision of the project. Project owners, the PMO/PPMO and social assessment group formulate outline for beneficiary participation and initiate monitoring and evaluation to ensure that major stakeholders join in the whole process of the project, including the preparation, design, implementation, monitoring and supervision, and equip them with the awareness of environmental protection;

(3) Carry out training on environmental knowledge and public health education

Relevant government departments should organize public training on national and regional laws and regulations on environmental protection as well as environment indicators under the assistance of the publicity department, Bureau of Education, Environmental Protection Bureau, Bureau of Radio and Television, newspaper offices,

and sub-district/town/township/village level residents' committees; launch training on water conservation, treatment of sewage and waste, control of point pollution, prevention of water-mediated diseases and recycle of waste; and publicize life-styles that may affect surrounding environment and help residents in the project area to realize that their way of living may have impacts on surrounding environment;

(4) Formulate a reasonable resettlement action plan

On the basis of public consultation, the PMO/PPMO, resettlement plan group and project owners should ensure that migrants' livelihood will not deteriorate due to the project construction;

(5) Create jobs opportunities

The PMO/PPMO, project owners, construction agency with the assistance of the Bureau of Civil Affairs and the Social Security Bureau will provide jobs opportunities for migrants, poverty-stricken families and women in cities and rural areas to involve them in the project construction;

(6) Formulate and implement preferential charging policy for impoverished groups

The PMO/PPMO, project owners and the Price Bureau should establish local charging policy for impoverished groups on the basis of public hearing;

(7) Safety and convenience maintenance during the construction

The project owners and construction agencies should schedule the construction progress by taking residents' need and habits into consideration;

(8) Institutional capacity building

The project managers and constructors should launch training on World Bank social and safeguard policies to better implement the project;

(9) Mechanism of follow-up project management

Residents should be involved in the follow-up management. It is proposed to establish a community team of follow-up project management based on the management group during the construction. Members of follow-up management team (women included) will be elected by villagers. Environmental institutions should strengthen the legislation and law enforcement on environmental protection and enhance environmental education for residents in the project area for sustainability of the project effects.

2. Suggestions on sub-projects

(1) Sewage pipelines

① Pipeline network construction will affect residents rest, shop business and industry operation on the two sides of roads. Therefore, pipe laying should shorten construction duration as much as possible to reduce unfavorable impacts. If possible, offer certain compensation to affected residents and shop owners; ② Try to connect sewage of households within the construction and residential area from the source; ③ Since the project area enjoys developed water system and abundant water, drainage project should be in line with local conditions to ensure construction quality and life time.

(2) Garbage Treatment Project

① It is proposed that residents' inclination of "NIMBY" should be taken into consideration. The sites of waste collection, transfer, and treatment facilities shall not be either too near or too far from residential areas to avoid high cost of waste transportation. The core principle is to conduct more consultation and communication with residents to ensure their recognition of waste treatment project. ②Due to adopted tax distribution system, financial budget of village and town (township) is very tight. Thus, the project funds should prefer the rural regions to support waste transfer system construction there. Meanwhile, the local government should not be responsible for too much project expenditure. ③Technology plays a crucial role in improving the efficiency of waste treatment. Scientific treatment of waste should be conducted in terms of technology either in simple garbage landfill sites or in new garbage treatment plants, to prevent leakage and pollution.

(3) Lake Management Project

① Fall of surface water level results in the reclamation of vegetable fields or farmland from wetlands, blocking exchange of water in the lake. Meanwhile, fertilizer in farmland will contaminate water bodies. Therefore, consultation with residents occupying wetlands is advised as a way to turn field into lake and to improve ecological system of wetland; ② Carry out non-engineering measures to control lake pollution, and issue regulations on economic activities within lake area to strengthen lawmaking on lake pollution control and enhance green administrative ability to reduce emission; ③ Integrate technology to promote synchronized development of ecological protection and economic growth in the lake area.

10 Environmental Management Plan

For details, see the stand-alone EMP of World Bank-financed Yugan County Water Environment Management Project.

11 Analysis of Economic Cost-Benefit of Environmental Impacts

11.1 Investment Estimate for Environmental Protection

The total investment is 232.5006 million yuan, and investment estimate for environmental protection is shown in Table 11-1, mainly including cost for environmental protection measures and cost for monitoring and training, with a total amount of 2.8094 million yuan. Environmental protection investment accounts for 1.2% of the total investment.

Table 11-1 Investment Estimate for Environmental Protection

Cost for Environmental Management	Environmental Monitoring Cost		Training Cost	Total Cost for Implementing EMP
	Construction Period	Operation Period		
263	9.7	0.24	8	280.94

11.2 Analysis of Economic Cost-Benefit of Environmental Impacts

Involving construction of the pipeline network and garbage collection and transportation, this project has significant benefits in the environment, including reduction of pollutant loads, improvement on water quality and environmental management capability, etc.

(1) Reduction of Pollutant Load

In 2023 after the completion of project, sewage volume of urban areas will be 0.16 (1000 t/d); Sewage collection rate will be over 100%. Pollutants discharged into Poyang Lake is predicted to reduce annually, in which TN will be reduced by 17.89t, TP 1.3t, COD 132.3t. Hazard-free treatment rate of domestic waste in urban areas exceeds 80%. Domestic waste will not be allowed to abandon arbitrarily. Gradually garbage should be separately collected.

(2) Improvement of Water Quality

The implementation of this project will help to control river pollution, purify and conserve the water, greatly reducing the pollutants discharging into Xin River. Therefore, impacts of pollutants on local surface water bodies will be reduced and the

regional water quality will be improved. As a result, it will fundamentally protect the regional water bodies and significantly improve environmental conditions in Yugan County.

(3) Improvement of Environmental Management Capacity

The implementation of environmental monitoring and management capacity building project provides local environmental protection with strong technical measures and supervision and management methods, thus it helps to promote healthy development of local environmental protection work and effectively prevent environmental pollution accidents and reduce environmental risks. Measures conducted from aspects of management, technique and others minimizes pollution of regional surface water bodies, hence improving regional environmental conditions.

(4) Provide Good Environmental Conditions for Regional Social and Economic Development

The implementation of the project helps to: speed up the local municipal infrastructure construction; establish and improve the environmental infrastructure network system; further ease the contradiction between the Basin's regional urban development and environmental constraints; improve environment quality of the basin in the project site; enhance water environmental functions and urban functions. All these create fine environmental conditions for rapid and healthy economic and social development of the region and the whole province at large.

11.3 Social Benefits

11.3.1 Improve Residents' Health Condition and Enhance Living Quality of Residents in the Basin

The implementation of the project effectively resolves the problem of the backward environmental infrastructure of the place. On the one hand, it purifies the waters; on the other hand, it eliminates the breeding environment for mosquitoes, flies and other disease transmission media, protecting and improving the residents` living environment, reducing diseases, enhancing the residents` health and further improving the quality of their lives.

11.3.2 Increase Residents' Employment Opportunities

As the project is implemented gradually, more employment opportunities will be provided. Firstly, during construction, some temporary and odd employment opportunities will be provided; secondly, in the operation stage, some long-term and stable employments will be provided, including technical and management personnel directly working on the project; lastly, the implementation will greatly improve the investment environment, attract funds, speed up agricultural development and stimulate development of the third industry, providing more employments.

11.3.3 Improve Residents' Awareness of Environmental Protection

The construction of the project is also a profound and vivid process for spreading environmental protection awareness. Through specific environmental protection activities, people can deeply realize the significance of the environmental protection and know the serious consequences due to environmental damages, including economic loss, health damage, resource loss, etc. This action is, compared with pure propaganda, more effective and easier to be accepted by people. Meanwhile, it can develop a demonstration base for environmental science popularization and education, which provides the public a place for receiving environmental education and is beneficial to the improvement of residents' environmental protection awareness.

11.3.4 Provide Fundamental Data for Regional Pollution Control

The implementation of environmental monitoring and the management capacity building can meet the increasing demand for environmental monitoring of the society and better serve regional economic development. At the same time, it provides fundamental data to further analyze pollution sources, scientific foundation for comprehensive treatment decision-making for regional pollution, foundation for accurately estimating the treatment effect on regional pollution, and effective methods for monitoring the operation of treatment facilities by the functional departments of the government according to laws. All these can help enhance the environmental management of the regional basin.

11.4 Economic Benefit

As a water environment management project, it belongs to public welfare project, which does not have obvious direct investment benefits. Its major economic benefits are indirect ones, mainly including:

(1) Economic Benefit from Pollution Control

It is mainly shown through the reduction of the social economic loss caused by the pollutants in the sewage, including:

Industries and enterprises: the additional investment and operation management expenses of separate sewage treatments by industries and enterprises can be reduced, hence their burden relieved.

Agriculture, forestry, animal husbandry and fisheries: water pollution may cause the decline of grain crop product, animal product, aquatic product and their quality, while the completion of the project may reduce the economic loss caused by such pollution;

Physical health: water pollution will increase morbidity and health care expenses, as well as decrease labor productivity. On the contrary, the completion of the project improves the dwelling environment and reduces related medical expenses.

(2) Benefits from Increasing Income

Along with the improvement of infrastructure and environment, the value of urban land will increase.

11.5 Summary

This project is one part of an integrated plan to improve environmental circumstances of Yugan County and promote water environment management of Poyang Lake Basin. The construction of proposed pipeline network, garbage collection and transportation, restoration of water body and water quality guarantee will result in a significant impact on urban infrastructure and ecological environmental protection within the project area and even on national economic and social development at large.

The project helps to: ①consolidate results of environmental treatment within the

project area and further improve the environmental quality; ② improve residents' production and living conditions as well as their living quality and heath level; ③ promote marketing of Yugan infrastructure construction and management through importing and absorbing advanced technology and management expertise both from home and abroad, thus realizing independent and healthy development of regional urban infrastructure; ④ boost Poyang Lake Basin water environmental safety building, aiming at safeguarding economic and social sustainable development driven by environmental sustainable development, hence creating good conditions for realizing sustainable development strategy and high level of ecological civilization within Poyang Lake Basin Ecological Economic Zone. Indeed, this project has considerable environmental, social and economic benefits.

12 Conclusion

According to the EIA, following conclusions can be reached:

(1) Construction of this project will improve the water environment of Pipa Lake basin and improve regional infrastructure. The project will change the current situation in Yugan County that domestic sewage are directly discharged into nearby water bodies without being treated, thus protecting the water quality of the receptor Xin River, and to some degree, improving Yugan's environmental hygiene. Also, it will greatly improve the residents' living conditions, protect nearby water bodies, beautify the surrounding environment, build a more comfortable and better living environment, and increase the quality of living environment.

(2) Construction of the project is in line with national laws and regulations and local overall urban planning and environmental protection planning. Therefore, the implementation of this project has a legal foundation.

(3) The implementation of this project may involve some environmental protection targets (sensitive points), such as residential areas. In the EIA, through taking mitigation measures and formulating and implementing EMP and via public participation and other means, it is likely to further reduce and eliminate negative impacts on environmental protection targets (sensitive points) due to the implementation of the project, and let potential impacts meet the requirements of state environmental protection laws and regulations and standard specifications.

(4) The implementation of this project may also have some adverse impacts on the ambient environment. Include construction and operation period.

1) Adverse impacts during the construction period mainly include: impacts of construction dusts on ambient air quality, noise of construction vehicles and machinery on the surrounding environment, and impacts of construction domestic sewage; soil erosion caused by digging and spoiling soil, excavating and filling earthwork as well as temporary earthwork stacking during construction; impacts of installation of sewage pipes on the surrounding traffic, and damage to vegetation

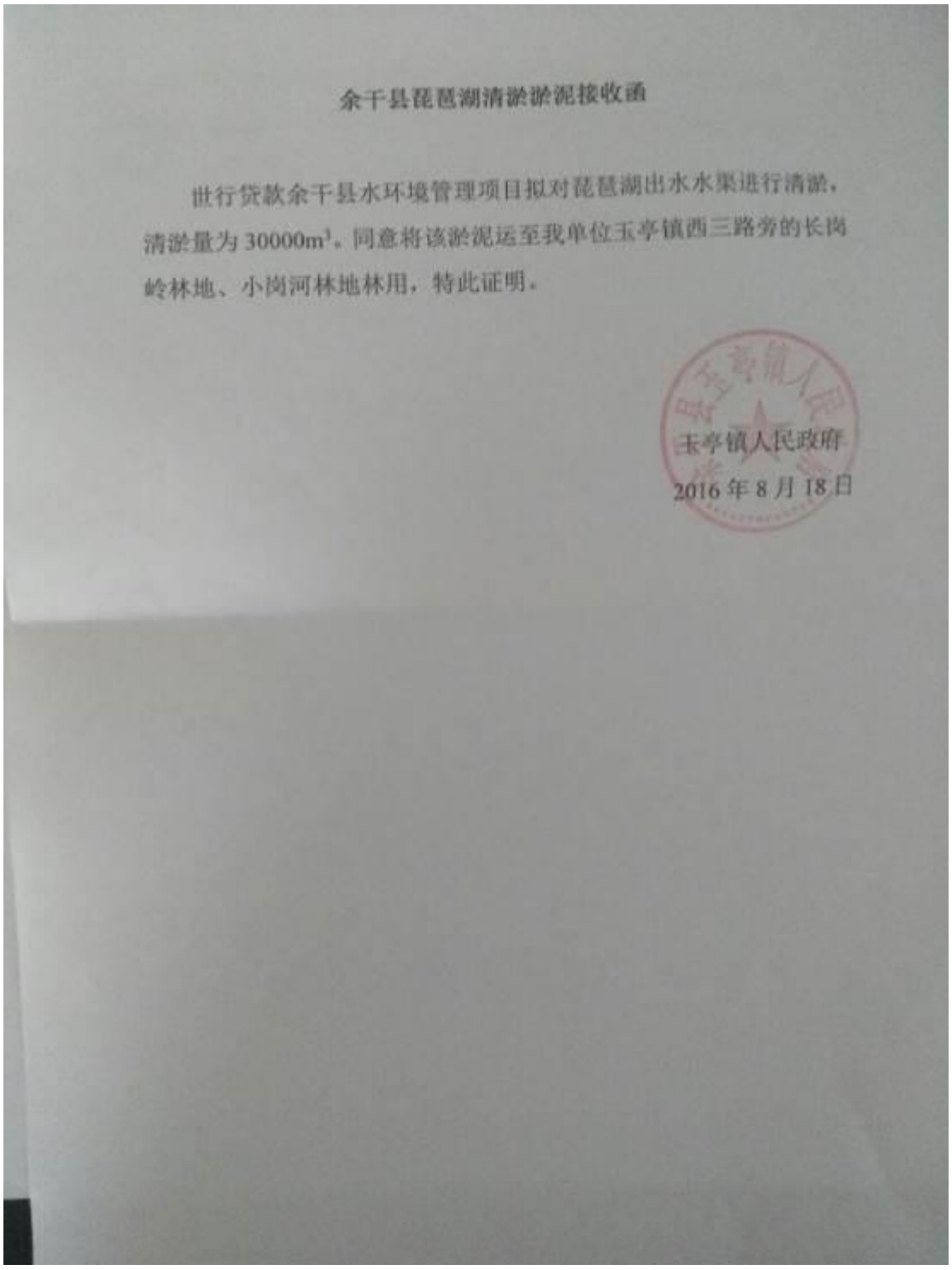
caused by the construction, etc.

2) Adverse impacts during the operation period mainly include: impacts of odor generated from garbage collection and transportation on ambient air, and impacts of equipment noise and garbage collection and transportation on neighboring environment, etc.

(5) By taking mitigation measures and implementing EMP and via public participation and consultation as well as other means, the extent and scope of potential negative impacts of the project can be controlled within the limits of national laws and regulations and standard specifications.

In summary, after taking mitigation measures proposed in this project and implementing EMP and via public consultation and other means, the implementation of this project is feasible when the environment is concerned.

Annex I: Sludge Acceptance Letter of Duchang County



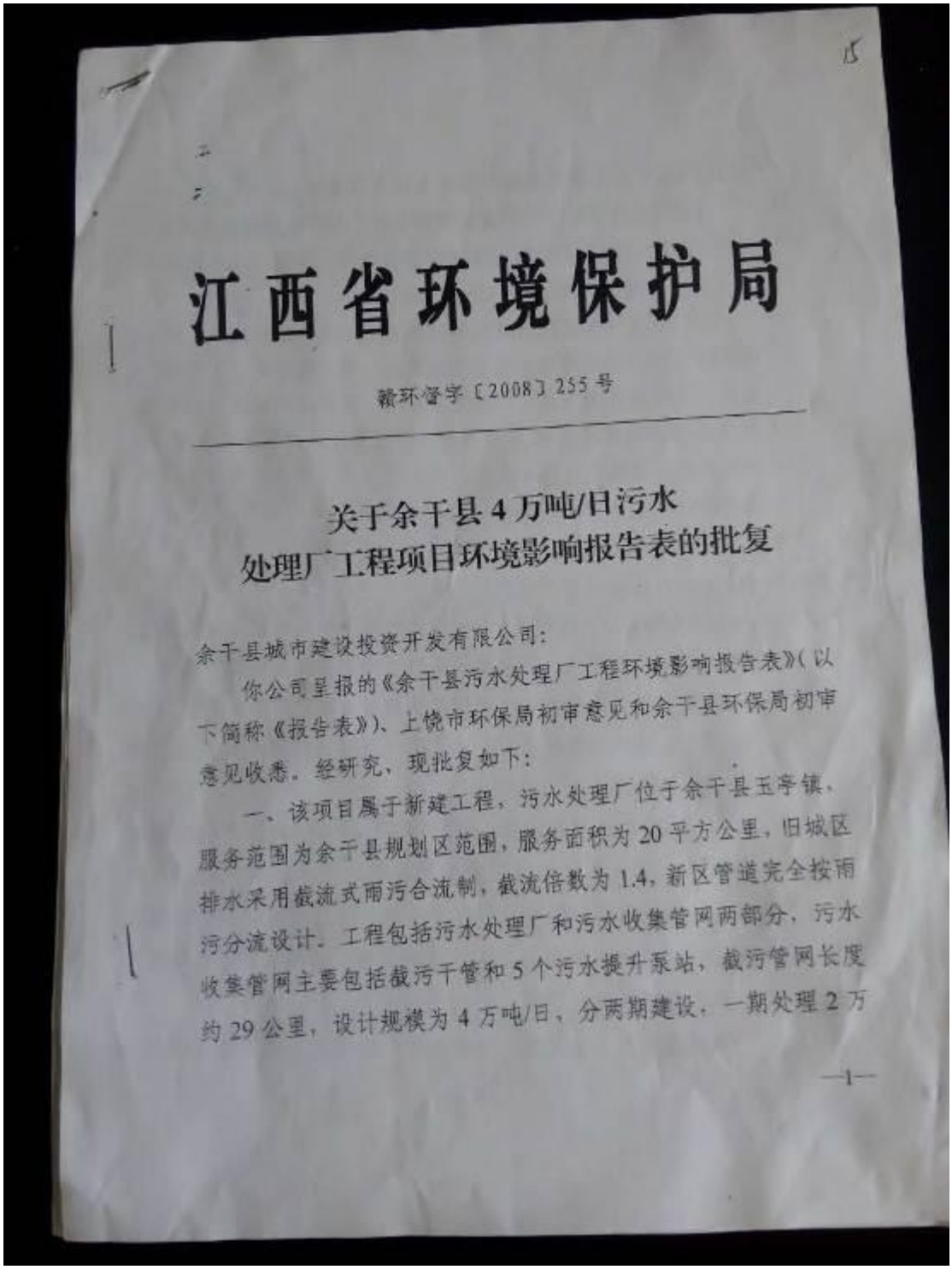
余干县琵琶湖清淤淤泥接收函

世行贷款余干县水环境管理项目拟对琵琶湖出水水渠进行清淤，清淤量为30000m³。同意将该淤泥运至我单位玉亭镇西三路旁的长岗岭林地、小岗河林地林用，特此证明。

玉亭镇人民政府

2016年8月18日

Annex II: Reply to the EIA Report of Yugan County Wastewater Treatment Plant



江西省环境保护局

赣环督字〔2008〕255号

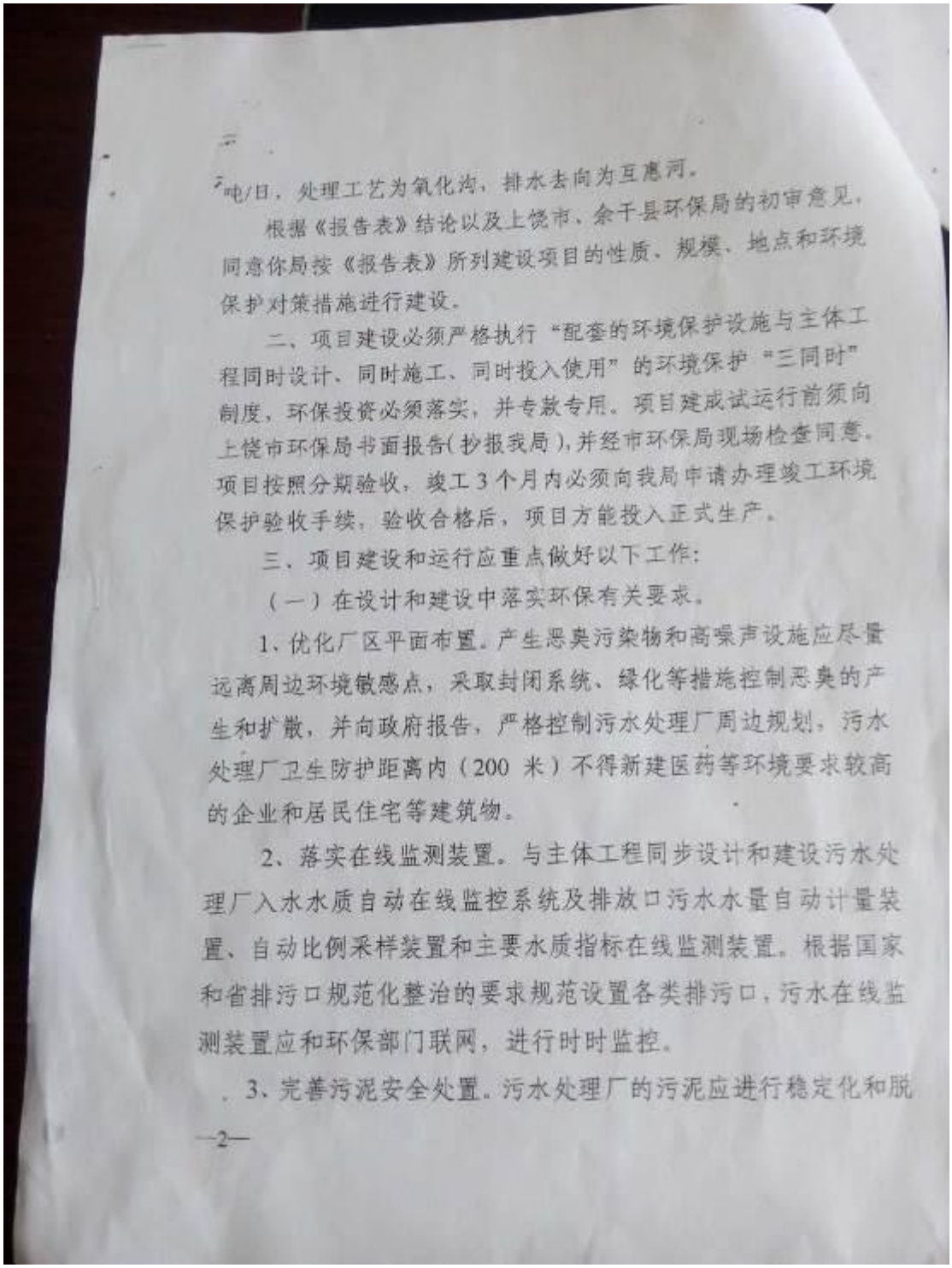
关于余干县4万吨/日污水处理厂工程项目环境影响报告表的批复

余干县城市建设投资开发有限公司：

你公司呈报的《余干县污水处理厂工程环境影响报告表》（以下简称《报告表》）、上饶市环保局初审意见和余干县环保局初审意见收悉。经研究，现批复如下：

一、该项目属于新建工程，污水处理厂位于余干县玉亭镇，服务范围为余干县规划区范围，服务面积为20平方公里，旧城区排水采用截流式雨污合流制，截流倍数为1.4，新区管道完全按雨污分流设计。工程包括污水处理厂和污水收集管网两部分，污水收集管网主要包括截污干管和5个污水提升泵站，截污管网长度约29公里，设计规模为4万吨/日，分两期建设，一期处理2万

—1—



吨/日，处理工艺为氧化沟，排水去向为互惠河。

根据《报告表》结论以及上饶市、余干县环保局的初审意见，同意你局按《报告表》所列建设项目的性质、规模、地点和环境保护对策措施进行建设。

二、项目建设必须严格执行“配套的环境保护设施与主体工程同时设计、同时施工、同时投入使用”的环境保护“三同时”制度，环保投资必须落实，并专款专用。项目建成试运行前须向上饶市环保局书面报告(抄报我局)，并经市环保局现场检查同意。项目按照分期验收，竣工3个月内必须向我局申请办理竣工环境保护验收手续，验收合格后，项目方能投入正式生产。

三、项目建设和运行应重点做好以下工作：

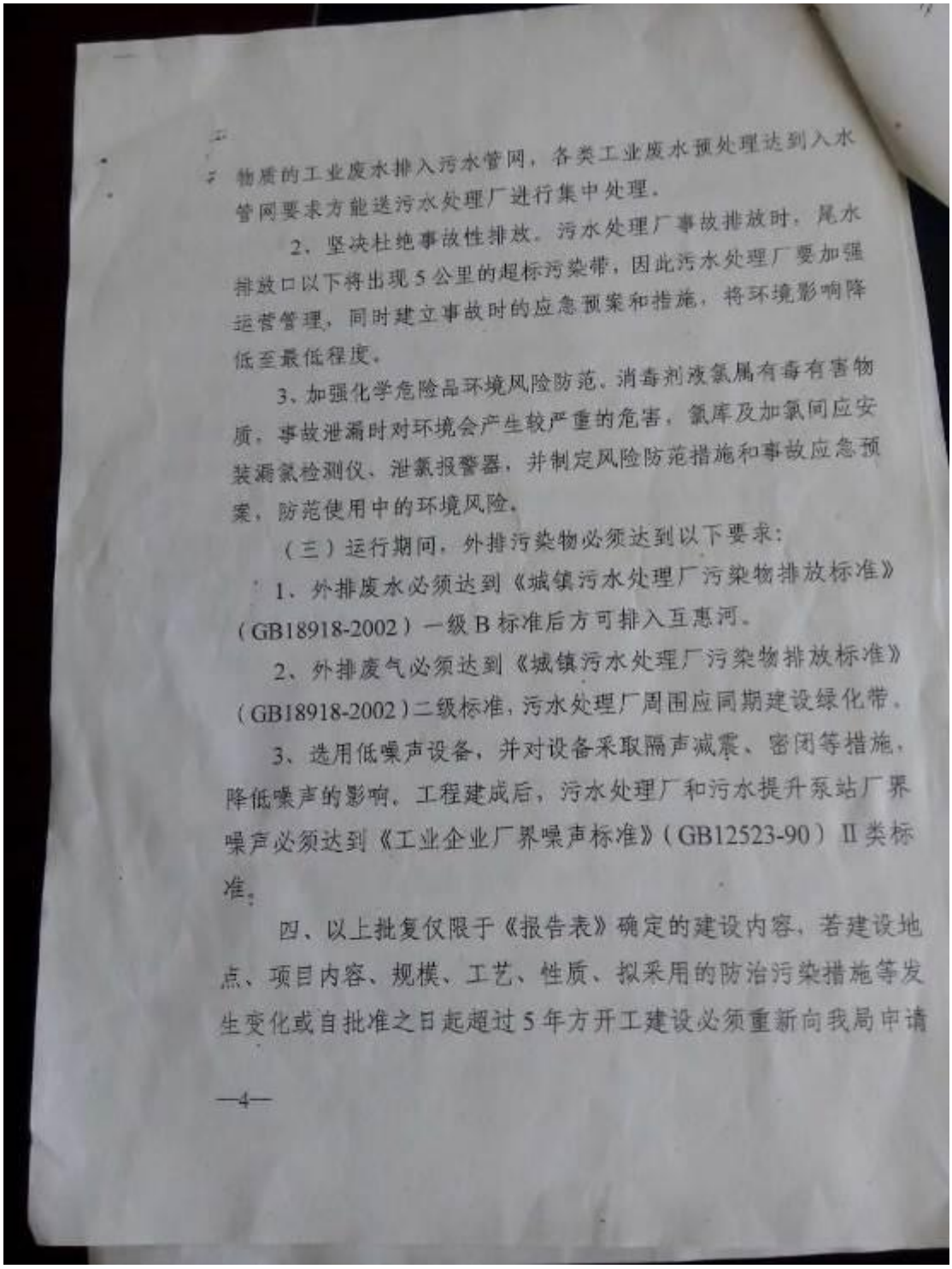
（一）在设计和建设中落实环保有关要求。

1、优化厂区平面布置。产生恶臭污染物和高噪声设施应尽量远离周边环境敏感点，采取封闭系统、绿化等措施控制恶臭的产生和扩散，并向政府报告，严格控制污水处理厂周边规划，污水处理厂卫生防护距离内（200 米）不得新建医药等环境要求较高的企业和居民住宅等建筑物。

2、落实在线监测装置。与主体工程同步设计和建设污水处理厂入水水质自动在线监控系统及排放口污水水量自动计量装置、自动比例采样装置和主要水质指标在线监测装置。根据国家和省排污口规范化整治的要求规范设置各类排污口，污水在线监测装置应和环保部门联网，进行时时监控。

3、完善污泥安全处置。污水处理厂的污泥应进行稳定化和脱

—2—



物质的工业废水排入污水管网，各类工业废水预处理达到入水管网要求方能送污水处理厂进行集中处理。

2、坚决杜绝事故性排放。污水处理厂事故排放时，尾水排放口以下将出现5公里的超标污染带，因此污水处理厂要加强运营管理，同时建立事故时的应急预案和措施，将环境影响降低至最低程度。

3、加强化学危险品环境风险防范。消毒剂液氯属有毒有害物质，事故泄漏时对环境会产生较严重的危害，氯库及加氯间应安装漏氯检测仪、泄氯报警器，并制定风险防范措施和事故应急预案，防范使用中的环境风险。

（三）运行期间，外排污染物必须达到以下要求：

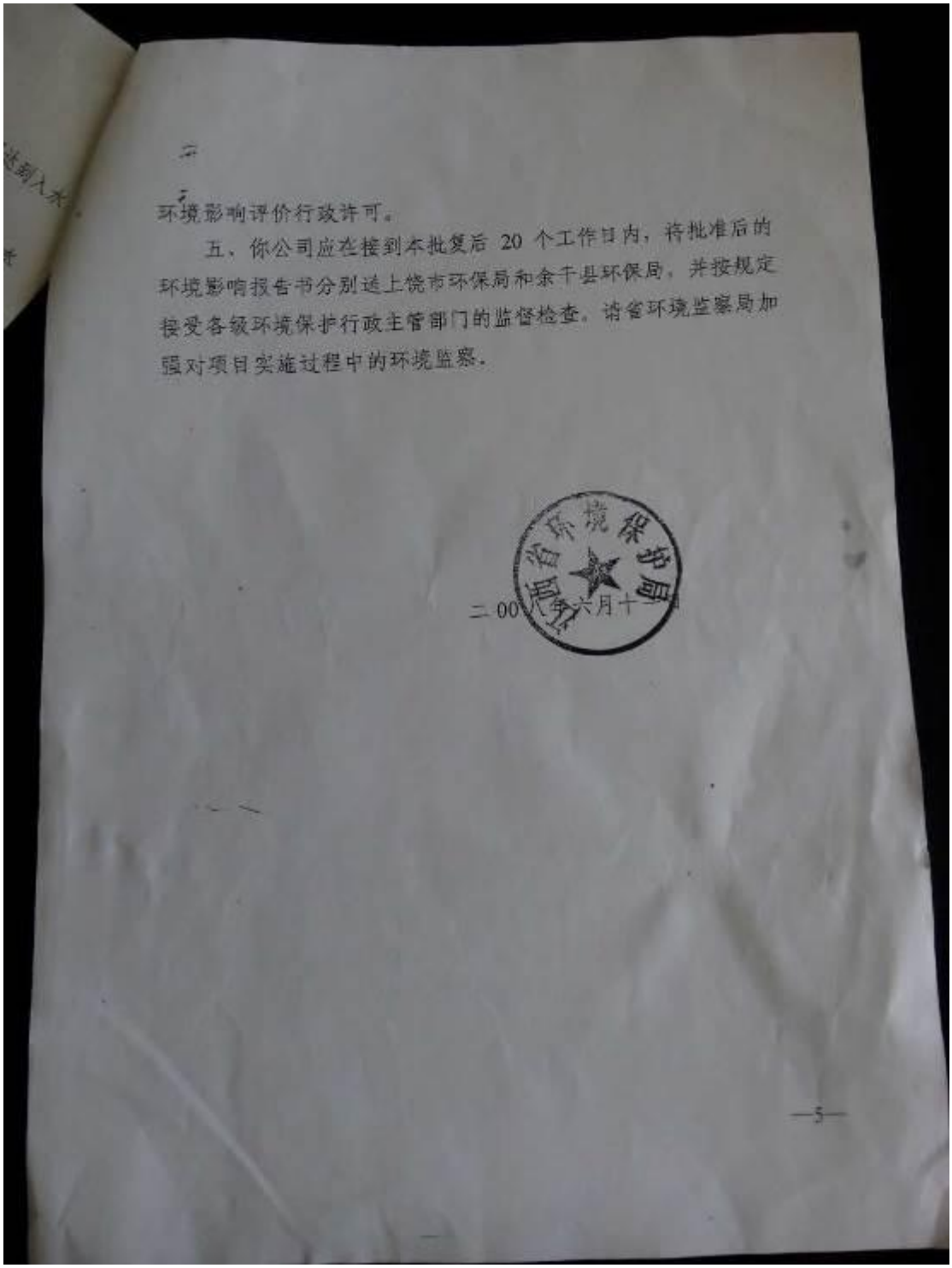
1、外排废水必须达到《城镇污水处理厂污染物排放标准》（GB18918-2002）一级B标准后方可排入互惠河。

2、外排废气必须达到《城镇污水处理厂污染物排放标准》（GB18918-2002）二级标准，污水处理厂周围应同期建设绿化带。

3、选用低噪声设备，并对设备采取隔声减震、密闭等措施，降低噪声的影响。工程建成后，污水处理厂和污水提升泵站厂界噪声必须达到《工业企业厂界噪声标准》（GB12523-90）II类标准。

四、以上批复仅限于《报告表》确定的建设内容，若建设地点、项目内容、规模、工艺、性质、拟采用的防治污染措施等发生变化或自批准之日起超过5年方开工建设必须重新向我局申请

—4—



环境影响评价行政许可。

五、你公司应在接到本批复后 20 个工作日内，将批准后的环境影响报告书分别送上饶市环保局和余干县环保局，并按规定接受各级环境保护行政主管部门的监督检查。请省环境监察局加强对项目实施过程中的环境监察。

二00[illegible]六月十[illegible]日

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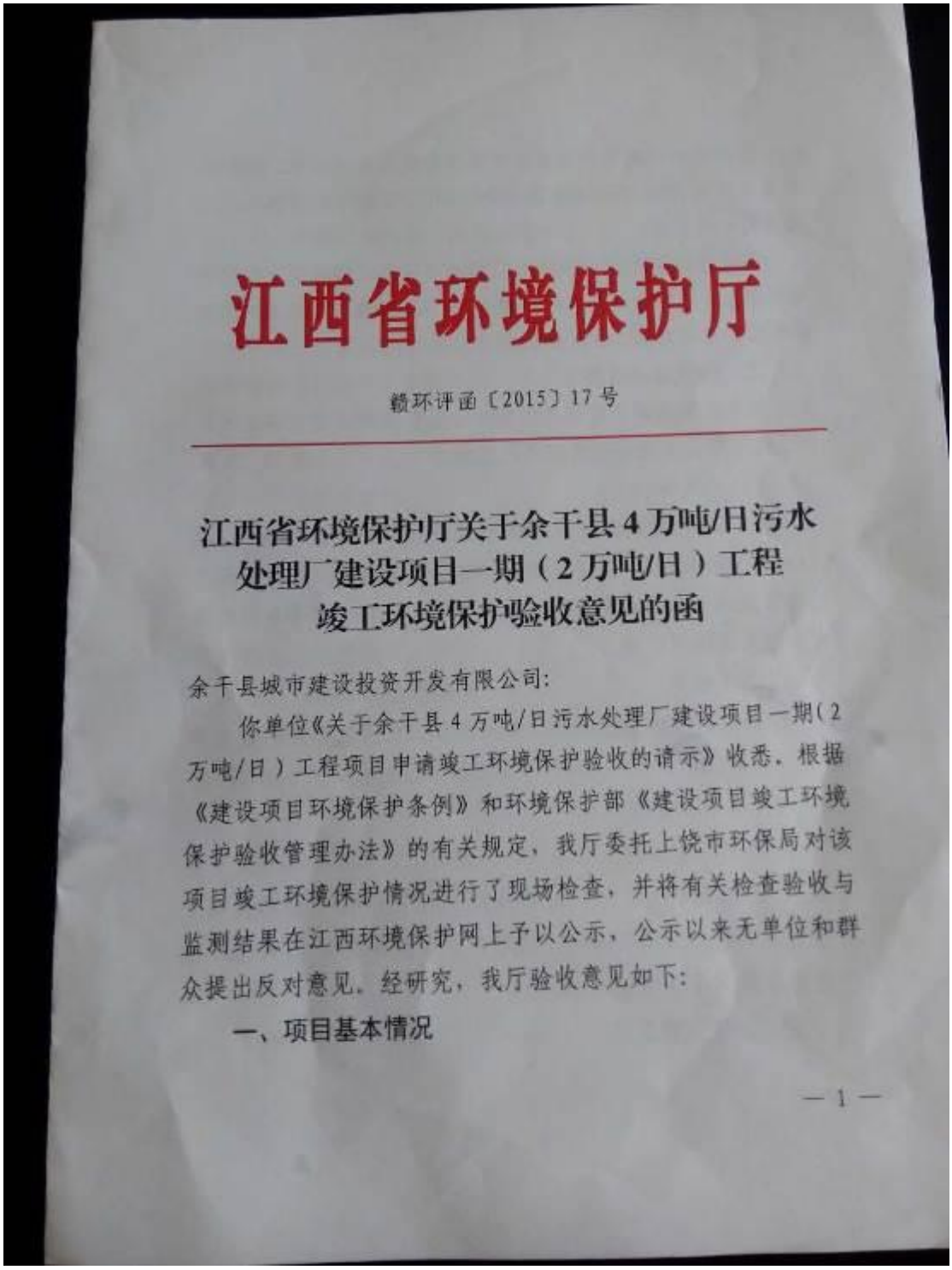
Annex III: Environmental Completion Acceptance of Yugan County Wastewater Treatment Plant



江西省环境保护厅

赣环评函〔2015〕17号

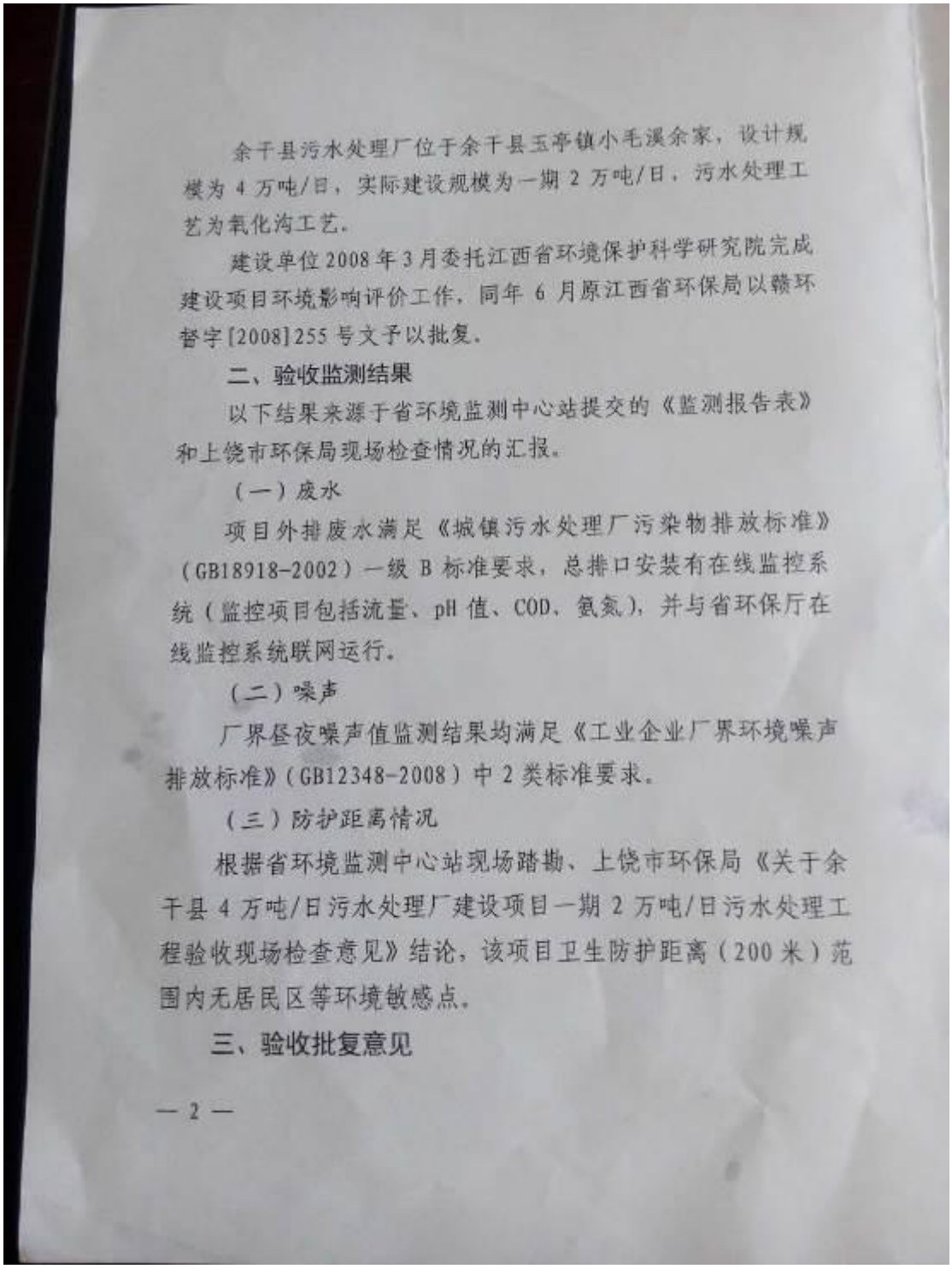
江西省环境保护厅关于余干县4万吨/日污水处理厂建设项目一期（2万吨/日）工程竣工环境保护验收意见的函

余干县城市建设投资开发有限公司:

你单位《关于余干县4万吨/日污水处理厂建设项目一期（2万吨/日）工程项目申请竣工环境保护验收的请示》收悉。根据《建设项目环境保护条例》和环境保护部《建设项目竣工环境保护验收管理办法》的有关规定，我厅委托上饶市环保局对该项目竣工环境保护情况进行了现场检查，并将有关检查验收与监测结果在江西环境保护网上予以公示，公示以来无单位和群众提出反对意见。经研究，我厅验收意见如下:

一、项目基本情况

— 1 —



余干县污水处理厂位于余干县玉亭镇小毛溪余家，设计规模为4万吨/日，实际建设规模为一期2万吨/日，污水处理工艺为氧化沟工艺。

建设单位2008年3月委托江西省环境保护科学研究院完成建设项目环境影响评价工作，同年6月原江西省环保局以赣环督字[2008]255号文予以批复。

二、验收监测结果

以下结果来源于省环境监测中心站提交的《监测报告表》和上饶市环保局现场检查情况的汇报。

（一）废水

项目外排废水满足《城镇污水处理厂污染物排放标准》（GB18918-2002）一级B标准要求，总排口安装有在线监控系统（监控项目包括流量、pH值、COD、氨氮），并与省环保厅在线监控系统联网运行。

（二）噪声

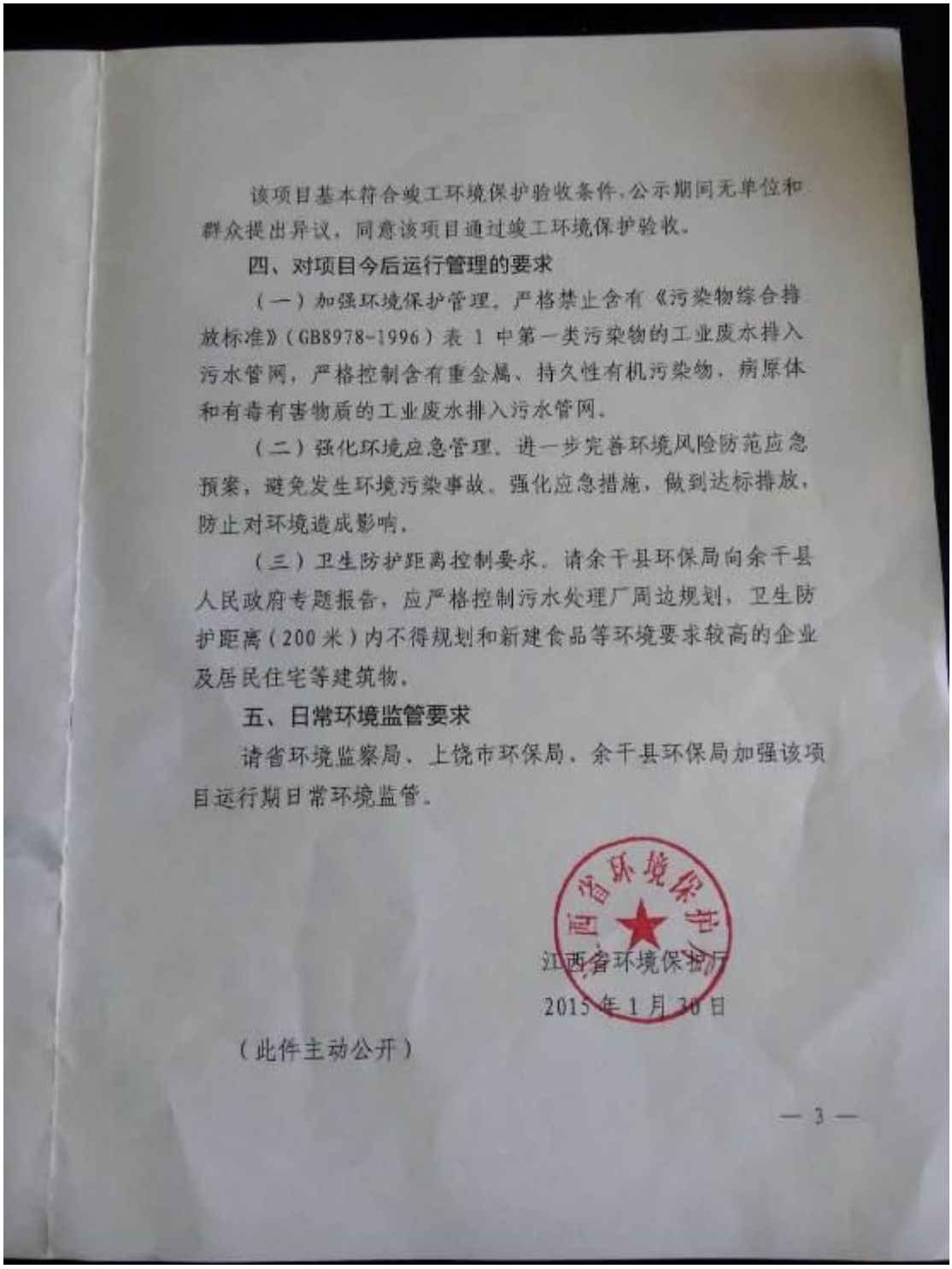
厂界昼夜噪声值监测结果均满足《工业企业厂界环境噪声排放标准》（GB12348-2008）中2类标准要求。

（三）防护距离情况

根据省环境监测中心站现场踏勘、上饶市环保局《关于余干县4万吨/日污水处理厂建设项目一期2万吨/日污水处理工程验收现场检查意见》结论，该项目卫生防护距离（200米）范围内无居民区等环境敏感点。

三、验收批复意见

— 2 —



该项目基本符合竣工环境保护验收条件，公示期间无单位和群众提出异议，同意该项目通过竣工环境保护验收。

四、对项目今后运行管理的要求

（一）加强环境保护管理。严格禁止含有《污染物综合排放标准》（GB8978-1996）表 1 中第一类污染物的工业废水排入污水管网，严格控制含有重金属、持久性有机污染物，病原体和有毒有害物质的工业废水排入污水管网。

（二）强化环境应急管理。进一步完善环境风险防范应急预案，避免发生环境污染事故。强化应急措施，做到达标排放，防止对环境造成影响。

（三）卫生防护距离控制要求。请余干县环保局向余干县人民政府专题报告，应严格控制污水处理厂周边规划，卫生防护距离（200 米）内不得规划和新建食品等环境要求较高的企业及居民住宅等建筑物。

五、日常环境监管要求

请省环境监察局、上饶市环保局、余干县环保局加强该项目运行期日常环境监管。

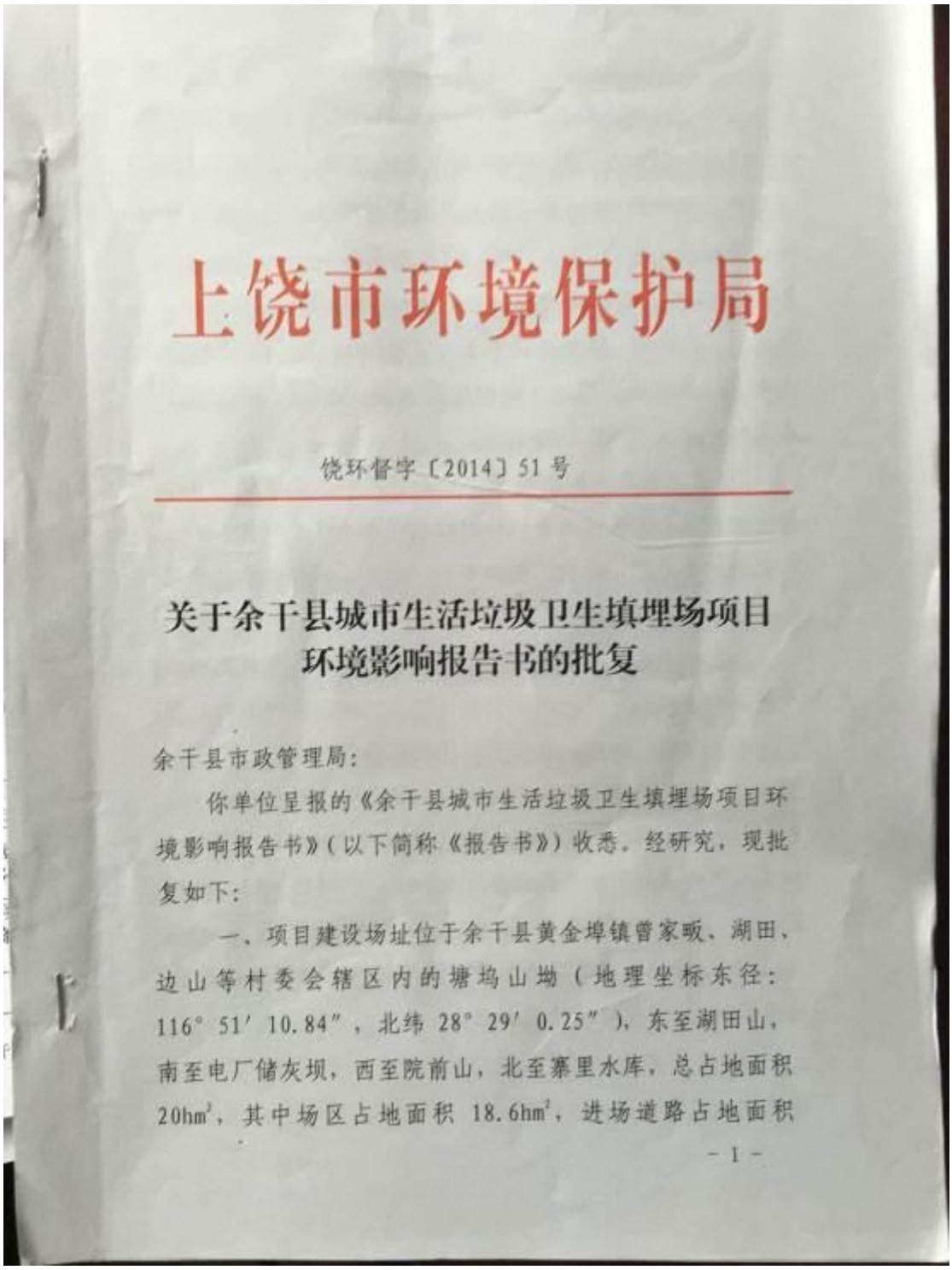
江西省环境保护厅

2015 年 1 月 30 日

（此件主动公开）

— 3 —

Annex IV: Reply to the EIA of Yugan Domestic Garbage Landfill



上饶市环境保护局

饶环督字〔2014〕51号

关于余干县城市生活垃圾卫生填埋场项目环境影响报告书的批复

余干县市政管理局：

你单位呈报的《余干县城市生活垃圾卫生填埋场项目环境影响报告书》（以下简称《报告书》）收悉。经研究，现批复如下：

一、项目建设场址位于余干县黄金埠镇曾家畈、湖田、边山等村委会辖区内的塘坞山坳（地理坐标东径：116° 51′ 10.84″，北纬 28° 29′ 0.25″），东至湖田山，南至电厂储灰坝，西至院前山，北至寨里水库，总占地面积 20hm²，其中场区占地面积 18.6hm²，进场道路占地面积

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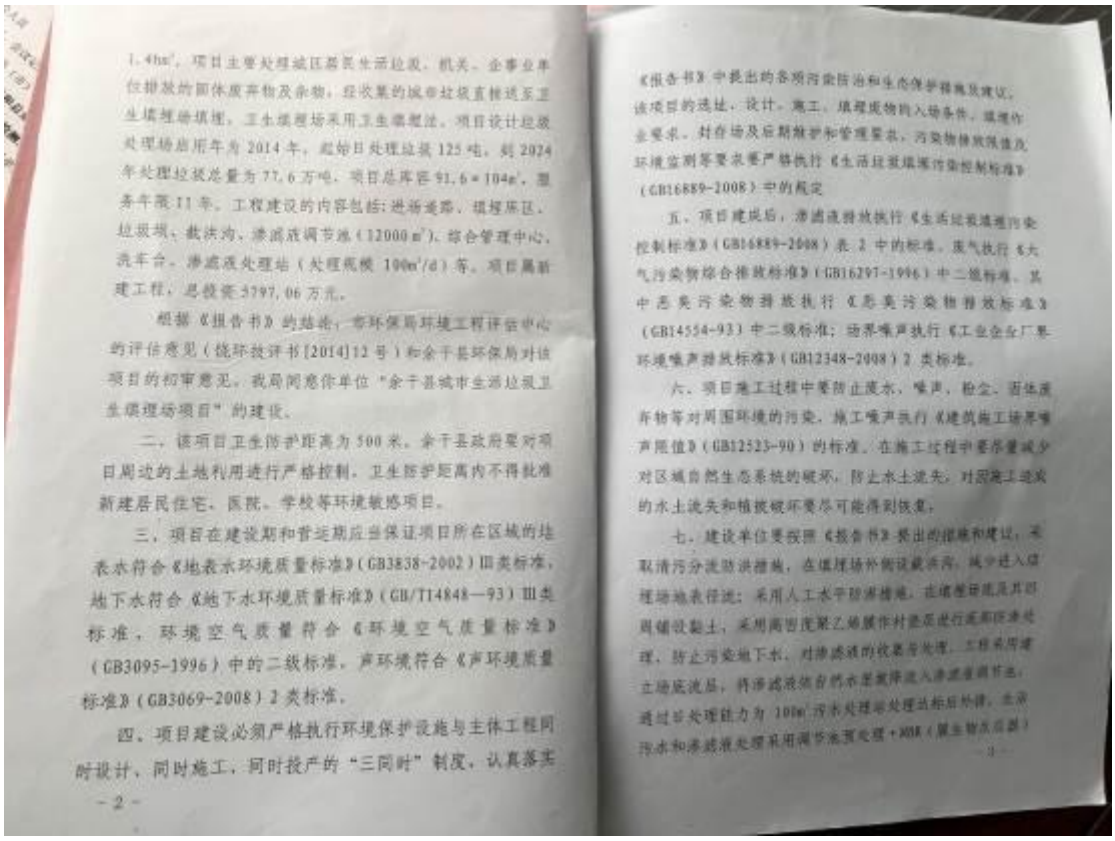


1.4hm²，项目主要处理城区居民生活垃圾、机关、企事业单位排放的固体废弃物及杂物，经收集的城市垃圾直接送至卫生填埋场填埋，卫生填埋场采用卫生填埋法。项目设计垃圾处理场启用年为 2014 年，起始日处理垃圾 125 吨，到 2024 年处理垃圾总量为 77.6 万吨，项目总库容 91.6×10⁴m³，服务年限 11 年。工程建设的内容包括：进场道路、填埋库区、垃圾坝、截洪沟、渗滤液调节池（12000m³）、综合管理中心、洗车台、渗滤液处理站（处理规模 100m³/d）等。项目属新建工程，总投资 5797.06 万元。

根据《报告书》的结论，市环保局环境工程评估中心的评估意见（饶环技评书[2014]12 号）和余干县环保局对该项目的初审意见，我局同意你单位“余干县城市生活垃圾卫生填埋场项目”的建设。

二、该项目卫生防护距离为 500 米，余干县政府要对项目周边的土地利用进行严格控制，卫生防护距离内不得批准新建居民住宅、医院、学校等环境敏感项目。

三、项目在建设期和营运期应当保证项目所在区域的地表水符合《地表水环境质量标准》（GB3838-2002）Ⅲ类标准，地下水符合《地下水环境质量标准》（GB/T14848—93）Ⅲ类标准，环境空气质量符合《环境空气质量标准》（GB3095-1996）中的二级标准，声环境符合《声环境质量标准》（GB3069-2008）2 类标准。

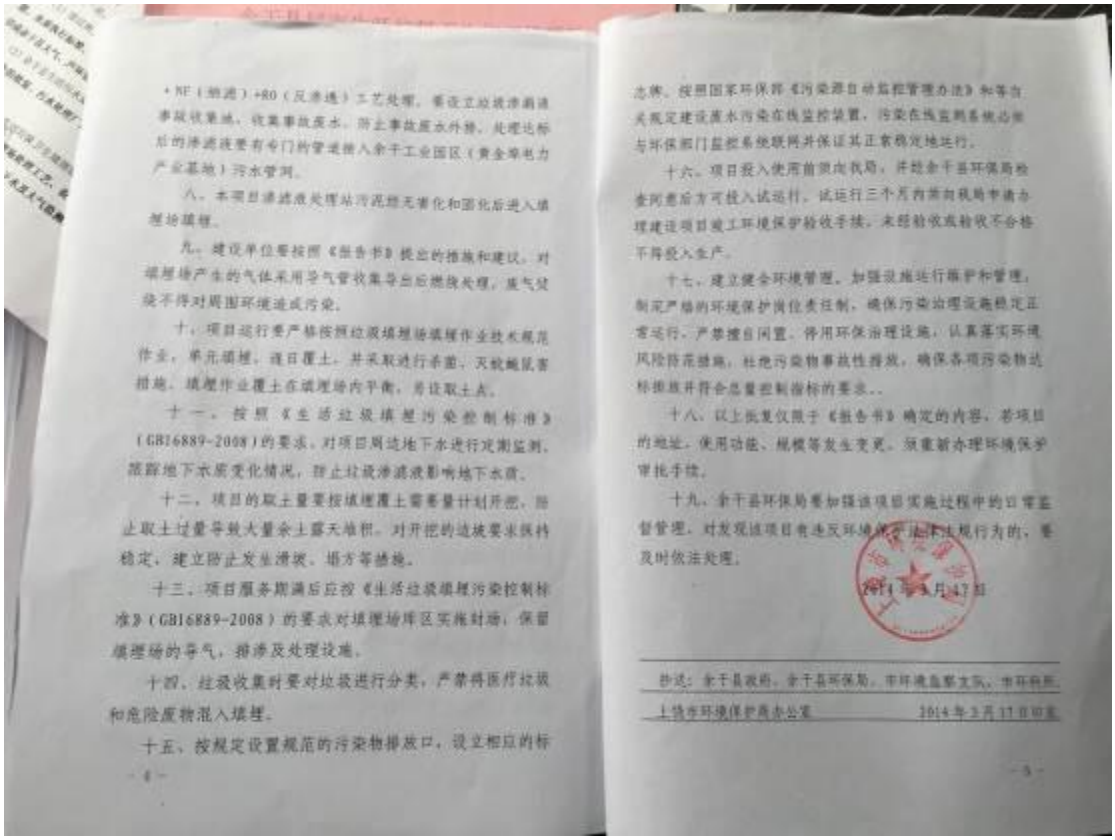
四、项目建设必须严格执行环境保护设施与主体工程同时设计、同时施工、同时投产的“三同时”制度，认真落实

《报告书》中提出的各项污染防治和生态保护措施及建议，该项目的选址、设计、施工、填埋废物的入场条件、填埋作业要求、封场场及后期维护和管理要求，污染物排放限值及环境监测等要求要严格执行《生活垃圾填埋污染控制标准》（GB16889-2008）中的规定

五、项目建成后，渗滤液排放执行《生活垃圾填埋污染控制标准》（GB16889-2008）表 2 中的标准，废气执行《大气污染物综合排放标准》（GB16297-1996）中二级标准，其中恶臭污染物排放执行《恶臭污染物排放标准》（GB14554-93）中二级标准；场界噪声执行《工业企业厂界环境噪声排放标准》（GB12348-2008）2 类标准。

六、项目施工过程中要防止废水、噪声、粉尘、固体废弃物等对周围环境的污染，施工噪声执行《建筑施工场界噪声限值》（GB12523-90）的标准。在施工过程中要尽量减少对区域自然生态系统的破坏，防止水土流失，对因施工造成的水土流失和植被破坏要尽可能得到恢复。

七、建设单位要按照《报告书》提出的措施和建议，采取清污分流防洪措施，在填埋场外侧设截洪沟，减少进入填埋场地表径流；采用人工水平防渗措施，在填埋库底及其四周铺设黏土，采用高密度聚乙烯膜作衬垫层进行底部防渗处理，防止污染地下水，对渗滤液的收集与处理，工程采用建立场底流层，将渗滤液依自然水压就降流入渗滤液调节池，通过日处理能力为 100m³ 污水处理站处理达标后外排，生活污水和渗滤液处理采用调节池预处理+AOH（厌生物水解酸



+NF（纳滤）+RO（反渗透）工艺处理，要设立垃圾渗滤液事故收集池，收集事故废水，防止事故废水外排，处理达标后的渗滤液要有专门的管道接入余干工业园区（黄金埠电力产业基地）污水管网。

八、本项目渗滤液处理站污泥经无害化和固化后进入填埋场填埋。

九、建设单位要按照《报告书》提出的措施和建议，对填埋场产生的气体采用导气管收集导出后燃烧处理，废气处理不得对周围环境造成污染。

十、项目运行要严格按照垃圾填埋场填埋作业技术规范作业，单元填埋，逐日覆土，并采取进行杀菌、灭蚊蝇鼠害措施。填埋作业覆土在填埋场内平衡，另设取土点。

十一、按照《生活垃圾填埋污染控制标准》（GB16889-2008）的要求，对项目周边地下水进行定期监测，跟踪地下水质变化情况，防止垃圾渗滤液影响地下水质。

十二、项目的取土量要按填埋覆土需要量计划开挖，防止取土过量导致大量余土露天堆积。对开挖的边坡要求保持稳定，建立防止发生滑坡、塌方等措施。

十三、项目服务期满后应按《生活垃圾填埋污染控制标准》（GB16889-2008）的要求对填埋场库区实施封场，保留填埋场的导气、排渗及处理设施。

十四、垃圾收集时要对垃圾进行分类，严禁将医疗垃圾和危险废物混入填埋。

十五、按规定设置规范的污染物排放口，设立相应的标

志牌。按照国家环保部《污染源自动监控管理办法》和等有关规定建设废水污染在线监控装置，污染在线监测系统必须与环保部门监控系统联网并保证其正常稳定地运行。

十六、项目投入使用前须向我局，并经余干县环保局检查同意后方可投入试运行，试运行三个月内须向我局申请办理建设项目竣工环境保护验收手续，未经验收或验收不合格不得投入生产。

十七、建立健全环境管理，加强设施运行维护和管理，制定严格的环境保护岗位责任制，确保污染治理设施稳定正常运行，严禁擅自闲置、停用环保治理设施，认真落实环境风险防范措施，杜绝污染物事故性排放，确保各项污染物达标排放并符合总量控制指标的要求。

十八、以上批复仅限于《报告书》确定的内容，若项目的地址、使用功能、规模等发生变更，须重新办理环境保护审批手续。

十九、余干县环保局要加强该项目实施过程中的日常监督管理，对发现该项目有违反环境保护法律法规行为的，要及时依法处理。

2014 年 3 月 17 日

抄送：余干县政府，余干县环保局，市环境监察支队，市环科所，上饶市环境保护局办公室　　2014 年 3 月 17 日印发

Annex V Minutes of Discussion Meeting of Yugan County

(1) Time: 9:30pm, December, 9th, 2015

(2) Place: the second floor conference room of Village Committee, Yugan County Development and Reform Commission

(3) Content: public consultation and information disclosure discussion meeting about Environment Impact Assessment (EIA) for World Bank-financed Yugan County Water Environment Management Project

(4) Attendee: 20 people including representatives from PPMO, Director Zhang of Yugan County PMO, residential representatives from Guankou Village and Pipa Community, representatives from City Council, Planning Bureau, Bureau of Aquatic Products, Land and Resources Bureau, Environmental Protection Bureau, Water Conservancy Bureau as well as EIA compilers.

(5) Chairperson: Director Zhang (World Bank-financed Yugan County PMO)

(6) Meeting minutes

At the meeting, the first round of public consultation about World Bank-financed Yugan County Water Environment Management Project was conducted. Consultations were made with affected residents on a brief introduction to the Project and its potential impacts on the environment, and a common consensus was made. Subject matters of the meeting are hereby documented as follows:

①The chairperson introduced the attendees and distributed questionnaires.

②The EIA institutes introduced the purposes of public consultation:

Pursuant to requirements of PRC laws and regulations as well as management regulations and World Bank Operation Policy (OP4.01), two rounds of public consultation and information disclosure were conducted. The first round of public consultation was carried out after environmental issues were screened and before the terms of reference for EIA was finalized, mainly for informing affected residents of a brief introduction to the Project and its potential impacts on the environment; the second round was conducted when the draft EIA as finished, mainly for discussion about environmental issues or problems of public concern and their mitigation measures to get public's understanding of the construction and related mitigation

measures. The purposes of public consultation and information disclosure are to: disclose relevant project information to the project areas and the public who are concerned about the project, keeping the public informed of the project's main content, its implementation and operation features and significant environmental issues or problems related to the project; help assessment staff identify issues or problems, confirm that all significant environmental issues or problems triggered by the project have been analyzed and assessed in the EIA; confirm the feasibility of environmental protection measures and implementation of optimal measures. This is the first round of public consultation.

③The EIA institutes briefly introduced the project and its potential environmental impacts;

Through sewage interception of Pipa Lake, garbage collection and transportation, Pipa Lake aquatic ecological restoration and other non-engineering measures, the proposed project aims at reducing pollutants discharged in Poyang Lake basin. Impacts of the project on environment include those during the construction period and those the operation period. During the construction period, main impacts are temporary impacts of construction wastewater, dust, construction noise, etc on environment and sensitive spots. During the operation, impacts include odor generated in garbage collecting spot and dust.

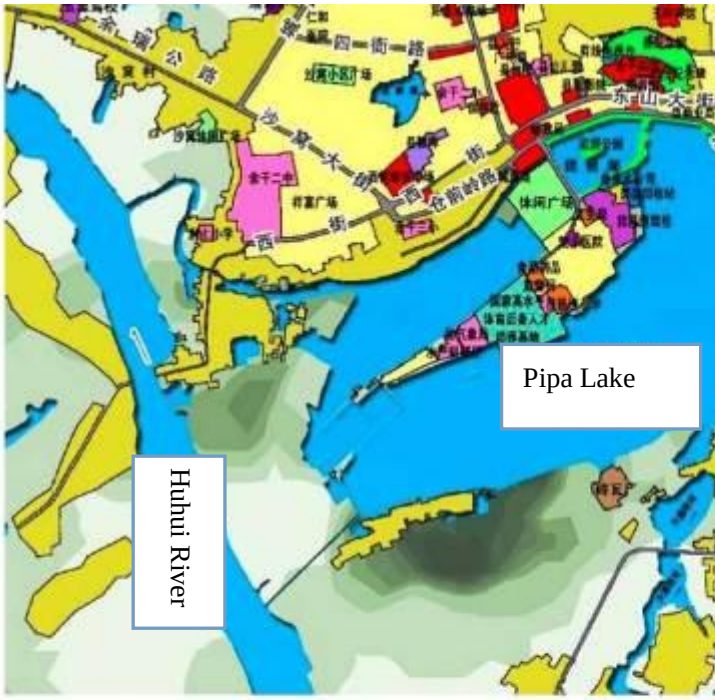
④Attendees spoke at the meeting: The public all support the project construction with no disagreement. At present, water quality of Pipa Lake is in a bad condition, and domestic wastewater is directly discharged into lake, causing a lot of garbage in the lake. Therefore, the construction is expected to start early and to complete as soon as possible.

⑤Response of the project owner and EIA institutes: thanks for public's understanding and support. The project will be further improved in its design and preparation work. Construction will be started early and completed as soon as possible.

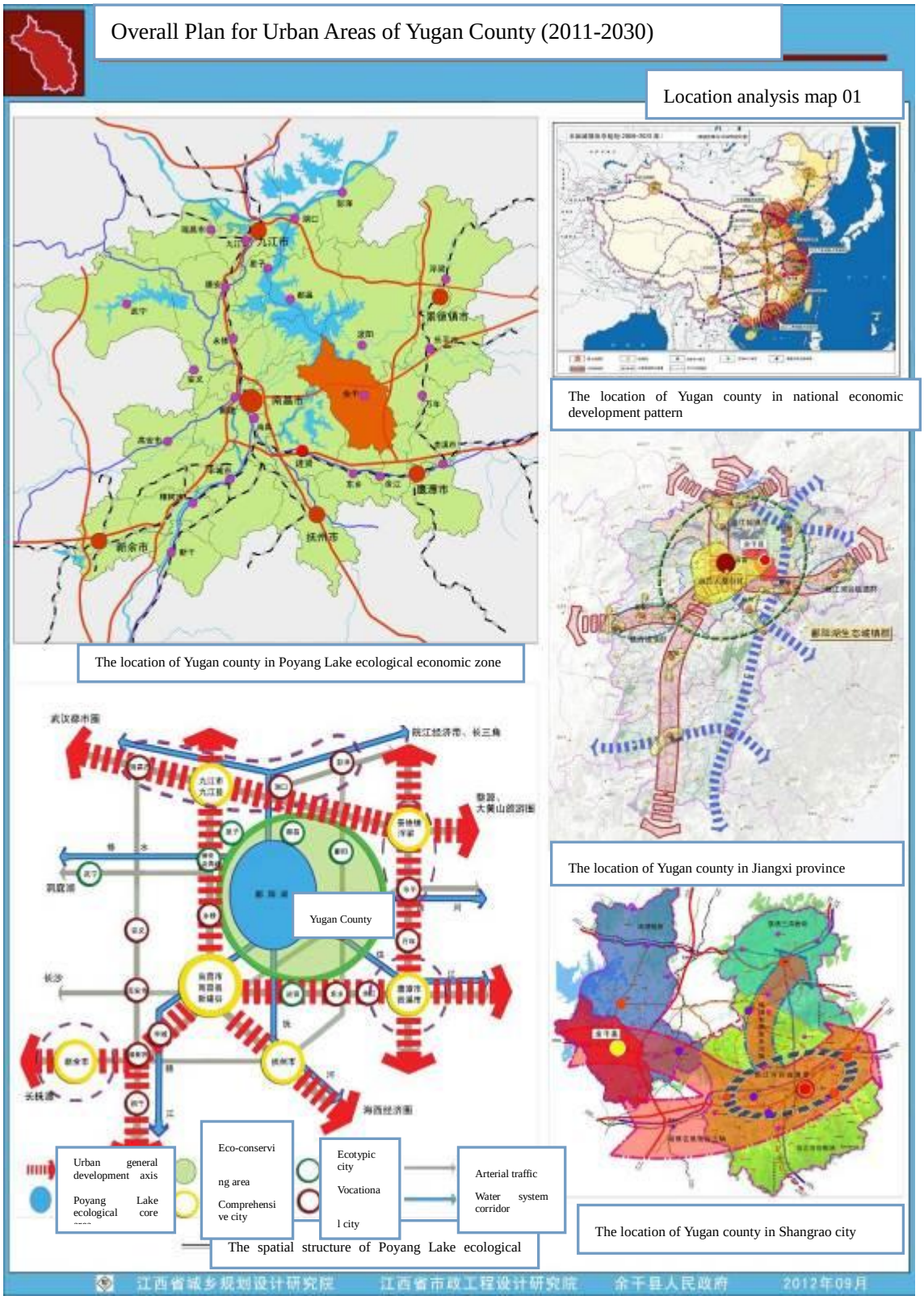
⑥Last, the chairperson summarized the content and the meeting was over.

Picture 1 Discussion Meeting Pictures of Yugan County

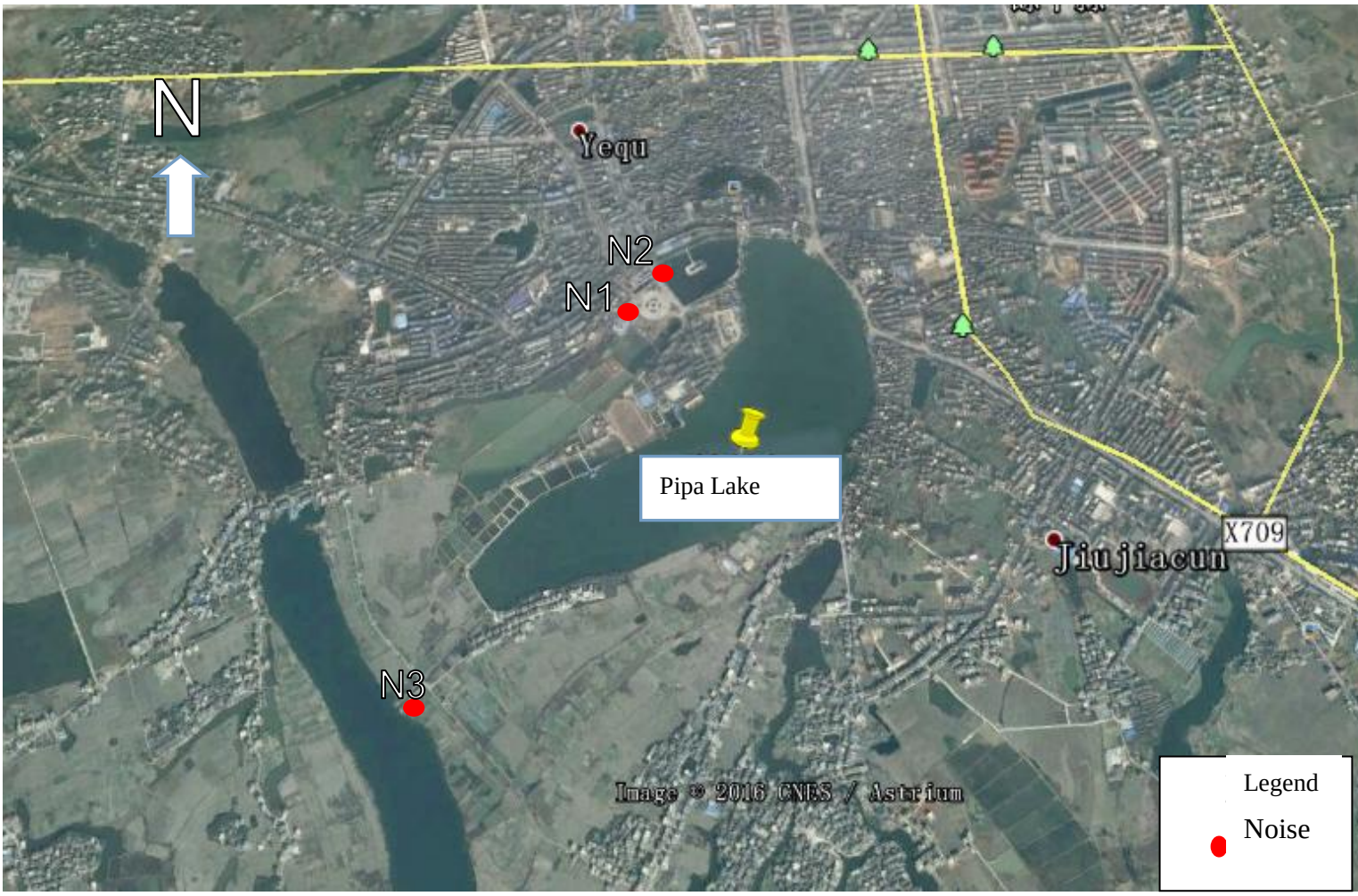
Map I: Geographic Location of Project



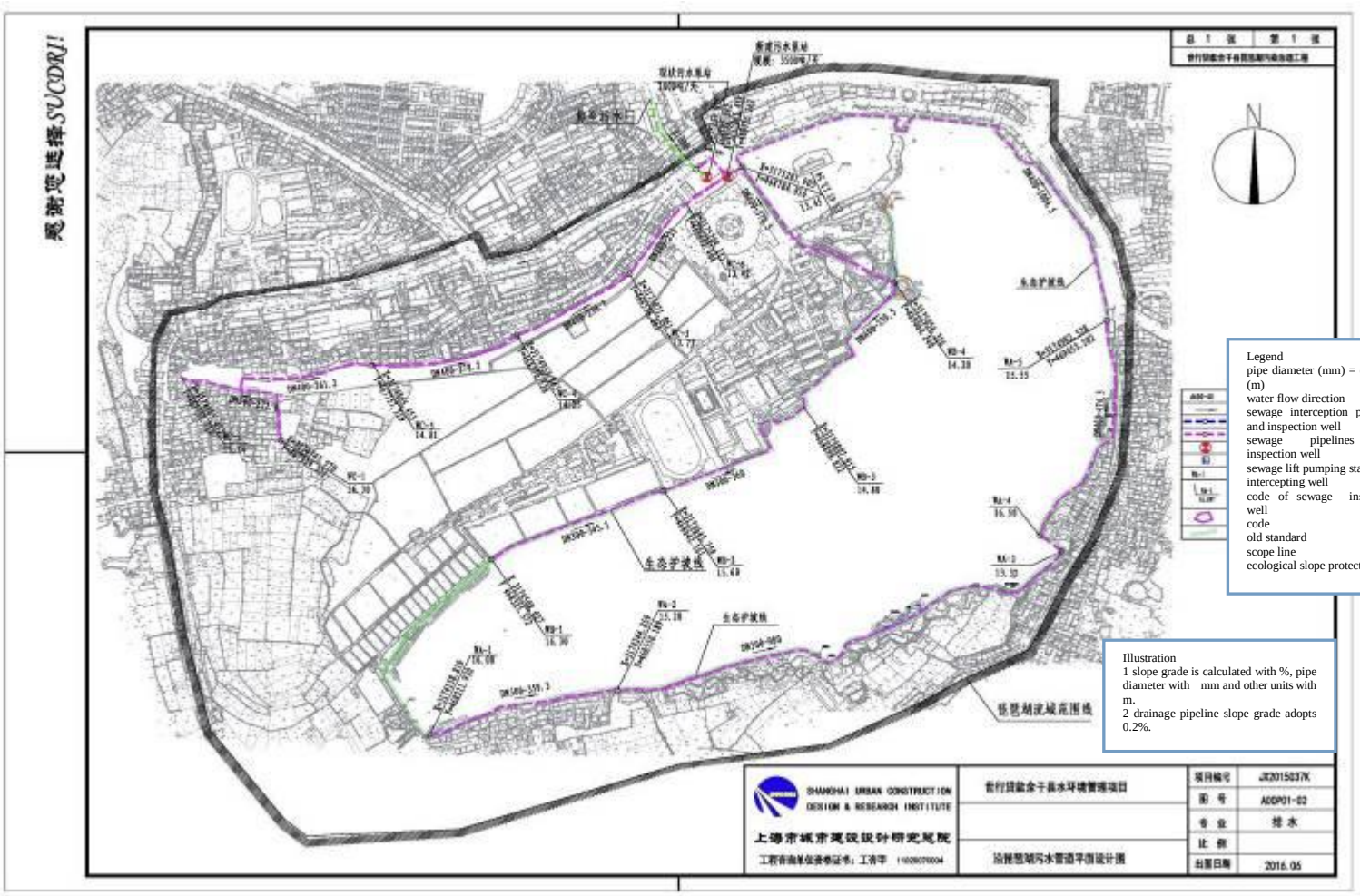
Map II: Master Plan of Yugan County



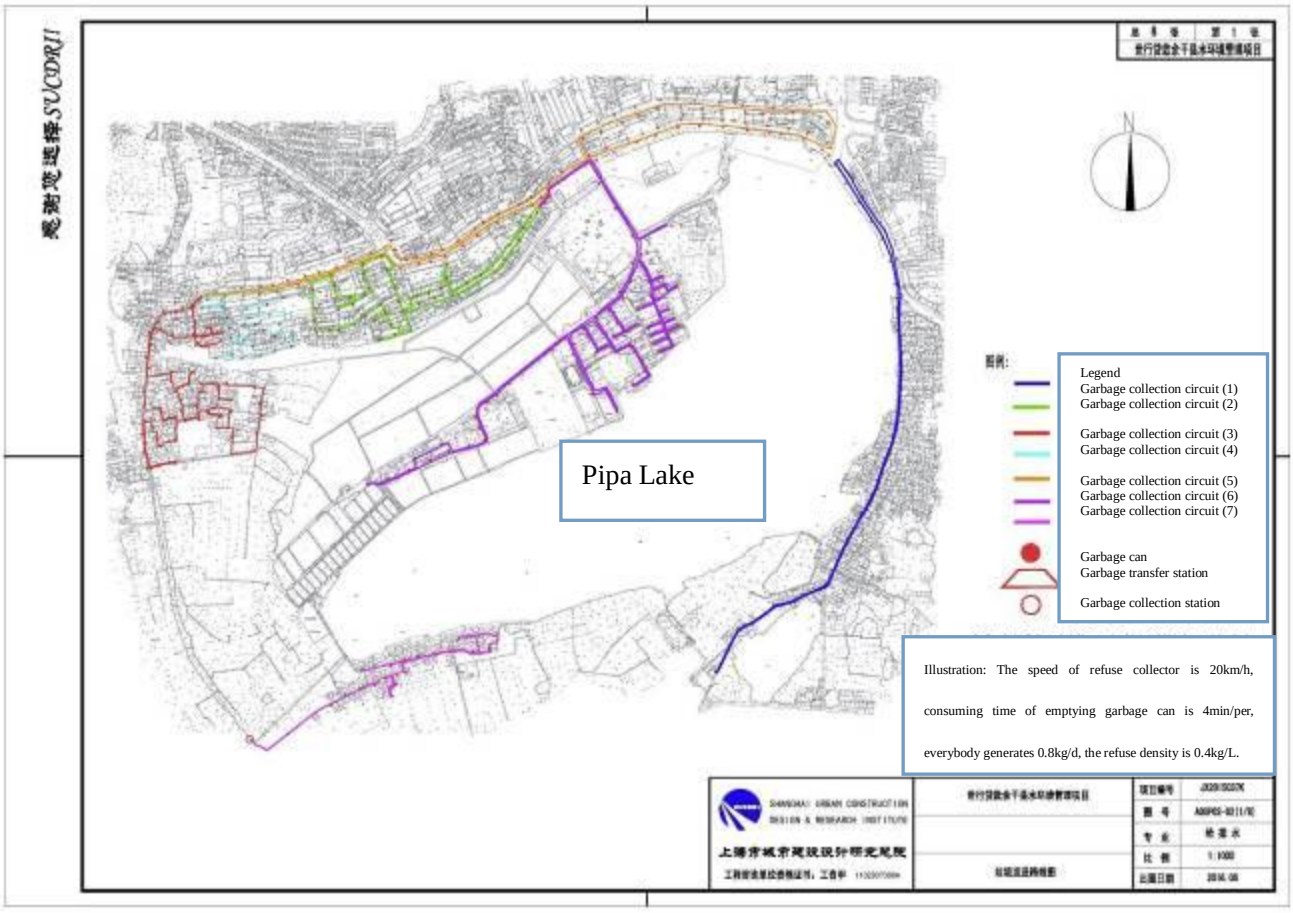
Map III: Distribution of Monitoring sites



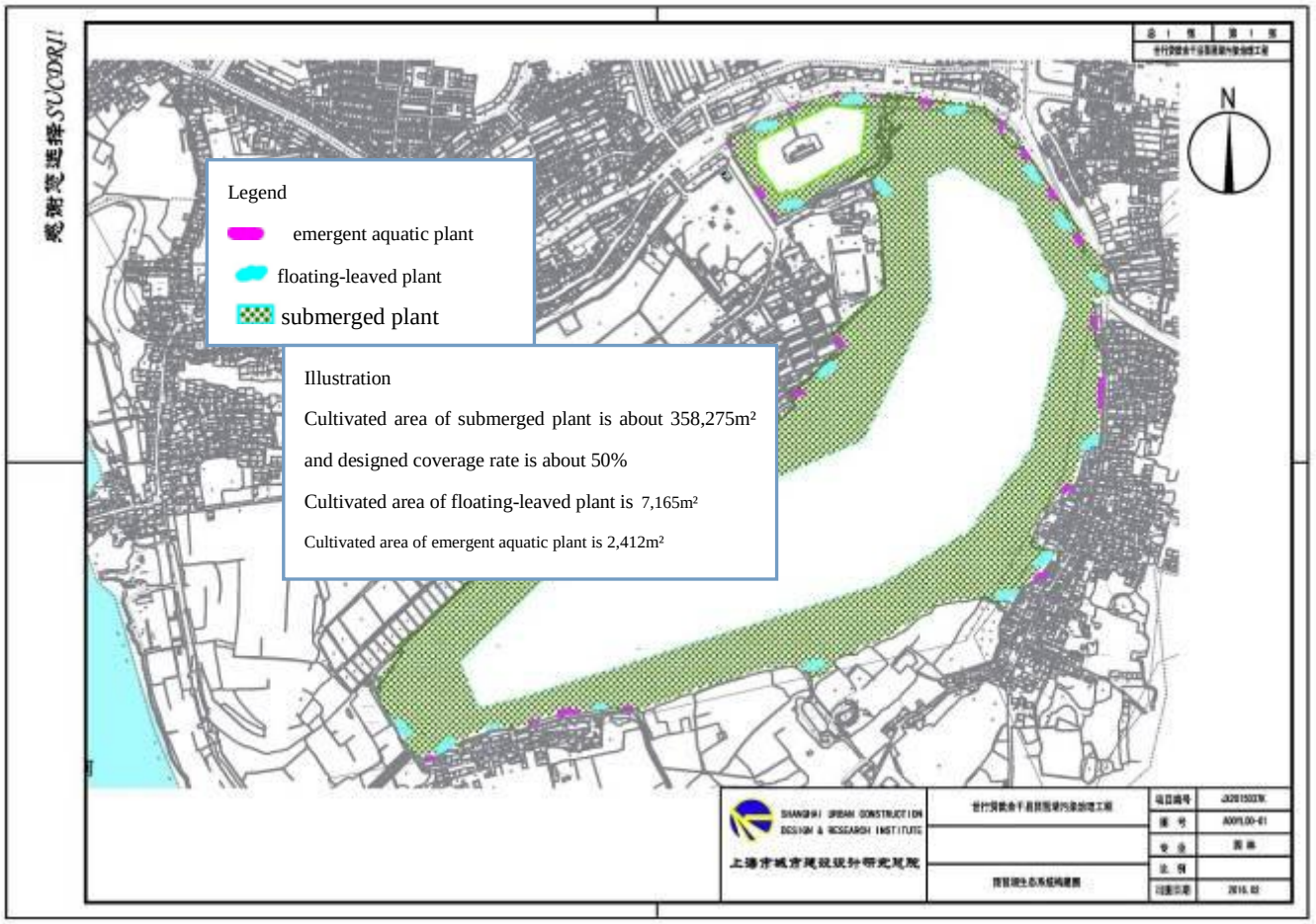
Map IV: Plane Layout of Sewage Pipeline Network



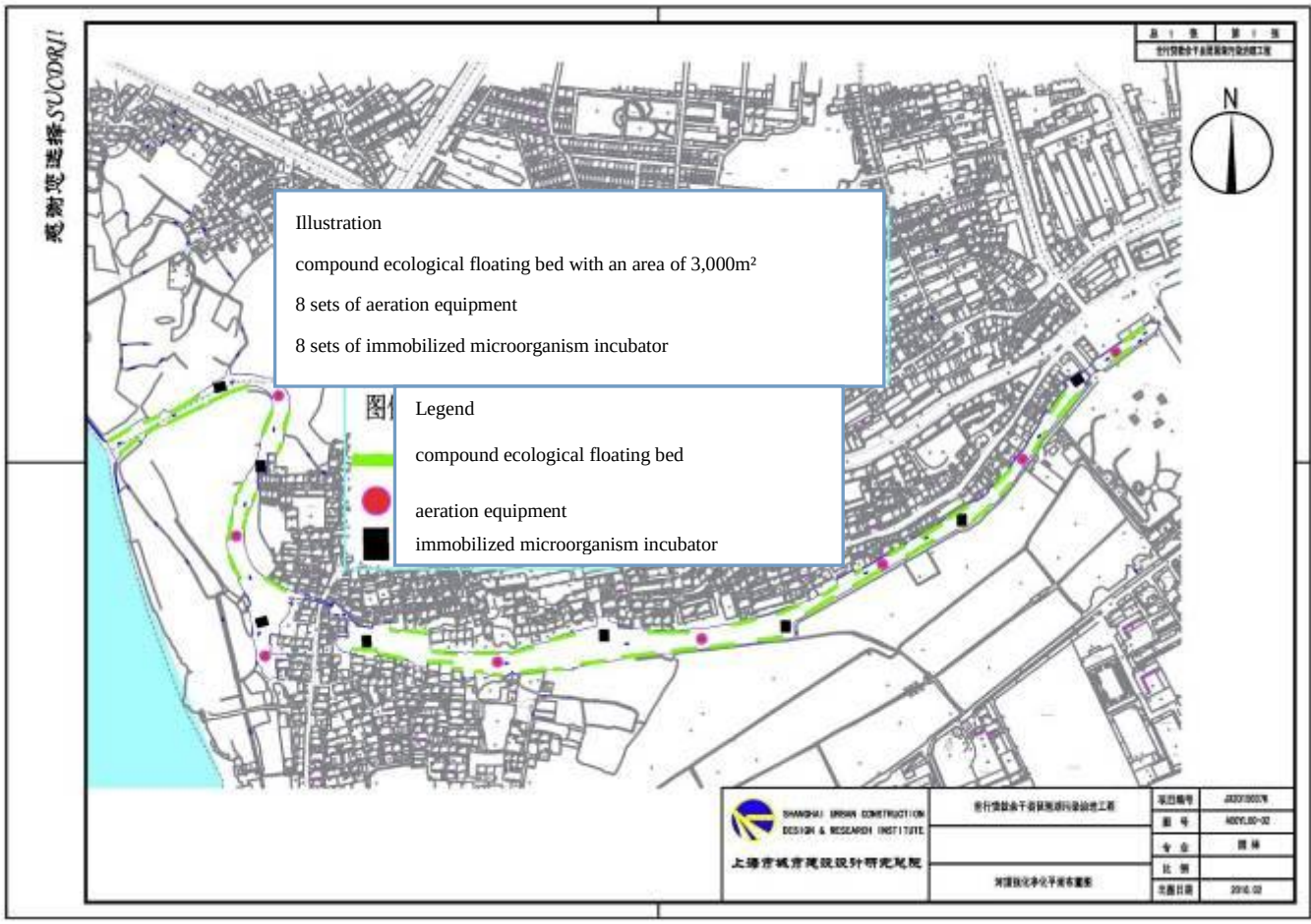
Map V: Map of Garbage Collection and Transfer Routes



Map VI: Component Diagram of Ecological System of Pipa Lake



Map Ⅶ: Plane Layout of Water Purification System



Map Ⅷ: Plane Layout of Ecological Slope Protection