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World Bank- APL3 Shanghai Urban Environment Project

Shanghai District Financing Vehicle (DFV) Subproject--

Minfeng Raw Water Conveyors Project

Environmental Assessment Executive Summary

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1 Introduction

The environmental assessment executive summary summarizes the potential environmental and social impacts of World Bank Loan Project—Minhang-Fengxian Raw Water Conveyors Project of APL3 Shanghai Urban Environment Project (hereinafter referred to as Minfeng Line Project). Minfeng Line Project shall be prepared and constructed synchronously with Jinze Reservoir Project of Upper Huangpu Raw Water Intake System project (hereinafter referred to as Jinze Reservoir Project) and Pipe Routing Project of Upper Huangpu Raw Water Intake System project (hereinafter referred to as Pipe Routing Project) and its normal operation will depend on the construction and operation of these two upper projects, therefore, the report also summarizes the environmental and social impacts of these two projects. At present, Environmental Impact Assessment Report of these three projects has been approved by Shanghai Environmental Protection Bureau and meets the procedure requirements for environmental assessment of domestic construction project. The report includes key environmental and social security matters related to construction and operation of these three project above, describes main findings and conclusions of environmental assessment and summarizes main protection measurements.

Jinze Reservoir Project is located in Qingpu County, southwest of Shanghai City; Upper Pipe Routing Project is located in Qingpu and Songjiang District, starting from Water Conveyor Pumping Station of Jinze Reservoir and ending at Minfeng Diversion Chamber and connected with Minfeng Line.Starting point of Minfeng Line Project is the section connecting with Minfeng Diversion Chamber of the Pipe Routing Project, divided into Minhang Conveyor and Fengxian Conveyor. Considering potential environmental and social impacts. The project is listed as Class A project. The owner has engaged an environmental assessment unit, Shanghai Investigation, Design & Research Institute which have Grade A qualification to make comprehensive environment assessment. Also Shanghai Academy of Environmental Sciences has prepared an Environmental Management Plan. Security polices of the World Bank applicable to the project include: (1) OP4.01 Environmental assessment; (2) OP4.04 natural habitat; (3) OP 4.37 dam safety; (4) involuntary resettlement.

According to the design of Shanghai Urban Environmental Project (APL2 and 3)，DFV is responsible for development and implementation management of Minfeng Line Project. In accordance with social and environmental security system prescribed in DFV manual, DFV is responsible for and has carried out an assessment for the project as well as has submitted an assessment report to the World Bank. During project implementation period, environmental and social monitoring and report of DFV will cover Minfeng Line, Pipe Routing Project and Jinze Reservoir project. SHANGHAI CHENGTOU RAW WATER CO.LTD, as the owner of these three projects, will accept DFV’s supervision and be responsible for implementation of Environmental Management Plan.

Environmental Impact Assessment Report and Environmental Management Plan are both in line with security polices of the World Bank and its EHS requirements. Completed Environmental Impact Assessment Report of Minfeng Line Project has been announced on website of Shanghai Environment Online on June 16, 2014; and completed Environmental Impact Assessment Reports of Jinze Reservoir

Project and Pipe Routing Project have been also announced on website of Shanghai Environment Online on August 26, 2014 and August 4, 2014 for public notice.

The environmental assessment executive summary is prepared on the basis of conclusion and suggestions of Environmental Impact Assessment Report, Environmental Management Plan and resettlement action plan. Implementation of Minfeng Line Project is in line with overall plan of Shanghai City that has been examined and approved by State Council and will contribute a lot to urban development and environmental protection. The project is designed to strengthen the protection of Upper Huangpu Raw Water Intake System, improve security capacity of Minhang and Fengxian Water Source, improve raw water quality and get obvious environmental benefits

Environmental assessment executive summary comprehensively assesses the potential environmental and social impacts related to construction and operation of Minfeng Line Project and environmental and social impacts of associated projects. During project implementation, some adverse impacts may occur, mainly including land acquisition and resettlement during construction and direct impact led to local region by construction. In order to further ensure implementation of environmental protection work and mitigation measures, separate Environmental Management Plan is prepared, in which sufficient mitigation measures are established in order to avoid, reduce, mitigate or offset social and environmental impacts. Professional institute shall supervise, monitor and manage the environmental work of Minfeng Line.

Public investigation shows that most of the impacted people have a positive attitude towards the project and they believe that implementation of the project will improve local water environment quality, raise living standard and promote economic development. The negative opinions on the project is mainly the concern about environmental pollution during construction. The project owner has established environmental mitigation measures in order to solve the public concern.

2 Project Background and Description

In the overall urban planning of Shanghai City, Shanghai City is defined as China's important economic center and shipping center as well as a national-level historical and cultural city, and it will gradually become a socialist modern cosmopolis and one of international economy, finance, trade and shipping center. While reflecting the functional requirement of a city of international economy center, the planning also puts forward sustainable development strategy to promote harmonious development of economy, society, population, resources and environment and people-oriented principle to create good living, working, study and entertainment environment for citizens.

Basic pattern of water supply source of Shanghai City is four centralized water sources of drinking water including Qingcaosha in Yangtze River, Chenhang, Dongfeng Xisha on Chongming Island and Upper Hangpu Intake System. According to location condition of each water source, intensive raw water supply of the city is achieved in the principle of urban and rural overall development, proximity, mutual connection and safety & reliability.

Upper Huangpu Raw Water Intake System is one of the four water sources of Shanghai City and its current supply scope includes Qingpu, Songjiang, Jianshan, Fengxian and Minhang (partial) region, of population of about 6 million; its location is also very important. However, because Upper Huangpu Raw Water Intake System is at lower reach of Taihu Basin and in an open, mobile and multi-functional water area and it may be polluted by upland water and impacted by local pollutant discharge, navigation and other factors, there are some problems such as unstable raw water quality and weak ability of responding to sudden water pollution accidents, etc. To improve security degree of raw water supply of upper Huangpu River, in the planning of Shanghai City, six existing intakes in Upper Huangpu River including Songpu, Minhang, Fengxian, Jinshan, Songjiang and Qingpu are merged into newly built Jinze Reservoir of Taipu River and original Songpu Intake, to form Pipe Routing Project of Upper Huangpu Raw Water Intake System with "one line, two points and three stations", that is, one master conveyor line (connecting Taipu River Jinze Reservoir and Songpu Raw Water Plant), two Concentrated (water) Intake Chamber (Taipu River Jinze and Songpu), three raw water lift pumping stations (Qingpu, Songjiang and Songpu Raw Water Lift Pumping Station), so as to make interconnection and interflow both forward and reverse. At the same time, at Jinze Area at north bank of Taipu River, a small ecological regulating reservoir is built with existing lakes in order to strengthen centralized protection of water source, stabilize water quality, form a system pattern of "reservoir regulating and raw water connection" and improve the ability of responding sudden water pollution accident.

Now water source pattern of Minhang and Fengxian is basically of "one district with one intake"; the water intake is at Huangpu River and with relatively poor emergency response capacity, so it is difficult to completely avoid sudden water pollution accidents. Moving Minhang and Fengxian Raw Water Intake up to Jinze Reservoir and conveying raw water from Jinze Reservoir through newly built routing pipes and Minfeng conveyor is not only helpful to solve closed-off management of Grade I water source conservation area of drinking water at Upper Huangpu Intake, carry out the requirements of *Protection Provisions of Shanghai City for Drinking Water Source*, but also helpful to improve water security

capacity of Minhang and Fengxian.

Starting point of Minfeng Line Project is the section connecting with Minfeng Diversion Chamber of Pipe Routing Project; Fengxian raw water is directly conveyed to newly built Fengxian pressure regulating tank through DN3000 pipes of the project at south bank of Huangpu River and raw water supplied for Minhang District will first pass Huangpu River through DN3000 river-crossing pipes and then be supplied to newly built pressure regulating tank of Minhang through DN2600 pipes at north bank of Huangpu River. See Table 2-1 for basic information of the project and associated project and see Fig.2-1 for project location. See Fig.2-2 for line direction of Minfeng Line Project.

Table 2-1 Basic Information of Minfeng Line Project and Associated Projects*

Project name	Project content	Capital source
Minfeng Raw Water Conveyors Project of Upper Huangpu River	Raw water conveying scale: 1.95 million m^3/d; Conveying scale of Minhang conveyor scale: 1.10million m^3/d; Conveying scale of Fengxian Conveyor scale: 0.85 million m^3/d; DN2600 raw water pipe of Minhang Conveyor: 2.3km; DN3000raw water pipe of Fengxian Conveyor: 10.117km; Volume of newly built pressure regulating tank of Minhang:13500m^3, effective volume: 11100m^3; Volume of newly built pressure regulating tank of Fengxian:11580m^3, effective volume: 9180m^3; Permanent land: 13719 m^2.	Some capitals are supported by World Bank Loan.
Jinze Reservoir Project of Upper Huangpu Raw Water Intake System	Scale of water supply: 3.51 million m^3/d; Total reservoir capacity: 9.10 million m^3, capacity of standby reservoir: 5.25 million m^3; Reservoir water area: About 1.90km^2, total dam length: 6356m, dam crest elevation:5.00m; Total diversion channel length: About 1.5km, bottom elevation: -2.0m, bottom width: 58m, mouth width: 100m; Net width of intake gate opening: 28m, net width of central hole	Not supported by World Bank Loan

* All the data of Table 2-1 are from of *Minfeng Raw Water Conveyors Project of Upper Huangpu Raw Water Intake System Feasibility Study Report, Jinze Reservoir Project of Upper Huangpu Raw Water Intake System Feasibility Study Report* and *Pipe Routing Project of Upper Huangpu Raw Water Intake System Feasibility Study Report.*

Project name	Project content	Capital source
	(navigation hole): 16m; each hole on both sides: 6m; Scale of conveying PS: 3.51 million m^3/d, building area: About 10524m^2; Total project land: About 2.7km^2, including water area of about 2.15km^2.	
Pipe Routing Project of Upper Huangpu Raw Water Intake System	Raw water conveying scale: 3.51 million m^3/d; DN4000raw water pipe 18.2km; DN3800raw water pipe 15.9km; DN3600raw water pipe 7.7km; A newly-built intermediate booster pump (design scale 2.40 million m^3/d); Coverage of Newly-built Qingpu Diversion Chamber: 0.4hm^2; Coverage of newly-built Songjiang Diversion Chamber: 4.71 hm^2; Coverage of newly-built Jinshan Diversion Chamber: 0.42 hm^2; Coverage of newly-built Minfeng Diversion Chamber: 0.5 hm^2; Total project land: About 6.03 hm^2.	Not supported by World Bank Loan

Fig.2-1 Geographical Location of Proposed Project

Description:

The project mainly includes:

1. Connect pipeline works of Minfeng Conveyors and Songpu Raw Water Plant;
2. The raw water pipeline of Minhang direction adopts DN2600 steel pipe, pipe-jacking construction, about 2300m with 4 pipe jacking wells.
3. The raw water pipeline of Fengxian direction adopts DN3000 steel pipe, pipe-jacking construction, about 10117m with 17 pipe jacking wells.
4. 1 set of pressure regulating tank and ancillary facilities, pressure regulating tank with connection works between intake pumping room suction wells shall be set respectively on the water points of Minhang and Fengxian.

Fig. 2-2 Line Direction of Minfeng Line Project

3 Regulatory Framework Analysis

Environmental impact assessment of the project conforms to China's laws and regulations of environmental impact assessment and security polices of the World Bank, this chapter will describe the compliance of China's regulations and policies of the World Bank.

3.1 Requirement of Safety Guarantee Policies of the World Bank

Among ten safety guarantee policies of the World Bank, the project involves: (1) OP/BP4.01 environmental impact assessment; (2) OP/BP 4.04 natural habitat; (3) OP 4.37 dam safety; (4) OP/BP4.12 involuntary resettlement and the project meets all the above polices, at the same time, information announcement of the project conforms to the policies of the World Bank about information disclosure, as shown in Table 3-1.

Table 3-1 Analysis on Applicability of Minfeng Line Project to World Bank Policies

Security polices	Applicability	Remarks
OP/BP 4.01 environmental impact assessment	**Yes**	According to OP4.01 classification of the proposed project, the project is an intake project and may impact water quality, water conservancy, ecological condition and other conditions of water source and areas along the pipeline, and the impact will last until project decommissioning, thereby, the project is of Class A, that is, "a project that may result in sensitive, versatile or significantly adverse unprecedented environmental impacts".
OP/BP 4.04 Natural habitat	**Yes**	The areas along the project are greatly impacted by human development and mostly forests, garden land, industrial land, large water area and other lands; the industrial area does not involve rare and endangered species and natural habitats.
OP 4.09 Pet management	No	Construction content of the project is raw water pipeline and will not cause diseases and insect pests to agricultural and people health.
OP 4.37 Dam safety	**Yes**	Construction of the project does not include dam, but the project uses water source of Jinze Reservoir, which is of a low dam and low acting head; maximum reservoir level is lower than or slightly higher than current ground elevation, beneficial to dam safety.

Security polices	Applicability	Remarks
OP4.11 physical cultural resources	No	No cultural relics are detected in the areas along the project, thereby, the project is not related to the policy.
OP/BP4.36 Forest	No	Along the project is countryside ecology, without forests, thereby, the project is not related to the policy.
OP/BP 4.12 involuntary resettlement	**Yes**	The RAP reports of this project and its associated projects have been prepared.
OD 4.20 national minority	No	Along the project there are no ethnic minorities.
OP 7.50 projects on international waterways	No	The project does not involve water channel and is completely in the territory of China, thereby, the project is not related to the policy.
OP/BP 7.60 disputed area	No	The project will not result in any international disputes and will neither result in regional regions.
EHS of the World Bank, Guidance of water and sanitation industry	Yes	This project belongs to treatment and distribution system of drinking water, the impact of the project on surface water environment is mainly reflected in the construction period, pollutants in wastewater include pH, SS and petroleum, and more attentions shall be paid to surface water protection.

3.2 Domestic Laws and Regulations

Environmental impact assessment document is completely prepared according to domestic laws, regulations, guidelines and procedures. See Table 3-2 for compliance summary of domestic regulations related to the project.

Table 3-2 Analysis on Compliance of Minfeng Line Project to Domestic Laws and Regulations

Name of laws	Compliance
Environmental Protection Law of the People's Republic of China	In the Environmental Impact Assessment Report, potential environmental pollutions are assessed and corresponding mitigation measures are established.

Law of the People's Republic of China for Environmental Impact Assessment Report	① A qualified unit of Environmental Impact Assessment Report is authorized to prepare Environment Impact Assessment Report and the report has been approved by Shanghai Environmental Protection Bureau. ② An announcement shall be made around surrounding towns, villages and on Minhang Newspaper, Fengxian Newspaper, Songjiang Newspaper and Shanghai Environment Online for public notice, and questionnaire survey shall be made on public participation.
Notice on Strengthening Environmental Impact Assessment Report Management of Loan-based Construction Project of International Financial Institution	Environmental Impact Assessment Report and Environmental Management Plan have been prepared according to the security policies of the World Bank.
Provisional Regulations on Public Participation in Environment Impact Assessment Report	An announcement shall be made around surrounding towns, villages and on Minhang News, Fengxian News, Songjiang News, Shanghai Environment Online, and questionnaire survey shall be made on public participation.
Water Pollution Control Act of the Republic of China	Mitigation measures for water environmental impact have been proposed in Environmental Impact Assessment Report.
Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise	Mitigation measures for noise environment impact have been proposed in Environment Impact Assessment Report.
Enforcement Regulations for Law on Prevention of Air	Mitigation measures for environmental air impact have been proposed in Environment Impact Assessment Report.

Pollution of the People's Republic of China	
Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes	Mitigation measures for solid wastes impact have been proposed in Environment Impact Assessment Report.
Regulations of Shanghai on Drinking Water Source Protection	Engineering contents of the project in Grade II water source conservation area of Upper Huangpu drinking water source mainly include construction of pipeline work, Minhang, Fengxian pressure regulating tank and corresponding auxiliary facilities; during the project operation, no pollutants are emitted, construction camp and temporary site are all set beside Grade II water source conservation area of drinking water during the construction period, and the above engineering construction contents are all not in the scope forbidden in the *Regulations*.

4 Alternative Comparison Analysis

4.1 Non-active Alternative Analysis

In the Environmental Impact Assessment Report of Minfeng Raw Water Conveyors Project of Upper Huangpu, alternative analysis is made for existence of water supply alternative from the point of environmental benefits & losses and social economy, and the analysis results are as shown in Table 4-1.

Table 4-1 Non-active Alternative Analysis of Water Supply Project

Class	Implementation of the project alternative	"Without project" alternative (non-active Alternative)
Major Advantages	*(1) Conform to relevant provisions of Overall Urban Plan of Shanghai (1999-2020), Professional Water Supply Plan of Shanghai, Planning of Water Environment Function Areas (Revision), Regulations of Shanghai on Drinking Water Source Protection (December 2009) and Planning of Upper Huangpu Raw Water Intake System.* *(2) Further improve the security requirements for Minhang and Fengxian raw water supply, improve raw water quality and safeguard physical health of community residents.* *(3) Further strengthen the protection of Upper Huangpu Raw Water Intake System and implement the requirements of Regulations of Shanghai on Drinking Water Source Protection.* *(4) After construction of the project, move the intake position up to Jinze Reservoir Intake of Taipu River, take existing intake as standby intake, establish a double-intake pattern in Minhang and Fengxian District, which is helpful to improve the capacity of Minhang and Fengxian in responding to sudden intake accidents and improve raw water supply security of Minhang and Fengxian.*	(1) Maintain the present situation, for example, the vegetation will not be destroyed. (2) Make no changes in land use value (no land occupied, etc.) (3) Have no vegetation deterioration, dust and other environmental impact problems during construction period.

Class	Implementation of the project alternative	"Without project" alternative (non-active Alternative)
Major Disadvantages	(1) Permanent land of the project is about 13719m^2, equal to 20.6mu. (2) Vegetation may be destructed during construction period and dust may also raised. (3) Equipment noise generated during operation period may have adverse impact on environment.	(1) "One district, one intake" pattern is established for Minhang and Fengxian; once any pollution occurs, serious consequence may result in. (2) At the north bank of Minhang Intake of Huangpu there are many enterprises, on its south bank there is Shanghai Shipyard Songjiang Branch and at the north bank of Fengxian Intake there are some factories and wharfs of Shanghai Motor Factory and Shanghai Turbine Factory; it is hard to remove all buildings above. Therefore, it is hard to make Grade I protection for Minhang and Fengxian Intake and it is required to take other measures to solve the problem. (3) Water quality of Huangpu is not satisfying.
Comprehensive Analysis	From the point of society and environment, this alternative is better than non-active Alternative.	

From Table 4-1 it can be drawn that though environmental impact may not result from do-noting alternative, Minhang and Fengxian are basically of a raw water pattern of "one district, one intake" and with weak emergency response capacity; if any sudden water pollution accident, serious consequences may be generated, at the same time, around Minhang and Fengxian Intake there are many industrial enterprises, so it is hard to make Grade I water source protection and Minhang and Fengxian water supply quality of Minhang and Fengxian may suffer potential dangers. Through implementation of this alternative may result in certain environmental impacts, in which, except irreversible permanent land of 13719m^2, other impacts may be usually avoided and mitigated with corresponding environmental

protection measures, and environmental impacts during construction period are tentative while social and environmental benefits resulting from project implementation and operation are of a long term. Thereby, from the point of social and economic development and environmental protection, this alternative is better than non-active Alternative and construction of the project is necessary.

4.2 Water Supply Comparison

Minhang Intake is 2.3km away from Lower Songpu PS Intake of Huangpu. Fengxian Intake is about 10km away from Lower Songpu PS Intake of Huangpu. After completion of construction, Minfeng Line Project will use raw water from the Taipu Jinze Reservoir . According to water quality monitoring data of Shanghai Water Environment Monitoring Center (Shanghai Hydrological Station), Taipu Jinze's water quality was generally better than that of Songpu Section of Upper Huangpu in the period from 2006 to 2012 and various indexes were better than that of Class I~II of Songpu Section of Upper Huangpu. After construction of the project, Minhang and Fengxian Intake will use raw water of Jinze Reservoir, which will significantly improve raw water quality.

At the same time, after construction of the project, present intake will be used as a standby intake and Minhang and Fengxian will have a "double-intake" pattern, which will improve the capacity of Minhang and Fengxian in responding to sudden intake accidents and improve raw water supply security of Minhang and Fengxian.

4.3 Alternative Comparison Analysis of Water Conveyance System

① Introduction to Proposed Alternative of Minfeng Line Project

Alternative I: A header pipe is laid in Songpu PS and connected with Minhang Intake PS, Minhang Conveyor will be directly connected with outlet pipe of Minhang Intake PS and directly conveyed to water factories of Minhang without secondary lifting; and some water of Minhang Intake PS will then pass Huangpu and be supplied to Fengxian, then connected with absorbing well of Fengxian Intake Pump Room and supplied to water factories of Fengxian after secondary lifting.

Alternative II: Two pipes will be laid in Songpu PS and respectively used to supply water for Minhang and Fengxian Intake PS, led to Minhang Intake PS in parallel; then water of one pipe will be led to absorbing well of Minhang Intake PS and supplied to water factories after secondary lifting at Intake PS; and water of the other pipe will pass Huangpu through pump room of Minhang Intake, run into absorbing well of Fengxian Intake PS and then be supplied to water factories of Fengxian after secondary lifting.

Alternative III: Two pipes will be laid in Songpu PS and respectively used to supply water for Minhang and Fengxian Intake PS; water of one pipe is connected with absorbing well of Minhang Intake PS at north bank of Huangpu and supplied to water factories of Minhang after secondary lifting; and water of the other pipe will directly pass Huangpu from Songpu PS, led to absorbing well of Fengxian Intake Pump Room along south bank of Huangpu and then supplied to water factories of Fengxian after secondary lifting.

② System Alternative Comparison and Recommended Alternative

See Table 4-2 for environmental factors of each system alternative.

Table 4-2 Comparison of System Alternatives

Compared items	Alternative I	Alternative II	Alternative III
Location relation with drinking water source	Coverage of Fengxian pressure regulating tank is 6192m^2, which belongs to Grade II water source conservation area of drinking water source of Upper Huangpu. Raw water pipe of Minhang Conveyor is 1.0km and the remaining part of 14.1km is at Grade II water source conservation area of drinking water of Upper Huangpu.	Coverage of Minhang pressure regulating tank and Fengxian pressure regulating tank is 13639m^2, which belongs to Grade II water source conservation area of drinking water source of Upper Huangpu. Raw water pipe of Minhang Conveyor is 1.0km and the remaining part of 9.75km is at Grade II water source conservation area of drinking water of Upper Huangpu.	Coverage of Minhang pressure regulating tank and Fengxian pressure regulating tank is 13639m^2, which belongs to Grade II water source conservation area of drinking water source of Upper Huangpu. Raw water pipe of Minhang Conveyor is 1.0km, raw water pipe of Fengxian Conveyor is 1.467km and in Grade II water source conservation area of drinking water source of Upper Huangpu; and the remaining part of 9.95km is at Grade II water source conservation area of drinking water of Upper Huangpu.
Area of occupied watershed forest	6192m^2	13639m^2	13639m^2
Discharge of construction and	66505 m^3	55205 m^3	60005m^3

Compared items	Alternative I	Alternative II	Alternative III
production wastewater			
Water loss	Water loss of Minhang Conveyor is 3.8m and water loss of Fengxian Conveyor is about11.83m.	Water loss of Minhang Conveyor is 1.74m and water loss of Fengxian Conveyor is about 7.10m.	Water loss of Minhang Conveyor is 1.78m and water loss of Fengxian Conveyor is about 6.57m.

In Alternative I, pressure regulating tank occupies relatively small watershed forest and water source conservation area, but it will result in more construction and production wastewater and water losses. By comparing Alternatives II and III, it is drawn that pressure regulating tank of these two alternatives occupy equal drinking water source area and watershed forest area; the length of the pipeline passing the conservation area in Alternative II is 1.667km shorter than that in Alternative III and production wastewater generated in Alternative II is 4800 m^3 less than that in Alternative III. Considering that in Alternative II Minhang and Fengxian share a main pipe, if the main pipe accident happens, water supply of Minhang and Fengxian Conveyor will be completely stopped and result in significant social impact. From the point of water supply security, Alternative III (this alternative) is relatively reasonable.

4.4 Technical Process and Design Comparison

(1) Construction Methods

Pipe construction alternative includes slope excavation, support excavation, pipe jacking and shield. Different pipe construction alternatives may have different impacts on project investment, construction period, greening, pipeline relocation and environment. According to topography, geological conditions, pipeline caliber and other factors along the project and after technical and economic comparison, Minfeng Line Project will be constructed with the method of pipe jacking. And only the pipeline section from the pipe jacking well at the end to the pressure regulating tank at the water reception end is laid by support excavation, with length of about 50m.

Compared with slope excavation and support excavation, in pipe jacking construction, except working well and receiving well that need temporary ground excavation, other works need no ground excavation, instead, construction may be made by road crossing, railway crossing, river crossing or under buildings.In this way, temporary land use will be less, less social impact and costs will result from land acquisition and demolition, relatively large economic benefits will produced, adverse impact on ecological environment will be also mitigated, second plowing and vegetation recovery will be made for lands of different uses after completion of construction, so as to recover the ecological environment to its original appearance in short term and rapidly achieve ecological balance of the region. Compared with

shield construction, pipe jacking construction has the advantages of rapid construction progress and low costs. Therefore, it is environmentally reasonable to adopt full-line pipe jacking construction for pipeline construction of the project.

(2) Pipes

Minfeng Line Project is a long-distance water supply project, therefore, comparison and selection of water supply pipeshave great significance in assurance of project safety operation, investment saving and construction convenience.

Steel pipes, nodular cast iron pipes, PCCP pipes, prestressed concrete pipes and glass steel pipes are often used in water supply pipeline in urban water supply engineering and have their own applicable scopes and defects. Now, often minor-caliber nodular cast iron pipes are used, not many domestic factories produce large-caliber (DN>2200mm) nodular cast iron pipes and require relatively high price; steel pipes are widely used and with high anti-corrosive requirements; anti-corrosive engineering quality is directly related to the service life of water supply pipeline; glass steel pipes are also used more and more widely, relatively speaking, they are of thin wall and are flexible pipes, with relatively high foundation and backfilling requirements. To assure water supply security, caliber of prestressed concrete pipes will generally not exceed DN2000mm and their working pressure is generally 0.4～0.8MPa. for engineering with relatively large caliber, high working pressure and relatively large pipe break pipe, more attention shall be paid to security. PCCP pipes are relatively heavy and there are more difficulties in pipe transportation and installation, in addition, pipe base shall also meet relevant requirements.

According to actual condition of the project, steel pipes are selected as the pipes of the project. From the point of construction convenience, steel pipes can be constructed with non-excavation of pipe jacking by experienced personnel; steel pipes and their fittings can be produced in factory or on site, and they may be welded on site, with advantages of easy installation and less temporary land use. From the point of operation safety, steel pipes are processed with rigid welding technology, not easy to leak and relatively safe in operation; even though any leak, they can be rapidly repaired and easily maintained by adding steel plates internally as well as have less impact on underground water environment. Therefore, it is environmentally reasonable to select steel pipes in the project.

5 Environmental and Social Background

5.1 Natural Environment

5.1.1 Topography and Landform

The general trend of Shanghai land terrain is slightly tilt from East to West. The Dianmao depression in Dianshan Lake area in the west is the lowest point with the altitude of only 2m-3m; the two shores of Huangpu River to the east of Sijing, Tinglin and Jinwei is the plate edge highland with the altitude of about 4m; the region to the east of Pudong Qingongtang is coastal plain with the altitude between 4m-5m.

Minfeng Line Project involves in Songjiang District, Minhang District and Fengxian District. The related project mainly involves in Songjiang District and Qingpu District. In this area, the topographical condition is relatively uniform with the altitude of 3.5-5m.

5.1.2 Climate and Weather

Shanghai City belongs to subtropical oceanic monsoon climate, with the annual average temperature of the whole city being 17.2℃, the extreme minimum temperature of the whole city between -8.5℃--5.9℃, and the extreme maximum temperature of the whole city between 38.3℃-40.0℃. The average annual precipitation of the whole city is 1305mm. The annual sunshine duration of the whole city is 1779h.

The perennial prevailing wind of project area is Southeast wind. The annual mean maximum wind speed is 12m/s. May to October is the typhoon season. The city has two times of typhoon in average each year. The average temperature is 15.50℃. The average annual precipitation is 1078.1mm. The annual average sunshine is 1941.9h. The perennial frost-free period is about 230d.

5.1.3 Hydrology

Shanghai City is located at the estuary of Yangtze River and the East edge of Taihu Basin. The riverway (lake) area within the territory is more than 500km^2, with the river area ratio of 9%-10%; the length of riverway in the whole city is 20,000 km, with the river network density of 3km/km^2-4km/km^2. Within the territory, river alternates with lake and pond, and the water network interweaves with each other.

Main water area in project area is Huangpu River. Huangpu River originates from Dianshan Lake in Dianfeng, Zhujiajiao Town, Qingpu District, Shanghai City. Dianshan Lake takes in many inflows from the upstream Taihu Basin. The span of Huangpu River is about 113km, with the river width between 300-770m. The river network flow of Huangpu River is interacted by surface water runoff and downstream tide. The water resource is composed by local runoff, inflow of upstream Taihu Basin, downstream tidal water and confined ground water. The average annual total water resource is 56.264 billion m^3, among which, the surface water resource is 55.83 billion m^3, accounting for 99.2%; the groundwater resource is 434 million m^3, accounting for 0.8%. In surface water resource, the inflow of upstream Taihu Basin accounts for 17.9%; the local runoff accounts for 2.8%; and the tidal water accounts for 79.3%.

5.1.4 Underground Water

The underground water in shallow soil layer of project area belongs to phreatic water. Its water level dynamic change is mainly controlled by atmospheric precipitation and evaporation from land surface. The burial depth of underground water level is generally between 0.3-1.0m. The corresponding elevation is 2.8-3.2m. There is no big pollution source along the line, and there is no obvious pollution in surface water and underground water.

5.1.6 Natural Disaster

Located in the front end of Yangtze River Delta and middle latitude region of north latitude, under the influence of monsoon, Shanghai has a complex and varied climate frequently accompanied by catastrophic climate.

- Typhoon: The typhoon period is from July to September. The typhoon intensity will strengthen when the meteorological tide appears.
- Drought: Drought occurs in summer and autumn, having a history of more than 10 years.
- Hail: Generally occur between April and August, such as in 1971, 1975, 1977 and 1985.
- Tornado: Once occurred in autumn of 1956, 1962 and 1976, resulting in severe damage to the local.
- Earthquake: Project area is located in Kunshan-Huzhou seismic belt of Yangtze River Delta which has earthquake occasionally. The infrastructure construction of Shanghai adopts national level 6 anti-seismic standard.

5.2 Social Environment

5.2.1 Social and Economic conditions

Minfeng Line Project and its relevant project mainly involve in Minhang District, Fengxian District, Songjiang District and Qingpu District.

(1) Minhang District

Minhang District is located in central region of Shanghai City, with its shape similar to a "key". Minhang District is located in north latitude 31.05^{o} and east longitude 121.25^{o}. It connects with Xuhui District and Pudong new area in the east, borders on Huangpu River in the south and faces Fengxian District, borders on Songjiang District and Qingpu District in the west, and adjoins Changning District and Jiading District in the north. Hongqiao International Airport is located in the edge of district. The area of Minhang District is almost 372km^2. It has 9 towns, 3 streets, 1 municipal industrial park and a total of 138 Villagers' Committees and 379 neighborhood committees.

The area of Minhang District accounts for 5.86% of that of Shanghai, and the permanent resident population accounts for 10%. The regional GDP realized by the whole district is RMB148.308 billion, among which, the added value of secondary industry is RMB 93.954 billion, with an increase of 6.0% over the previous year; the added value of tertiary industry is RMB 54.178 billion, with an increase of

13.7% over the previous year. Minhang District realizes the total annual agricultural output value of RMB 444 million, among which, the output value of plantation is RMB 317 million, and the output value of animal husbandry is RMB 86 million.

Minhang District is a factory & enterprise district in Shanghai planned and developed in the early years. There are many large scale factories and enterprises in Minhang District. With the reform and opening up, lots of new and high-tech development zones are planned in the district. Some high-tech enterprises are settled down in new established development zone. Meanwhile, Minhang is also a population importing district. Lots of newly built residence communities are built in Minhang. Soon afterwards, people are settled down in Minhang. The regional business develops rapidly with the increase of regional population. Original environs area of Minhang has connected to central urban area and developed into a highly urbanized modern urban area.

In regional development, Minhang District implements park development strategy, forming a new park development pattern Minhang Economic & Technological Development Zone, Shanghai Xinzhuang Industrial Park, Shanghai Zizhu Science-based Industrial Park, Pujiang Hi-tech Park in Shanghai Caohejing Development Zone and Shanghai Caohejing Export Processing Zone with as the main body.

(2) Fengxian District

Fengxian District is located in the South of Shanghai City, borders on Pudong new area in the east, neighbors Jinshan District and Songjiang District in the west, adjoins Hangzhou Bay in the south, and faces to Minhang District in the north separated by the Huangpu River. It is 42km from People's Square--the center of Shanghai and 30km from Pudong International Airport. Having a river coastline of 13.7km and a sea coastline of 31.6km, it is a coastal city with beautiful landscape. The whole district has an acreage of 720.44km^2, and a regional agricultural acreage of 25794.5hm^2.

Fengxian District has 8 towns, 2 communities, 178 Villagers' Committees and 97 neighborhood committees.

The local financial revenue of Fengxian District is RMB 5.2 billion, with an average annual increase of 18.2%. The total output value of industrial enterprises with annual main business income of RMB 5 million and above is RMB 154.5 billion, with an average annual increase of 18.5%. There are advanced manufacturing industry and modern service industry in the district. The rural income increases steadily. In 2011, the per capita disposable income (PCDI) of rural household reached RMB 14900, with a year-on-year growth of 13% which exceeded the increase of urban PCDI for many consecutive years. The total households of the whole district in household register were 202200 households. The total population in household register was 525300, with an increase of 1775 people over the previous year. Among which, the nonagricultural population was 350600, taking up 66.7% of total registered population, an increase of 5387 people over the previous year. The newly-born population in registered population was 3722, with the birth rate of 7.10‰. The death population was 3921, with the death rate of 7.48‰. The natural growth rate of population was -0.38‰. By the end of the year, the permanent resident

population was 1.1299 million, with an increase of 2.4% over the previous year.

(3) Songjiang District

Songjiang District is located in Yangtze River Delta, north latitude 31° and east longitude 121°14′, Southwest of Shanghai and upstream of Huangpu River. Songjiang District has a total area of 604.67km^2, taking up 9.5% of total area of Shanghai City. The whole district is wide in south and narrow in north. The North-South length is about 24km, and the East-West width is about 25km, slightly in trapezoid shape. The land area accounts for 87.91%, and the water area accounts for 12.09%. Songjiang District is located in Yangtze River Delta, north latitude 31° and east longitude 121°45′, Southwest of Shanghai and midstream & upstream of Huangpu River.

Songjiang District has jurisdiction over 11 towns, 4 streets and 1 park. The whole district has 182 neighborhood committees and 87 Villagers' Committees. It has national level export processing zones and municipal industrial zones, and is the development core transferring the strategic target of Shanghai to suburb in the "12th Five-Year Plan".

In 2012, the regional GDP realized by Songjiang District was RMB 88.655 billion, among which, the primary industry realized the added value of RMB 841 million, with an increase of 1% over the previous year; the secondary industry realized the added value of RMB 54.072 billion, decreasing 10.5%; the tertiary industry realized the added value of RMB 33.742 billion, increasing 3.9%.

At the end of 2012, the whole district had a total registered population of 588777, with an increase of 1.7% over the previous year, among which, the non-agricultural population was 494322, increasing 2.8%. It had a total permanent resident population of 1.6984 million, with an increase of 2.9% over the previous year. Among which, the external permanent population was 1.0483 million, increasing 4.5%; Shanghai household register population was 650100, increasing 0.4%.

Over the years, Songjiang District has actively promoted the non-agricultural employment of farmer, implemented and improved farmers' social security, and accelerated the continuous increase of farmers. In 2012, the annual PCDI of rural households was RMB 17769, increasing 11.1%. The income of farmer continuously increases.

(4) Qingpu District

Qingpu District is located in the west of Shanghai City, downstream of Lake Taihu and upstream of Huangpu River. It adjoins Minhang District in the east, borders on Songjiang District, Jinshan District and Jiashan of Zhejiang in the south, links with Wujiang District of Suzhou City, Jiangsu Province and Kunshan City of Suzhou, and borders on Jiading District.

Qingpu District has jurisdiction over 8 towns, namely, Zhaoxiang Town, Xujing Town, Huaxin Town, ChongGu Town, Baihe Town, Zhujiajiao Town, Liantang Town and Jinze Town, and 3 subdistrict offices, namely, Xiayang, Yingpu and Xianghuaqiao. There are a total of 88 neighborhood committees and 184 Villagers' Committees.

The whole Qingpu District has a total land area of 668.54km^2, taking up about one-tenth of total area of Shanghai City. Among which, the water surface area accounts for 18.6% of total land area of the whole district. By the end of 2012, the total permanent population of Qingpu District was 1.1698 million, including the external population of 692500; the total households of the whole district were 165615; the registered population was 465000, among which, the rural population was 342000, and the registered population density was about 696 people/km^2.

In 2012, the whole Qingpu District realized the regional GDP of RMB 71.808 billion, with an increase of 8.0% over the previous year. Among which, the added value of the primary industry was RMB 1.029 billion, increasing 4.5%; the added value of the secondary industry was RMB 41.303 billion, increasing 4.2%, and the industrial added value was RMB 39.785 billion, increasing 3.8%; the added value of the tertiary industry was RMB 29.477 billion, increasing 13.9%. In 2012, the proportion of three industries in the whole district was 1.4: 57.5: 41.4. The modern service industry oriented tertiary industry developed steadily. The whole year accomplished the fiscal revenue of RMB 24.278 billion, with an increase of 12.1% over the previous year. The whole year accomplished the tax revenue of RMB 23.24 billion, with an increase of 11.9% over the previous year. The income of urban and rural residents improves continually. In 2012, the annual urban PCDI was RMB 31274, with an increase of 11.1% over the previous year. The annual PCDI of rural residents was RMB 16381, increasing 11.8%. The growth of rural resident's income was in the front row of each suburban counties of the whole city.

In recent years, the project area is located in the water source conservation area of Shanghai City. The development of traditional breeding industry and industry, etc. in Qingpu is greatly restrained, total industrial output value is in continuously downtrend. The growth of economic aggregate, fiscal revenue and resident income, etc. in Qingpu District was relatively slow.

5.2.2 Transportation Network

(1) Minhang District

The land transportation of Minhang District is very convenient. G60 (original A8 Shanghai-Hangzhou) and G2 (original A11 Shanghai-Nanjing) Expressways, and 318 and 320 National Highways pass this district and lead to various provinces and cities in north and south. Construction projects such as "one longitudinal and three horizontals", S32 (original A15) Expressway and Minpu Bridge II and others are steadily implemented as per design schedule. In addition, Hongqiao International Airport directly borders on the district, only 12km to district government. Minhang District has developed subway transportation. Metro Line 1 passes through Xinzhuang Town (the location of district government) directly to the downtown and Shanghai Railway Station, and connects to Metro Line 2, Line 4 and Light Rail Line 3. The distance between Minhang and the People's Square is less than 35min. With the total length of more than 17km, Light Rail Line 5 stretches from Xinzhuang in the north, along the Humin Road to the south, and ends at Tianxing Road in Minhang Development Zone. There are a total of 11 stations. The one-way travel time of the whole line is about 30mins. Metro Line 9 was officially open to traffic on December 28, 2007. There are 4 stations within Minhang, namely, Zhongchun Road Station, Qibao

Station, Xingzhong Road Station and Hechuan Road Station. Metro Line 8 Phase II has a total of 12km within Minhang, and five stations are set, namely, Luheng Road Station, Pujiang Town Station, Jiangyue Road Station, Pujiang World Expo Home Station and Astronautical Park Station. In addition, Metro Line 12 starts from Gudai Road of Minhang District and ends at Pudong Caolu Town. It has about 6.6km within Minhang, and five stations are set, namely, Qishen Road Station, Hongshen Road Station, Gudai Road Station, Donglan Road Station and Hongmei Road Station. It is under construction now.

(2) Fengxian District

The transportation of Fengxian District is convenient, and the infrastructure is complete. Fengpu Bridge and Minpu Bridge II stretch over Huangpu River. Puwei Highway, Shanghai-Hangzhou Highway (Nanqiao Road, Jianghai Road), East Ring Road, Xinfengjin Highway (A4), South Hongmei Road Passage—Jinhai Highway, Linhai Highway, Hangtang Highway, South Extension Section (A3) of Luonan Avenue, Xinfeng Highway, Daye Highway, Dajin Highway (New Hangnan Highway, Original Qisi Highway), Nanfeng Highway, Pingzhuang Highway, Dating Highway and Haifang Highway, etc. constitute the nine-longitudinal and six-horizontal highway road. The density of highway has reached the level of developed countries. It links up Pudong new area in the east, and runs through Shanghai Chemical Industry Park in the west. It is 30 mins from Hongqiao Airport and 40 mins from Pudong International Airport. Fengxian District has developed water transportation. The mother river of Shanghai--Huangpu River flows through Fengxian District. Port of Jinhui runs north and south, getting through the lane from Huangpu River to Hangzhou Bay. Pudong Canal (Punan Canal) spans east and west of the district.

(3) Songjiang District

The land transportation of Songjiang District is very convenient. Main lines within the district such as Shanghai-Hangzhou High-speed Rail, Shanghai-Hangzhou Expressway (G60 Shanghai-Kunming Expressway), Huqingping Expressway (G50 Shanghai-Chongqing Expressway), Tong-San National Highway (G1501 Shanghai Ring Expressway), Jiajin Expressway (G15 Shenyang-Haikou Expressway) and Airport Expressway (S32 Shenjiahu Expressway) form a criss-cross road network. It is a core area linking Shanghai with the whole Yangtze River Delta and radiating to Yangtze River Basin. The successful operation of Light Rail Line 9 Phase I and Phase II also shortens the distance between Songjiang District and urban area. Songjiang is an important node in Shanghai-Hangzhou development axis and the southwest gate of Shanghai. It is also the linking of Shanghai with the whole Yangtze River Delta and radiating Qiaotoubao of Yangtze River Basin and the core area.

(4) Qingpu District

Qingpu District is located in the junction of Jiangsu Province, Zhejiang Province and Shanghai, and the heartland of China Yangtze River Delta economic circle, having the pivotal role of linking east & west, and the radiation effect on Eastern China. There is the first first-class highway in Shanghai suburb in the district---318 national highway (Shanghai—Lhasa Tibet). A9 Huqingping Expressway, A8

Shanghai-Hangzhou Expressway and A12 Shanghai-Nanjing Expressway in east & west direction, Suhong Highway linking Shanghai Hongqiao Airport with Suzhou run through the whole district. The north and south direction highway includes Tong-San National Highway, Waiqingsong Highway and Jiasong Highway. They form a criss-cross and dense land transportation system in Qingpu District and its surrounding area, which lays a solid foundation for a new round development of Qingpu. The water transportation advantage of Qingpu District is very obvious. Qingpu District has the golden waterways of Dianpu River and Taipu River which link with Huangpu River, and also has many channels above level 6 such as Maohejing, Shangda River, West Daying River, East Daying River and Youdungang. These channels connect to Suzhou River in the north and Dianpu River in the south. It is open to navigation to Jiangsu Province and Zhejiang Province, etc. There are 16 channels can navigate 500 tonnage vessel.

In addition to developed road transport system, the public transport within Qingpu District is also very convenient. There are more than 40 passenger special lines directly reaching each town within the district and crossing many districts and counties within Shanghai City, and 15 trans-provincial bus lines in the district. In addition, to adapt to accelerated development of Qingpu urbanization, four bus ring lines are opened in Qingpu District. The stations of ring line spread all over Qingpu District, which facilitates the transportation of residents in Qingpu District.

5.2.3 Infrastructure

The construction water of project area can be directly pumped from peripheral riverway. The domestic water can be sourced from the tap water network of nearby village. The construction electricity can be directly supplied by local grid after application.

5.3 Environment-sensitive Targets

(1) Environment-sensitive targets of surface water

In accordance with *The Notification on the Range of Shanghai Upper Huangpu, Qingcaosha, Chenhang and Dongfeng Xisha Drinking Water Source Conservation Area*, Minfeng Line Project is located in the range of upper Huangpu water source conservation area. Among which, Minhang regulating tank covers an area of 7447m^2, while Fengxian regulating tank covers an area of 6192m^2. Both of them are located in upper Huangpu Grade II drinking water source conservation area. The length of Minhang raw water pipe is 2.3km, and the length of Fengxian raw water pipe is 10.117km. Among which, 1.0km of Minhang raw water pipe and 1.467km of Fengxian raw water pipe are located in upper Huangpu Grade I drinking water source conservation area, and the rest part of the pipe is located in upper Huangpu Grade II drinking water source conservation area. The water quality executes *Environmental quality standard for surface water* (GB3838-2002) type II-III. Therefore, local water area of upper Huangpu drinking water source conservation area within assessment range is listed as the water environment-sensitive target of this Project.

In this Project， Minhang and Fengxian raw water intake will be transferred up to Taipu Jinze Reservoir intake. After the completion of project, the daily intake of Minhang and Fengxian intake will be ceased,

and they will serve as the emergency intake. With the designed water intake capacity of 5 million m^3/d, Songpu PS currently serves as the standby station of each water works of Yanqiao conveyor in Qingcaosha system. The water intaking scale of Minhang intake is 600000 m^3/d. A centralized intake will be set in south bank of Huangpu River main stream in Fengxian District, with the design scale of 550000 m^3/d. Therefore, Songpu raw Water Plant intake, Minhang intake and Fengxian intake are regarded as the water environment protection object. According to the investigation, besides the intake of this Project, there is no other intake along the line. The environment-sensitive target of surface water of this Project is shown in Table 5-1.

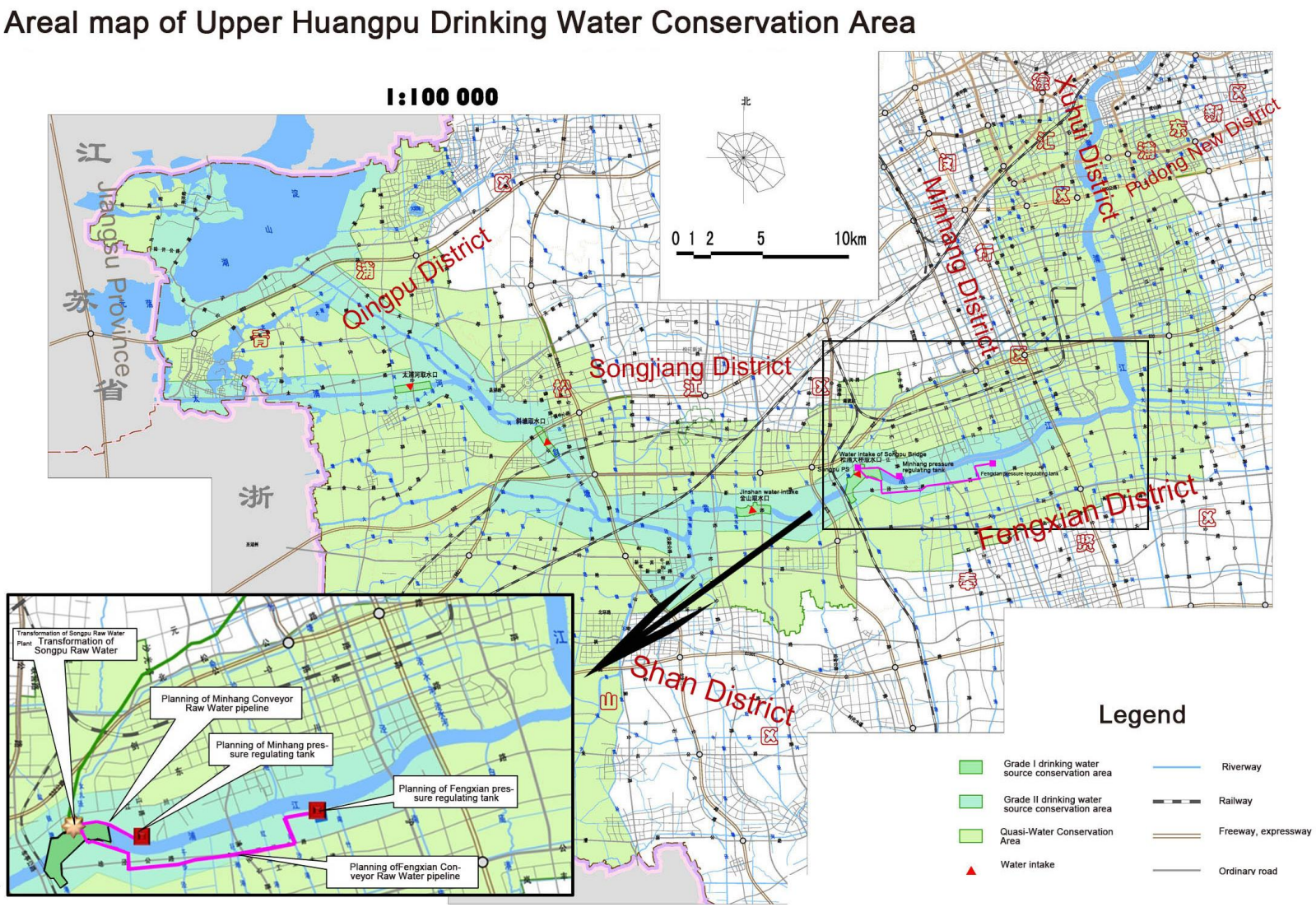


Fig. 5-1 Range of upper Huangpu drinking water source conservation area

(2) Environment-sensitive targets of underground water

Along Minfeng Line Project, there is no special underground water resource conservation zone (hot water, mineral water and hot spring, etc.) related to underground water environment and specified by the nation or Shanghai Municipal Peoples Government, nor underground water environment-sensitive target such as distribution area beside special underground water resource conservation zone.

(3) Air and sound environment-sensitive target

According to the investigation, within the Minfeng Line Project assessment range, the air and sound environment-sensitive targets are 22 residential areas such as Zhongfan residential district, Group II of Lianzhuang Village, Nanzhangjia and Beichao resident, involving 3 districts, 7 administrative villages and a total of 366 households. The sound environment-sensitive target along the line executes *Environmental quality standard for noise* (GB3096-2008) Class I, Class II and Class III standard. The ambient air quality of environment-sensitive targets executes *Ambient air quality standards* (GB3095-2012) Grade II standard. The air and sound environment-sensitive targets of this Project is shown in Table 4-1.

(4) Ecology-sensitive target

According to the investigation, Huangminfeng Line Project involves in Shanghai key wetland conservation area (Huangpu River riverine wetland). Therefore, the ecology-sensitive target of this Project is local water area of Huangpu River within assessment range.

Table 5-1 Summary sheet of environmental protection objectives of Minfeng Line Project

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
1	Lianzhuang village	Residential buildings in Zhongfan	About 36m north of Songpu Raw Water Plant, the minimum distance away from the project is about 48m	16 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period and operating period
2		Residential buildings in	About 121m northwest of Songpu Raw Water Plant, the	22	Acoustic environment	Sensitive targets

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
		Group II of Lianzhuang village	minimum distance away from the project is about 214m	households	Class I standard, atmospheric secondary standard	during construction period and operating period
3	Pengdu village	Residential buildings in Nanzhangjia	About 26m east of Minhang pressure regulating tank	27 households	Acoustic environment Class III standard, atmospheric secondary standard	Sensitive targets during construction period and operating period
4	Yanjing village	Residential buildings in Beichao	Southeast of JN2A pipe jacking working well, the minimum distance away from the construction site project is about 185 m	15 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
5		Residential buildings in Zhoujiabang (now named Zhoushan)	Southwest of JN2 pipe jacking receiving well, the minimum distance away from the construction site project is about 151 m	5 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
6		Residential buildings in Jinjiadai(now named	South of JN3 working well, the minimum distance away from the construction site project is about 16 m	12 households	Acoustic environment Class I standard, atmospheric	Sensitive targets during construction

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
		Jinshanwu)			secondary standard	period
7	Dongqin village	Residential buildings in Sunjiadai	Northeast of JN3 pipe jacking working well, the minimum distance away from the construction site project is about 102 m	18 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
8		Residential buildings in Fanjiadai	Northwest of JN4 working well, the minimum distance away from the construction site project is about 153 m	11 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
9		Residential buildings in Tangjiadai	West of JN4 working well, the minimum distance away from the construction site project is about 168 m	4 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
10		Residential buildings in Hujiazhai	North of JN5 receiving well, the minimum distance away from the construction site project is about 16 m	8 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
11	Xinye village	Residential buildings in	North of JN6 working well, the minimum distance away from	24	Acoustic environment	Sensitive targets

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
		Nanbang	the construction site project is about 38 m	households	Class I standard, atmospheric secondary standard	during construction period
12		Residential buildings in Jinjiazhai	Southwest of JN6 working well, the minimum distance away from the construction site project is about 172 m	10 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
13		Residential buildings in Silongtang	North of JN7 receiving well and JN8 working well, the minimum distance away from the construction site project is about 85m	11 households	Acoustic environment Class II standard, atmospheric secondary standard	Sensitive targets during construction period
14		Residential buildings in Majiatang	Northeast of JN8 working well, the minimum distance away from the construction site project is about 113m	30 households	Acoustic environment Class II standard, atmospheric secondary standard	Sensitive targets during construction period
15		Residential buildings in Fengjia	Southwest of N9 working well, the minimum distance away from the construction site project is about 91m	16 households	Acoustic environment Class II standard, atmospheric secondary standard	Sensitive targets during construction period

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
16	Yuli village	Residential buildings in Shijiabang	North, southwest and southeast of JN10 working well, south of JN11 receiving well, the minimum distance away from the construction site project is about 31m	34 households	Acoustic environment Class II standard, atmospheric secondary standard	Sensitive targets during construction period
17		Yangjiali	Southwest of JN11 receiving well, west of JN12 receiving well, the minimum distance away from the construction site project is about 98m	6 households	Acoustic environment Class II standard, atmospheric secondary standard	Sensitive targets during construction period
18		Residential buildings in Wujiazhai	Southwest of JN13receiving well, the minimum distance away from the construction site project is about 92m	15 households	Acoustic environment Class II standard, atmospheric secondary standard	Sensitive targets during construction period
19	Puxiu village	Residential buildings in Majiatang	East of JN12 receiving well, the minimum distance away from the construction site project is about 62m	7 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
20		Residential buildings in	Southeast of JN13receiving well, the minimum distance	40 households	Acoustic environment	Sensitive targets

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
		Ruijiali	away from the construction site project is about 33m		Class I standard, atmospheric secondary standard	during construction period
21		Residential buildings in Wangjiatang	South and southwest of JN14 receiving well, the minimum distance away from the construction site project is about 21m	20 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
22	Yanjing village	Chuantangfang	Southwest of JN1A receiving well, the minimum distance away from the construction site project is about 146m	15 households	Acoustic environment Class I standard, atmospheric secondary standard	Sensitive targets during construction period
23	Local water area of of Upper Huangpu Drinking Water Source Conservation Area		The pressure regulating tank of this project occupies about 13639 m^2 of Grade II drinking water source conservation area of Upper Huangpu Raw Water, the length of Minhang Raw Water Conveyors pipe and Minfeng Raw Water Conveyors pipe in Grade I drinking water source conservation area of Upper Huangpu Raw Water is abount 2.467km, the length in Grade I water source	—	Water environment protection class II~III, the key wetland protection area of Shanghai city	Protection targets during the construction period

S/N	Their administrative villages	Names	Relative relationship with Minfeng Line Project	The households within evaluation scope of 200m	Protection target category	Protection stage
			conservation area of Upper Huangpu Raw Water is abount 9.95km			
24	Intake of Songpu Raw Water Plant		Southwest of JB1 pipe jacking well of this project, about 200m	—	Water environment class II	Water environment protection target during the construction period
25	Minhang Intake		Southeast of Minhang pressure regulating tank of this project, about 227m	—	Water environment class III	Water environment protection target during the construction period
26	Fengxian Intake		Northeast of Fengxian pressure regulating tank of this project, about 350m	—	Water environment class III	Water environment protection target during the construction period

5.4 Surrounding Environment Quality

5.4.1 Surface Water Environment

The surface water have been monitored once in the area where the project is located during February to April in 2014, seven monitoring sections respectively set in intake of Jinze reservoir, Babaimu bridge,

Dingzhazha, Xiazixu,Sanjiaodu, Songpu Bridge and Liugang Bridge.

From the monitoring results of each section, the dissolved oxygen compliance rate of class II water is in the range of 25% to 88%, among the 7 sections, the dissolved oxygen compliance rate of class II water in the Dingzhazha and Xiazixu is higher, they are 88% and 82 %, the compliance rate of class II water in Liugang section is 25%, from Liugang to the Lower Songpu Bridge, the compliance rate of dissolved oxygen raised , up to 70%.

The ammonia nitrogen compliance rate of class II water is low, it is between 1% to 9%, among the 7 sections, the ammonia nitrogen compliance rate of class II water in Dingzhazha is the highest, it is 19%, the compliance rate of other sections are all less than 10%

The chemical oxygen demand compliance rate of class II water is between 1% to 43%, among the 7 sections, the chemical oxygen demand compliance rate of Class II water in Babaimu and Xiazixu section are the highest, they are 34% and 43%, the chemical oxygen demand compliance rate of class II water in dingzhazha is only 1%.

The total phosphorus compliance rate of class II water ranges from 0% to 75%, among the seven sections, the total phosphorus compliance rate of class II water in the upper Jinze, Babaimu and Dingzhazha sections are highest, they are 62%, 49 % and 75%, the total phosphorus indicators concentration of the 68 monitoring frequencies all fails to meet the limit value of class II water, the compliance rate of Pusong Bridge is only 1%.

The compliance rate of five days life oxygen demand of class II water ranges from 1% ~ 96%, the compliance rate range of class II water ranges from 52% to 100%, the volatile phenol compliance rate of class II water ranges from 78% to 100 %, the compliance rate of other indicators of class II water all reached 100%.

5.4.2 Groundwater Environment

According to the monitoring results of groundwater environment in the project area, the pH in dry season, Hg, Pb, Cd, As, Zn, Cr (hexavalent), volatile phenol, nitrate, chlorides, sulfates and Fe all meet the water quality level of groundwater class III, the permanganate index and ammonia nitrogen meet the water quality level of groundwater class IV. The nitrite detected in several wells and the total hardness is in water quality level of groundwater class V. The pH in wet period, Cr (hexavalent), Cd, Pb, As, Hg, Zn, volatile phenol, nitrate, permanganate index, total hardness, chloride and sulfate meet the water quality level of groundwater class III, nitrite, ammonia nitrogen and Fe meet water quality of groundwater class IV.

The relative high concentrations of ammonia nitrogen and potassium permanganate index in the groundwater of some point locations may relate to the water pollution of the surface water in this area. The relative high concentrations of nitrate may relate to that long-term use of nitrogen fertilizer and pesticides in the long history of agricultural activities of this field. The concentration of Fe and total hardness detected in the regional groundwater is generally high, the total hardness of some point

locations are in water quality of class V, this may relate to that the background level of Fe, Ca, Mg in the regional groundwater of phreatic layer is higher.

Generally, the groundwater environment quality of phreatic layer in the project is good, the main pollutants are nitrite and total hardness. The pollutant concentrations levels in the groundwater of dry season and wet season generally remained the same without any significant change.

5.4.3 Ecology environment

The land use type in the project area is relatively simple; the main land use types are agricultural land, water area, residential land, and industrial land. In the aspect of ecosystem composition, they are mainly agricultural ecosystems, plantation ecosystem, near-natural forest ecosystems, river ecosystem. All the ecosystems in the area highly affected and managed by human activities, but because this area is located in the water source conservation area, the conservation degree and vegetation coverage is high, the water quality in the river is relative good, and the overall community structure is complete, the ecosystems are well developed. Although the natural system restore stability in this area is relative weak and the impedance stability is not high, but the integrity of overall terrestrial ecological system in this area is relative good.

5.4.4 Acoustic Environment

The noise background value in the project area is relative low, the monitoring value of the acoustic environment monitoring points in daytime and nighttime can meet the standard requirements of the corresponding function areas in “Environmental Quality Standard for Noise” (GB3096-2008), the acoustic environment quality in project area is good.

5.4.5 Ambient Air

The concentrations of SO_2, NO_2, PM_{10}, and TSP in the ambient air monitoring points in the project area are not exceeding the standard, which can meet the secondary standard of the “Ambient air quality standards” (GB3095-2012).

5.5 Photos along the Project line

Residential buildings in Zhongfan

Residential buildings in Group II of Lianzhuang village

Regulating sluice of Nverjing

Water Cultural Museum Park of Shanghai Huangpu River

Position of Minhang pressure regulating tank

Residential buildings in Hujiazhai

Residential buildings in Nanzhangjia

Residential building in Beichao

Residential buildings in Fanjiadai

Residential buildings in Caojiali

Residential buildings in Tangjiadai

Residential building in Jinjiadai

Qingshuigang

Residential buildings in Sunjiadai

Residential buildings in Silongtang

Qianbujing

Residential buildings in Jinjiazhai

Residential buildings in Nanbang

Sluice in Nanshagang

Residential buildings in Fengjia

Residential buildings in Shijiabang

Residential buildings in Majiatang

Residential buildings in Ruijiali

Pressure regulating tank position in Fengxian

Residential buildings in Wangjiatang

Hongweigang

6. Environmental Impact Assessment and Mitigation Measures

Shanghai is gradually developing into a modern international metropolis, and the water quality requirements are increasing. In 2020, the Minhang Raw Water Conveyors is planned to serving a population of 2.1 million, the Fengxian Conveyors is planned to serving a population of 1.3 million. The Project Construction can further improve the raw water supply security capabilities of Minhang and Fengxian, and improve the raw water quality of Minhang and Fengxian, and increase the emergency response capabilities when accident occurred in the central city. The project construction provide countermeasures and secure solutions to the frequently occurred water pollution of the water sources and sudden accidents, which greatly improving the ability of disposing the water quality of urban crisis. This project will help improve the water quality of drinking water and the usage level of sanitary water, improve the health of residents in Shanghai and the project area. Secondly, the enhancements of water supply capacity can improve the investment environment, and create a favorable environment for economic and social development and real estate development which is conducive to the development of the project area.

However, the construction activities of the project will bring adverse environmental and social impacts. The foreseeable major environmental and social impacts including:

- Construction spoil, sewage disposal;
- The construction work' s emissions, noise effect to the surrounding residents along the project line;
- The degree of the construction work's destruction and disturbance to the ecological systems along the project line;
- The damage and disturbing degree of the ecosystem along the construction work line;
- The impacts of Huangpu River runoff and even ecosystems caused by the project running;

The effects above have been evaluated in detail in the EIA report, social assessment report, and the resettlement action plan, and adequate measures have been proposed in the environmental management plan and resettlement action plan. In general, this project will not have adverse effects on the environment in the project area. The environmental mitigation measures proposed in environmental management plans and resettlement action plan will avoid, minimize, mitigate or compensate for the potential adverse effects of the environment and the social.

6.1 Environmental Impact and Mitigation Measures during the Construction Period

The adverse impact on water environment, ambient air, acoustic environment, solid waste and ecological environment during the construction period is limited. The impact will be temporary, partial, and if appropriate mitigation measures were adopted during the construction period, the impact can be minimized or even completely be eliminated, and the impact is not obvious. The potential construction

impacts include:

6.1.1 Water Environment

(1)Impact Analysis

The construction wastewaters of Minfeng Line Project mainly are pipe jacking mud, mud and wastewater of the working well, and a small amount of oily wastewater produced in construction machinery, vehicle maintenance and cleaning process.

The contaminant in the mud and wastewater of the pipe jacking construction is the high concentrations of SS. Part of the mud the pipe jacking construction can be recycled, the rest can be transported to the muddy water treatment plant on the ground through the mud conveyor system, and the recycling rate can reach 75%. The wastewater and mud can be pumped to the construction camp buildings outside the grade I and grade II drinking water source conservation area in the upper Huangpu River for treatment together with other construction water until they can reach the relevant standards of *Reuse of Urban Recycling Water--Water Quality Standard for Urban Miscellaneous Water Consumption*(GB / T18920-2002), then they can be used for the dust suppression of the construction roads and work site, the cleaning of construction vehicles. When the treated retained water meets the standard of special protected water area, they can be discharged into the riverway except the grade I and grade II drinking water source conservation area in the upper Huangpu River. Therefore, it will not cause a significant impact on the water environment,

(2) Mitigation Measures

① When the treated mud and wastewater of the pipe jacking construction, the mud and wastewater of the working well, the wastewater for construction machinery and vehicle maintenance meet the standards, they can be used for dust suppression of the construction roads and work site, the cleaning of construction vehicles. When the treated retained water meets the standard, they can be discharged into the riverway except the grade I and grade II drinking water source conservation area in the upper Huangpu River. . Therefore, it will not cause a significant impact on the water environment,

② The sanitary sewage of this project shall be reused for the washing of the site and the road and the washing of the vehicle come in and out of the work area after they are treated, the treated retained water can be discharged into the riverway except the grade I and grade II drinking water source conservation area in the upper Huangpu River after they meet the standard.

③ Collecting from Huangpu River, the pressure test pigging water is free from any reagent. A small amount of mud remained on the pipe wall will not produce a significant impact to the pigging water after they are diluted, the direct discharging of the pressure test pigging water will have little effect to the water environment.

6.1.2 Ambient Air

(1) Impact Analysis

The impacts on air environment during the construction period of Minfeng Line Project are mainly from the construction dust (or stive) and the exhausts discharged by all kinds of construction machinery and transport vehicles, among them, the construction dust will produce greater impact, dust may be produced during the links of site clearance, earth excavation and backfill, concrete mixing, material handling and transportation, which will make the TSP concentrations of the surrounding ambient air increased obviously. Therefore, the project owner must take measures for dust suppression to reduce the impact on the surrounding environment and all the acoustic environment sensitive targets. But the impact to the air of the local environment caused by the construction is temporary, the pollution will come to an end with the end of construction.

(2) Mitigation Measures

① Simple isolating screen shall be established around the residential buildings close to the construction area to separate the construction area to the external environment, and reduce the adverse impact of construction exhausts on the external environment.

② Simple isolating screen shall be established around construction area, watering the construction area regularly and make a simple covering.

③ If the construction wastes, construction dregs cannot be removed and transported within 48 hours, a temporary dump shall be set in the construction site, the dust prevention measures of fencing and covering shall be taken in the temporary dump.

④ Before the construction machinery and the transport vehicles entering the construction, according to relevant regulations, the exhaust gas purification device shall be set to ensure that the discharged exhausts can meet the corresponding discharging standard. High-grade fuel shall be used and leaded gasoline is prohibited to be used to ensure that the discharged exhausts can meet the corresponding discharging standard.

6.1.3 Acoustic Environment

(1) Impact Analysis

The construction noises of Minfeng Line Project are mainly fixed, continuous noise comes mainly from the construction machinery and equipment and the moving traffic noise produced by the construction vehicles.

According to the forecast, the average sound level A 160m away from the construction machinery and vehicles in the daytime can basically meet the requirement of Class II functional areas specified in *Environmental Quality Standard for Noise (GB3096-2008)*, that of Class 1 functional areas can be basically met at the place 285m away; that of Class III functional areas can be basically met at the place 90m away; In the nighttime, the average sound level A 500m away from the above construction equipment can basically meet the requirement of Class II functional areas specified in *Environmental Quality Standard for Noise* (GB3096-2008), that of Class I functional areas can be basically met at the

place 890m away; that of Class III functional areas can be basically met at the place 300m away. However, the actual situation is that because of small possibility of simultaneous operation, coupled with that the impact of the heaviest noise does not appear at the same time. There is a certain distance between equipment, so the actual value is lower than the predicted value. In addition, because of the terrain restrictions of engineering work, at the workplace, due to height difference of sensitive points, shielded propagation route, discontinuous operation time every day and other factors, the actual impact time and degree are lower than the predicated values.

According to the forecast, implement according to Class I standard, the construction vehicles have an impact on the sensitive points within the range of 120m and 310m at both sides of the road in the daytime and nighttime. Implement according to Class II standard, the construction vehicles have an impact on the sensitive points within the range of 55m and 140m at both sides of the road in the daytime and nighttime. Implement according to Class III standard, the construction vehicles have an impact on the sensitive points within the range of 30m and 100m at both sides of the road in the daytime and nighttime.

(2) Mitigation Measures

① Reasonably arrange the construction plan, strictly prohibit to conduct the construction work that may produce noise at nighttime during the construction period except the concrete continuous pouring.

② Set up a 2.5m high temporary screen around the construction work area close to the residential area for noise and dust control.

③ Select the low-noise and advanced operating machinery as far as possible.

④ For the excavator, pipe layer that may produce relative loud noise, reduce the noise by installing a hush tube, silencer and other methods.

6.1.4 Solid Waste

(1) Impact Analysis

Solid wastes during the construction period of Minfeng Line Project are composed of construction solid waste and domestic garbage of construction workers. Thereinto, the solid wastes generated in construction are mainly excavation spoil, precipitated wet soil generated from pipe jacking, waste residue and building rubbish, etc.

① Excavation Spoil

A certain amount of excavation spoil may be produced during the construction process of the project pipe trench excavation, working well of pipe jacking and pressure regulating tank, the excavation spoil shall be collected and disposed in accordance with the requirements of muck management departments, which will not pollute the surrounding environment.

② Sedimentation Wet Soil of the Mud and Wastewater

A lot of mud and wastewater will be generated in the pipe jacking construction process, the mud and wastewater can be reused by the pipe jacking construction after they are separated, large amount of wet soil will be produced in the sedimentation at the same time, the wet soil produced in the sedimentation shall be collected and disposed in accordance with the requirements of muck management departments, which will not pollute the surrounding environment.

③ Construction Residue and Construction Wastes

The construction residue and construction waste are mainly produced in the processes of site clearance, excavation, equipment demolition. The construction residue and construction waste shall be collected and disposed in accordance with the requirements of muck management departments, which will not pollute the surrounding environment.

④ Domestic Garbage

The domestic garbage produced by the construction workers shall be removed and transported regularly by the sanitation department, which will not pollute the surrounding environment.

(2) Mitigation Measures

① The construction waste, construction wastes, and the sedimentation wet soil produced by the pipeline construction, and the excavation soil shall be disposed by the amenities greening administrative departments of Songjiang District, Minhang District and Fengxian District.

② Strengthen the management of the domestic garbage in the construction work area, set the dustbins by areas and classification to avoid the domestic garbage mixing into the construction spoil (slag), and the garbage can be removed by the sanitation department regularly.

6.1.5 Ecology Environment

(1) Impact Analysis

The vegetation in the temporary construction area of Minfeng Line Project, due to rolling of transport vehicles, materials stacking, or the scattering building materials will not be removed timely, that may lead to the condition that the plants cannot grow normally in short period of time after the completion of the construction. But after the project is completed, the greening project, artificial replanting and reclamation can be carried out timely to reinstate the original vegetation, or carry out effective vegetation construction in accordance with the planning requirements. Therefore, the vegetation loss caused by temporary construction of the project is temporary and reversible . In addition, the rare plants and conservation grade plants in the project area is artificial cultivated. The project construction has no obvious adverse impact on species diversity.

(2) Mitigation Measures

① The project shall reasonably select various temporary construction area, temporary construction roads, and temporary dumps. Try to minimize the occupation of farmland, and it is not allowed to occupy

basic farmland. The area shall be reinstated or the vegetation greening shall be carried out after construction.

② The trees in the construction site shall be migrated, and trees felling is not allowed. In case that the tree felling is needed indeed, that shall be reported to the local authorities for approval.

6.1.6 Social Impact

(1) Impact Analysis

Social impacts that may arise at Minfeng Line Project include traffic jam and population health of construction workers.

During construction, transportation, trunk traffic near the construction area will increase greatly, which increases the land transport pressure of the region to some extent. At the same time, along with a variety of causal factors such as poor transportation scheduling, traffic accidents, etc., there may cause local congestion, thus causing inconvenience to the normal life of local residents and travelers.

A large number of construction workers will go into the work area where potential pandemics may break out. The affected population is mainly construction workers, or the surrounding population to a certain extent.

(2) Mitigation Measures

① According to the construction progress, the project owner with the traffic management department and road traffic department formulate the transport plans to make specific arrangement on vehicle scheduling, driving route determination, transportation period arrangement, etc.

② Before construction, the construction workers shall go through physical examination, and those suffering from illness may be allowed to enter into the work area after curing.

③ Strengthen health and epidemic prevention work in the work area, and complete hygiene and disease control publicity and education.

6.2 Environmental Impact and Mitigation Measures in Operating Period

6.2.1 Water Environment

Minfeng Line Project is a municipal water pipeline project, adding no management personnel. The management in operating period depends on existing management personnel and original environmental facilities of Shanghai Water Plant Fengxian Co., Ltd. and Shanghai Water Plant Minhang Co., Ltd. Domestic sewage of Shanghai Water Plant Minhang Co., Ltd. has been incorporated into the surrounding municipal pipe network. Since the municipal pipe around Shanghai Water Plant Fengxian Co., Ltd. has not been laid, domestic sewage of management personnel of Shanghai Water Plant Fengxian Co., Ltd. has been entrusted for outward transport and disposal by the sanitation department. Water environment protection measures of Shanghai Water Plant Fengxian Co., Ltd. and Shanghai Water Plant Minhang Co., Ltd. are consistent with the environmental requirements, and the project

basically has no polluting impact on the surrounding water environment during operation.

Minhang and Fengxian water intakes are located in the downstream of Songpu intake of Huangpu River. Current scale of water supply of Minhang intake is about 0.97 million m^3/d, while that of Fengxian intake is about 0.3 million m^3/d. After completion of the project, the water intake will be moved up to Jinze reservoir intake of Taipu River (with scale of water supply of 3.51 million m^3/d). As backup water intakes, the intaking scale of original Minhang and Fengxian water intakes is increased from 1.27 million m^3/d to 1.85 million m^3/d. Annual average runoff of Taipu River is about 5.37 billion m^3/d, while the newly increased intaking scale of 0.68 million m^3/d only accounts for 0.0127% of the annual average runoff of Taipu River. Therefore, the construction of this project will not have a significant impact on the Huangpu River.

6.2.2 Acoustic Environment

There is no water booster pumping station along the pipeline of Minfeng Line Project, the impact of acoustic environment mainly comes from the dynamic noise generated by water gravity flow in the pipeline. In the project, the pipeline burial depth is at 6.1~32.5m underground, so the impact of dynamic noise generated by water gravity flow in the pipeline on the surrounding acoustic environment is small.

6.2.3 Solid Waste

Solid waste in the operating period of Minfeng Line Project is mainly small amounts of sediment deposited in the regulating tank. According to the monitoring, Huangpu River has low SS content, so the sediment in the regulating tank is less. Also, sediments in the raw water is mainly inorganic minerals, and the organic matter accounts for a relatively small proportion, which will be transported outward after cleaning for disposal, so the impact on the environment is small.

6.2.4 Ecological Environment

(1) Impact on the Landscape Ecology

According to the regional landscape components, in the Minfeng Line Project, unused land, building land and grass land are the mainlandscape patches. Patch of farmland is large in area and small in quantity, the matrix in the landscape ecosystem. The waters function as corridor. Building land, grass land and forest land are the major patches. Throughout the project, only 50m uses the method of timbering and excavation for pipe laying, has no adverse effects on the regional landscape ecology. Before and after the project, there was no significant change of landscape ecology.

(2) Impact on the Terrestrial Ecology

Project needs to add permanent land. Total permanent land area of the project is 13719m^2. A part of the land is temporarily occupied during construction. The original vegetation within the temporary and permanent occupation of land in construction is damaged. However, because there are mainly orchards, nurseries, forest, farmland and so on within the scope of the project, considering that plants in the occupied area of the project are common species. Therefore there will only be a loss in the number of

plants, will not affect the local biodiversity. The effect is little after rehabilitation reduction measures are taken. Upon entering the operational phase, the project will .have no adverse impact on the terrestrial ecological environment within the region.

(3) Impact on the Aquatic Ecology

Minfeng Line Project is part of raw water project of Upper Huangpu Raw Water Intake System, directly connected to the Minfeng Diversion Chamber of Pipe Routing Project of Upper Huangpu Raw Water Intake System, has no water intake. Upon entering the operational phase, only two pumping stations at upper and down streams are supplied with water through the pipeline. Therefore, during operating period the project will have no adverse effects on aquatic ecosystem of the riverway.

6.3 Environmental Impact and Mitigation Measures of Associated Projects

6.3.1 Jinze Reservoir Project of Upper Huangpu Raw Water Intake System

(1) Construction Period

① Impact Analysis of Surface Water Environment

(a) Impact Analysis

During the construction period, wastewater of the project is mainly domestic sewage in the construction area, wastewater of construction, oily wastewater of ships. In addition, during project constriction, although such construction activities as surface silt dredging, drainage of foundation pit, etc. These will not produce source of pollution, however it may increase SS concentration of water in the construction area.

Wastewater of construction mainly includes foundation pit wastewater, slurry wastewater generated by sand and gravel, construction machinery and equipment, vehicles and ground cleaning, drainage of concrete curing, as well as oily wastewater generated in the maintenance process of vehicles, constriction machinery and equipment, etc. Overflow of such sewage will have an adverse affect on the surface water environment.

Major pollutants of domestic sewage in the construction area COD_{Cr}, BOD_5, ammonia nitrogen, animal and vegetable oil, bacteria and so on, about 138.5m^3/d. if overflow of these domestic sewage happens, it will have an adverse effect on the surface water environment.

Construction ships will have a certain amount of oily water discharged from the cabin and seriously polluted ballast water which will have an adverse effect on the surface water environment.

Impact of the project construction work on the water quality of suspension is a short-term environmental effect. After the engineering work, water quality in the water area where the project locates will gradually be restored to the original level. Increased suspended matter concentration caused by project constriction has small impact on the water environment.

(b) Mitigation Measures

Foundation pit water shall be discharged to the riverway beyond Level II water source protection area around when the effluent after sediment and other treatment meets the special water standard in Shanghai Municipal *Integrated Wastewater Discharge Standard*. Firstly, settle the high concentration muddy water at the bottom to remove large particles of sediments which are easier to be subsided. Secondly, reduce the high concentration SS to about 1000mg/L by passing through the grit chamber. Then, add coagulant in the foundation pit to remove the finer sand grains in the wastewater,. After that SS removal can reach more than 95%. When the wastewater discharge meets the special protection water standard in the *Reuse of Urban Recycling Water--Water Quality Standard for Urban Miscellaneous Water Consumption* and Shanghai Municipal *Integrated Wastewater Discharge Standard* ,then it can be discharged into the riverway beyond Level II water source protection area. After taking the above measures, foundation pit wastewater will have less impact on the water environment.

Each construction camp has one car washing platform around which set an open trench to collect the rinse water. After oil removal, the construction machinery and vehicle maintenance, rinse water will enter into the treatment facilities along with the effluent of pre-sedimentation tank for treatment, and recycled in dust suppression, construction vehicles flushing of the construction road and construction site after meeting relevant standards in the *Reuse of Urban Recycling Water--Water Quality Standard for Urban Miscellaneous Water Consumption*. The residual water will be discharged in the lake of proposed protected areas around after meeting the special protection water standard in Shanghai Municipal *Integrated Wastewater Discharge Standard*. Rinse water of construction vehicles may enter into the wastewater treatment system for treatment after collection.

Domestic sewage is entrusted to the sanitation department for transporting to Jinze sewage treatment plant for disposal. Therefore, the sewage generated in the construction period of the project has no polluting impact on the water environment around.

Oily sewage of construction ships will be discharged to the on-shore or water movable receiving facilities on the same day after pre-treatment by oil-water separator, delivered to the qualified unit for unified disposal without random discharge to avoid influence of constriction shop sewage on the water environment.

② Impact Analysis of Groundwater Environment

(a) Impact Analysis

During project construction, foundation pit drainage and project dewatering and other activities will affect the surrounding phreatic water and groundwater levels and flow field. According to the results of groundwater environmental impact prediction, in the case of the design of foundation pit drainage construction, since the unconfined aquifer on the site are low to moderate permeability, groundwater flow is slow, construction process have limited impact on the surrounding groundwater level. The maximum radius of influence is 423m, and affect mainly is concentrated in the vicinity of the construction area. The maximum distance from the reservoir line which is 350m underground water level is predicted

to be reduced by 0.1m . At the same time, since the construction period is short, the impact of construction on the groundwater level is reversible, and the underground water level will be gradually restored after completion of the construction .

(b) Mitigation Measures

Before construction of foundation pit, according to the geological survey report with size and burial depth of main structure, make the specific foundation pit enclosure design. The support structure is designed according to the calculation and analysis result. The communication shall be made effectively with the project owner on safe and feasible schemes to determine the schemes of each subproject.

Early water level information system is established. Appropriate monitoring wells, standby well and recharge well are set around the project to strengthen water level observation. During construction period, monitoring points are set at important structures such as Taipu River flood control wall and so on to track and monitor subsidence, tilting, etc.

During project implementing stages of foundation pit, each side shall communicate and get in touch with each other to realize the information construction. In monitoring during excavation, if excessively fast change rate in surroundings happens, according to the monitoring results, should conduct dewatering or take recharge measures, or take effective protection measures, such as adjusting the construction progress, grouting for reinforcement locally, etc.

③ Impact Analysis of Ecological Environment

(a) Impact Analysis

Terrestrial vegetation involved in the entire project consists of mainly water conservation forest and artificial economic forest. Direct loss of cinnamomum camphora, elaeocarpus decipiens and other vegetation in and around the construction area will be caused with the progress of the construction, and the vegetation distribution and layout will also be affected. However, with the recovery of greening and vegetation after completion of the project, the impact of project construction on the regional vegetation may be effectively offset. Moreover, the vegetation in the whole region is planted artificially later, involving no rare species and famous trees. Therefore, in general, construction has little effect on regional vegetation.

In the project, cofferdam of reservoir and fastland construction will cause a direct loss of planktons and total loss of benthos, aquatic plants in the water area focusing on Li Jia Dang Lake and Wu Jia Dang Lake. The impact of these loss is long-term, adverse, difficult to be rapidly recovered through natural state, but can be offset via restocking after project construction, and the impact brought by construction on the benthos will be reduced.

The project construction results in loss of adult fish and shrimps, fish eggs and larvae in Li Jia Dang Lake and Wu Jia Dang Lake. Although after opening of river diversion, maybe a part of fishery resources will be supplemented by diversion from Taipu River, supplement may be slow and the numbers are relatively

small. Therefore, making adequate compensation after completion of construction can accelerate the recovery of the fishery resources in the reservoir. It is suggested to carry out 2-3 years juvenile fish releasing after completion of civil engineering construction so as to resume the number of affected resources as soon as possible.

(b) Mitigation Measures

According to the current situation or land use planning, after completion of construction, should take corresponding protective measures in the residue area outside the Quasi-protection zone, temporary construction site and temporary occupation of land and other areas and make restoration and construction timely. In the construction process of lake, riverway and related projects, carry out the necessary investigations and monitoring tests of surrounding waters at any time, and strengthen the monitoring of water quality, ecology and bottom mud so as to find out the problems timely and adopt a positive response and compensation measures. In design of diversion riverside purification belt, purification belt around the reservoir, eco-lakeside belt, eco-diversion dike, underwater embankment ecological purification zone and other projects, focus on combining ecology and landscape effects, stress on compensation and restoration of aquatic and benthic organisms. For compensation of aquatic plants and benthonic organisms, consider both damage and loss of the species and current situation of the species. In diversion river, reservoir protecting river and other part of the shore with suitable conditions, it is considered to design some ecological slope protection forms by simulating the original ecological environment. Material and form of the slope protection shall be suitable for growth of emergent aquatic plants. Riverside wetlands and buffering greenbelt shall be appropriately built to crease a riverside ecological corridor In favor of activities, growth and reproduction of aquatic, wetland vegetation and amphibians.

④ Impact Analysis of Ambient Air

(a) Impact Analysis

The impact generated on ambient air during project constriction mainly includes construction dust, mechanical fuel gas, canteen gas fume, asphalt fume and odors generated by dredging rivers and reservoirs, etc. It is predicted that the air within 300m of construction site will be affected during construction. The project owner shall take corresponding environmental measures in the construction period so as to reduce the impact on the ambient air in the construction process. Impact generated in the construction period on the air is temporary, and the impact will disappear with completion of the construction.

(b) Mitigation Measures

Set simple isolating screen in the zone close to the environment-sensitive targets around the construction site to separate the construction site from the external environment. General height of screen shall be 2.5~3m. Screen shall be made from hard materials, such as color plate, etc.

Construction unit should strengthen the planning and management of the construction area. Building

materials yard (cement, sand, etc.) shall be set at fixed position. Excavated earth shall be centralized and piled to minimize the impact range of dust, back filled or cleaned and transported itimely . Take dust prevention measures such as enclosing, covering, etc. to reduce the impact of dust.

Construction work should try to avoid windy weather. Specially assigned personnel shall be appointed to the construction site responsible for cleaning, watering and sweeping the construction site and roads for transport vehicles. Frequency of watering shall depend on the weather. When the construction machinery are doing removal, excavation, loading, piling, breaking and other operations, shall take water spraying and other measures to avoid dust pollution.

⑤ Impact Analysis of Acoustic Environment

(a) Impact Analysis

During the construction process of the project, the noise fromconstruction machinery, vehicles are the main source of noise in the project construction. In the construction period, the main area that is influenced by the noise is the area in a range of 320m on the construction site, involving Gongjiangzhuang Village of Hongdu Township, Nitan Village, Beikuyu Villiage, Dongtian Village of Dongxi Township and other natural villages. Construction noise will reduce the Acoustic Environment quality in and around the work area to a certain extent and produce short-term disturbance to residents living near the project area. During the construction period, it is predicted the greatest impacts on each sensitive targets are 79 dB (A), 80 dB (A), 76dB (A) and 83dB (A) respectively.

(b) Mitigation Measures

Construction unit shall select low noise construction machinery and advanced technologies during construction period, and set temporary protective enclosure and other measures. Also reasonably arrange the various types of construction machinery's working hours, strictly prohibit making high noise at the side which closes to the village to avoid noise superposition. At the same time, at different construction stages, control the noise of the construction site according to *Noise limits for Construction Site* (GB12523-2011) to reduce the impact of such noise on the surrounding environment so that sensitive targets meet *Environmental Quality Standard for Noise* (GB 3096-2008).

⑥ Solid Waste

(a) Impact Analysis

Solid wastes during project construction period include muck, domestic waste, construction waste, sediment sludge and various greases and oil residue, etc. In normal operation and maintenance, the construction machinery will produce oil residue, oil sludge, waste oil and other waste mineral oils, used oil, waste rags and waste lead-acid batteries and other hazardous waste.

(b) Mitigation Measures

All kinds of waste should be collected and classified, and separately disposed duly according to *Law of Solid Waste* and relevant provisions of shanghai's water source protection. Construction muck shall be

treated by the contractor on a contract basis, transported outward for utilization. The construction waste is entrusted to the sanitation department for timely cleaning and transporting. Household garbage and kitchen waste shall be transported and cleaned by the local sanitation department daily. Waste oil and fat, waste mineral oils, used oil, waste rags and waste lead-acid batteries and other hazardous waste shall be entrusted to the qualified unit for disposal according to the working conditions to avoid pollution to the soil and water environment in the project area and impact on the environmental health.

(2) Operating Period

① Impact Analysis of Surface Water Environment

(a) Impact Analysis

After completion and commissioning of the project, there will only domestic sewage discharged by the staffs in the management area.

(b) Mitigation Measures

At present, there is no municipal sewage pipe network around the project area. As a combined facility, the municipal sewage pipe network of about 4.4km will be laid to Xicen Sewage Plant. In the operating period, the sewage will meet *the Wastewater Quality Standards for Discharge to Municipal Sewers* and then discharge into municipal sewage pipe network , so the sewage produced in the operating period of the project will have no pollution to the surrounding water environment.

② Impact Analysis of Ambient Air

(a) Impact Analysis

During operating period, there will no exhaust emission by the project itself, but a small amount of chemical reagents will be used in the water quality analysis experiment. Chemicals volatilization and exhaust fumes from canteen may have some impact on the surrounding ambient air.

(b) Mitigation Measures

A small amount of chemical reagents will be used in the water quality analysis experiment of the project. Water quality test must be carried out in a fume hood. Experimental exhaust is discharged at a high altitude of 16.5m building roof through independent exhaust system. NMHC emission concentration and rate shall meet the maximum allowable emission concentrations and maximum allowable emission rate of exhaust funnel at relative height specified in the *Integrated Emission Standard of Air Pollutants*.

Canteen cooking will produce gas fumes. Fume purification device must be used in the kitchen. Fume purification facilities removal efficiency and exhaust fumes of the gas fume from canteen shall be ensured to meet the relevant requirements in *Emission Standard of Cooking Fume* (GB18483-2001).

③ Impact Analysis of Acoustic Environment

(a) Impact Analysis

The source of noise in the operating period of the project are operation of pump and opening and closing of the gate in running of pumps and gates, with the noise source intensity of about 75 ~ 90dB (A).

After noise attenuation, the noise of the project at site boundary shall meet the relevant standards in *Emission Standard for Industrial Enterprise Noise at Site Boundary* (GB12348-2008); besides, acoustic environment sensitive targets around the project are far away from the site boundary, and the noise of the project during operating period basically has little impact on the surrounding environmental protection targets. The acoustic environment of each sensitive target remains unchanged, and its acoustic environment quality remains undisturbed, meet the requirements of Class I standard.

(b) Mitigation Measures

In the project design, consider using equipment and supporting facilities with small vibration and low noise.

Strengthen the maintenance and management of the equipment, reduce the impact of noise produced by abnormal operation of the equipment on the surrounding environment. Make sure the noise generated by operating fixed equipment in the management area of the reservoir meets corresponding standard in *Emission Standard for Industrial Enterprise Noise at Boundary* (GB12348-2008).

④Impact Analysis of Solid Waste

(a) Impact Analysis

The solid wastes generated in the operating period of the project are mainly household garbage and kitchen waste produced by the working staff in the management area. Random throwing of garbage will also pollute the water and soil, affecting the environmental hygiene. There set grating trash holding devices for taking and delivering of water in the pumping station. Screenings may produce about 52t per year during the operating period.

All the pumps brake are equipped with transformers. During the maintenance it may produce a little oil residue, oil dirt, waste oil and other used mineral oil, and the total amount will be about 60kg/a. Water quality analysis experiment will produce high concentration wastewater and waste chemical reagents. The wastewater contains chemicals. Estimated wastewater quantity will be about 7.3m^3/a, acid pickle, waste alkali and waste organic solvents are about 0.46t/a. The wastes that mentioned above are all need to be considered as hazardous wastes and shall be entrusted to the qualified unit for disposal.

(b) Mitigation Measures

Household garbage and screenings produced in the project shall be cleaned by the local sanitation department daily.

High concentration wastewater and waste test reagents produced by the water quality laboratory as hazardous wastes shall be disposed by related qualified units. Temporary storage of the hazardous wastes shall meet *Standard for Pollution Control on Hazardous Waste Storage*, and hazardous wastes shall be stored in the separated temporary storage room on the second floor, cannot store these hazards

on the ground or underground.

In the project, a small amount of waste acid, waste alkali, waste organic solvents and other laboratory wastes will be produced by the water quality test, a small amount of used oil generated by machine and transformer maintenance, transformer maintenance oil and other hazardous waste shall be temporarily stored in the temporary storage room for hazardous wastes in the management area, as hazardous wastes shall be entrusted to the qualified units for outward transport and disposal, and their storage space shall also meet the *Standard for Pollution Control on Hazardous Waste Storage* (GB18597-2001), can prevent wind, rain, exposure to sun and leakage.

⑤ Eutrophication Analysis of Reservoir

(a) Impact Analysis

According to eutrophication forecast results of the reservoir, in the conventional scheduling, due to the shorter residence time of the reservoir (1.5-2 days), the risk of eutrophication existing in the lake reservoir of Upper Huangpu Raw Water Intake System is small; it is suggested to optimize the reservoir shape, flow pattern design and construction of aquatic ecosystems to improve water quality and prevent eutrophication, and make environmental sediment dredging in a timely manner; it is recommended to plant aquatic plants in shoal waters and regions prone to stagnation to further reduce the risk of reservoir summer blooms.

(b) Mitigation Measures

- Improve the water source protection zoning, and strictly implement the provisions of protection regulations.
- Strengthen the management of water protection areas; establish an automatic water quality monitoring system of Jinze water source to monitor the water quality automatically, comprehensively and systematically, so as to prevent water quality pollution accident, which may be caused by shipping leakage, emergent discharge of upstream outfall, etc.
- Establish and improve the water quality and ecological monitoring systems. Monitor the water source quality at fixed time intervals to get a comprehensive understanding of the pollution load input and law of water quality change. Periodically monitor and evaluate the conventional water quality indicators and aquatic ecosystem indicators of reservoir waters.
- Build the water quality warning and monitoring network and forecast system for sudden water pollution accident of Jinze water source to strengthen the dynamic monitoring and tracking of water source quality and avoid water quality pollution accident, which may be caused by shipping leakage, accident discharge by upstream enterprises and other reasons. Set an online poison monitoring equipment at the water source intake and in the reservoir, and set up biological early warning test and accumulate specific water quality data and materials so as to find out the poisons or contaminants as early as possible and take corresponding measures. On this basis, accelerate information transfer of

water quality data, and timely make report to related authorities. Share the resources and regulate rivers and watercourses jointly. Meanwhile, make sure the convergence of risk contingency plans of Jinze water source and Taihu Lake area. Do unity and joint work of emergency management.

⑦ Safety Impact Analysis of Reservoir Dam

Jinze reservoir is formed by the excavation of the original Li Jia Dang Lake and Wu Jia Dang Lake. The largest dam height is 9.24m (the lowest bottom is taken as -4.00m), and they are generally about 7m, low dams. Normal elevation of a river around and outside the reservoir is 2.50m~2.80m. Under normal operating conditions, water level inside and outside the reservoir is basically level. When the reservoir is at the highest water level of 3.30m, the lowest water level of river around the reservoir is 0.5m elevation, that is water head difference borne by the dam is just about 3m. Thus it can be seen that Jinze reservoir is a small low dam, with low acting water head. Its highest water level is lower or slightly higher than the current ground elevation. These circumstances are conducive to dam safety, meet flood control capacity. Therefore, there are no dam safety issues.

6.3.2 Pipe Routing Project of Upper Huangpu Raw Water Intake System

(1) Construction Period

①Impact Analysis of Surface Water Environment

(a) Impact Analysis

Project construction and industrial wastewater mainly comes from raw water pipeline pipe-jacking construction mud and wastewater, working well construction mud and wastewater, as well as oily wastewater generated in the process of washing construction machinery and vehicles. In the collection and disposal process, improper operation or random discharge of untreated mud and wastewater will have an impact on the surroundings and water quality of receiving water, causing a significant increase of SS content of local water areas. If a small amount of oily waste washing water generated in the process of washing construction machinery and vehicles is directly discharged to the nearby water, oil content in the local water area will increases, and the water quality will be affected.

Project construction domestic sewage is from the manure of temporary living quarters, canteen, public services, etc. on the construction site. Mobile toilet shall be set on the construction site to collect the domestic sewage which will be entrusted to the sanitation department for disposal by a pumping truck. It shall be cleaned daily. Therefore, project construction domestic sewage will be recycled or discharged after meeting the standard, will not have an obvious impact on the water environment.

(b) Mitigation Measures

Excess mud and wastewater generated by project constriction is pumped to the construction base beyond Level I, II conservation areas of Huangpu River drinking water source protection areas for disposal. The effluent is recycled in dust suppression, construction vehicles flushing of the construction road and construction site after meeting relevant standards in the *Reuse of Urban Recycling*

Water--Water Quality Standard for Urban Miscellaneous Water Consumption. The residual water meets the special water standard in Shanghai Municipal *Integrated Wastewater Discharge Standard*.

After oil removal, the construction machinery and vehicle maintenance, rinse water will enter into the treatment facilities along with the effluent of pre-sedimentation tank for treatment, and recycled in dust suppression, construction vehicles flushing of the construction road and construction site after meeting relevant standards in the *Reuse of Urban Recycling Water--Water Quality Standard for Urban Miscellaneous Water Consumption*. The residual water may be discharged in the riverway other than Level I, II conservation areas of upper Huangpu drinking water source after meeting the special water standard in Shanghai Municipal *Integrated Wastewater Discharge Standard*.

Domestic sewage produced by personnel on the construction site is collected by the movable toilets, and entrusted to the sanitation department for disposal by a pumping truck. It shall be cleaned daily.

② Impact Analysis of Groundwater Environment

(a) Impact Analysis

In the project, inflow switching well of Songjiang midway pump station and well-points dewatering of pressure regulating tank in the construction process have a limited scope of influence on surrounding groundwater level, is 270m outside the foundation pit. The construction dewatering mainly affects the vicinity of the construction area, and has limited influence on the surrounding underground water level. Besides, due to limited construction period of the project, this effect can be reversed with a resistance. The impact of falling groundwater level with the end of the construction period will slowly recover. The project during construction period has limited impact on the groundwater level.

Conduit jacking well is an important channel node causing the connection of micro- confined water and phreatic water. Therefore, in the case of sealing up between pipe jacking well wall and pipelines, the construction of raw water pipeline will not cause the connection of phreatic aquifer and confined aquifer.

(b) Mitigation Measures

In excavation of foundation pit, keep the construction machinery clean, and complete civilized and standardized constriction. Prevent polluting the underground water due to leakage of oil and dirt, etc.

Necessary blocking measures shall be taken around the excavated foundation pit to avoid inflow of rainfall on the ground after collecting, resulting in direct entry of ground rainfall into the underground water system.

In the dewatering process, ground and roads around the foundation pit and underground water level;are monitored. Observation of soil deformation and ground subsidence, as well as deformation monitoring of ground building (structure) shall be completed. Once the ground cause obvious subsidence, the construction shall be stopped immediately. The feasibility of adopting other construction methods shall be discussed.

Sewage and wastewater collection and disposal tank in the construction base shall use the impervious

concrete structure. Concrete impervious grade is recommended to be above P8, and the thickness above 300mm to avoid possible impact on the groundwater of pollutant leakage.

③ Analysis of Impact of Construction Noise on the Environment

(a) Impact Analysis

According to the prediction, average sound level A 100m away from the construction equipment in the daytime can meet Class 1 *Emission Standard of Environment Noise for Boundary of Construction Site* (GB12523-2011); the construction machineries are required to be set 560m away from the boundary of construction site during the nighttime so that the noise value meets the limited value requirements.

According to the prediction, the requirement of Class 1 functional areas can be basically met at the place 560m away from the construction machinery, vehicles in the daytime; that of Class 3 functional areas can be basically met at the place 180m away; that of Class 4a functional areas can be basically met at the place 100m away. In the nighttime, the average sound level A 1770m away from the above construction equipment can basically meet the requirement of Class 1 functional areas specified in *Environmental Quality Standard for Noise* (GB3096-2008), and 560m away can basically meet the requirement of Class 3 and4a functional areas. However, the actual situation is that because of small possibility of simultaneous operation, coupled with that the impact of the heaviest noise does not appear at the same time. There is a certain distance between equipment, so the actual value is lower than the predicted value. In addition, because of the terrain restrictions of engineering work, at the workplace, due to height difference of sensitive points, shielded propagation route, discontinuous operation time every day and other factors, the actual impact time and degree are lower than the predicated values.

According to the prediction, according to class 1 standard, the construction vehicles have an impact on the sensitive points within the range of 120m and 310m at both sides of the road in the daytime and nighttime. According to Class 3 standard, the construction vehicles have an impact on the sensitive points within the range of 30m and 100m at both sides of the road in the daytime and nighttime. Implement according to Class 4a standard, the construction vehicles have an impact on the sensitive points within the range of 15m and 100m at both sides of the road in the daytime and nighttime. According to the construction organization, the existing roads are mainly used as the project construction accesses, and only a few accesses are newly added near the construction base. There is a certain amount of settlements and units along the construction road. Noise caused by vehicle transport and traffic will have an impact on the settlements ay both sides of the road along the line. But, most of the traffic noises of construction vehicle are transient, will produce little impact. As a whole, the impact caused by the traffic noise on the regional acoustic environment during construction period is partial and transient. With the end of construction, pollution has come to an end.

(b) Mitigation Measures

Various types of construction machineries with mature technology, low noise and small power shall be selected.

Selected temporary construction area shall be away from the residential area and other acoustic environment-sensitive targets.

Strictly control construction at night. Continuous nighttime construction must be approved.

Strengthen the personal protection of construction workers.

For the residential area within the range of 200m away from the project, try to shorten the construction time of equipment with high intensity noise near residential area, and pay attention to avoiding construction at weekend and noon break in summer to reduce the impact on sensitive target.

④ Analysis of Impact of Solid Waste on the Environment

(a) Impact Analysis

Solid wastes during the construction period are composed of construction solid waste and domestic garbage of construction workers. Of which, the solid wastes generated in construction are mainly excavation spoil, precipitated wet soil generated by pipe jacking, waste residue and building rubbish, etc.

(b) Mitigation Measures

Construction waste slag, building rubbish, precipitated wet soil generated by pipe construction and excavation spoil shall be collected and disposed according to the requirements of *Provisions on Administration of Construction Waste and Engineering Sediment Disposal in Shanghai*; construction and household garbage shall be cleaned and transported by sanitation department periodically after classification.

⑤ Analysis of Impact of Construction Dust, Exhaust on the Ambient Air

(a) Impact Analysis

The impact on the ambient air during construction period mainly comes from the construction dust (or powder) and exhaust emitted by various construction machineries and transport vehicles as well as steel welding fumes, among which construction dust has a greater impact. Dust is produced in site cleaning, earth excavation and backfilling, concrete mixing, material handling and transporting and other links, significantly increases the total suspended particulates (TSP) in the work area and the ambient air.

(b) Mitigation Measures

Simple isolating screen shall be established around the residential buildings close to the construction area to separate the construction area to the external environment, and reduce the adverse impact of construction exhausts on the external environment.

During construction, car washing platform shall be set at the inner side of exit for materials, muck transport vehicles. Before leaving the site, tyres and bodies of the vehicles shall be cleaned at the platform. Do not drive with muddy car.

Temporary stacking yard is set in the construction site, where blocking, covering and other dust

prevention measures shall be taken.

⑥ Impact Analysis of Ecological Environment

(a) Impact Analysis

Because of transport vehicle rolling, materials stacking and untimely disposal of building materials after falling, vegetation in the temporary land occupation due to project construction may not be able to grow normally and naturally in a short time after completion of the construction period,. However, after the project is completed, restore the original vegetation through landscape engineering, artificial replanting and timely reclamation, or carry out effective vegetation construction according to the planning requirements. Therefore, the vegetation loss caused by temporary land occupation and construction is generally temporary and reversible. In addition, the rare plants and protective level plants in the project site are planted artificially. Construction had no adverse effects on species diversity.

(b) Mitigation Measures

Project construction base, temporary construction access, temporary spoil yard and temporary land occupation shall occupy less cultivated land and grass land. If the cultivated land is temporarily occupied, strip the surface soil and stack separately. After completion of the project, level the land, and clean broken stone and debris on the ground, and then back fill the surface soil for recovery of cultivated land. If the used land is temporarily occupied, restore it or make vegetation greening after construction.

(2) Operating Period

① Impact Analysis of Surface Water Environment

(a) Impact Analysis

The project is a municipal water pipeline project. The industrial wastewater in the operating period mainly are the everyday water changing at pressure supplement towers in Qingpu Diversion Chamber, Songjiang Midway pump station, Jinshan Diversion Chamber and Minfeng Diversion Chamber. After operation of connecting pipe , water changing at the pressure supplement tower is the raw water. The water quality is the same with that of the raw water. It can be discharged to the riverway through storm sewer of each diversion chamber and pump station, will not have any impact on the river water environment.

(b) Mitigation Measures

Songjiang Midway pump station is in the scope of services of Songjiang West Wastewater Treatment Plant. The domestic sewage generated by management personnel in operating period is discharged to Songzheng Road sewage pipe network directly through DN300 sewage pipe with the length of about 1km.

② Impact Analysis of Ambient Air

(a) Impact Analysis

The main impact of the project on the ambient air comes from the exhaust emitted from the kitchen of Songjiang Midway pump station.

(b) Mitigation Measures

In the project, a fume hood shall be set above the cooking bench in the kitchen of Songjiang Midway pump station to collect fumes. The fume hood is equipped with an efficient soot filter. Filtered soot is discharged through the hood shaft after electrostatic fume purification; removal efficiency and maximum allowable emission concentration of fume purification facilities shall meet the relevant provisions of *Emission Standard of Cooking Fume* (GB18483-2001).

③ Impact Analysis of Acoustic Environment

(a) Impact Analysis

According to the forecasts, each boundary of Songjiang Midway pump station in the operating period can meet the limiting values in Class 1 areas specified in *Emission Standard for Industrial Enterprise Noise at Boundary* (GB12348-2008). At the same time, noise contribution value of Songjiang Midway pump station to the environmental protection target in the operating period is small. The acoustic environment quality in Yaojia Village and Xinyao Village can meet Class 1 standard in *Environmental Quality Standard for Noise* (GB3096-2008).

(b) Mitigation Measures

In project design, equipment and supporting facilities with small vibration and low noise shall be preferred.

Water pump is set indoors and goes through sound insulation measures. Close the doors and windows in operation to effectively reduce noise effect.

④ Impact Analysis of Solid Waste

(a) Impact Analysis

Solid waste generated after completion and commissioning of the project is mainly household garbage, which is produced by management personnel of Songjiang Midway pump station. These wastes will be collected to the designated garbage collection spot in the station. Sanitation department will clean and treansport these wastes in a timely manner. It has little impact on the environment sanitation.

(b) Mitigation Measures

Household garbage is collected to the designated garbage collection spot in the station. Sanitation department will clean and transport these wastes in a timely manner.

6.4 Environmental Risks

The main environmental risks in the construction and operation process of Minfeng Line Project include: risk of accidentally discharge muddy water which is caused by pipe jacking construction; risk of muddy

water pipeline leakage from construction area to construction base; risk of direct discharge of untreated sewage and wastewater in construction; risk of oil spill caused by machinery vehicle collision during construction period; risk of hydraulic oil leakage in hydraulic pipe jacking system during construction period; risk of wastewater leakage of wastewater treatment facility in construction base during construction period; risk of pipes and valves leakage caused by accident during operation. The occurrence of these risk accidents will exert a certain degree of harm to the environment, however, the probability of occurrence of each risk accident is very small, and the environmental risk in this project is controllable by taking relative preventive countermeasures.

6.5 Resettlement

The impact of resettlement is determined on the basis of *Land Administration Law of the People's Republic of China* and the RAP prepared by World Bank Involuntary Resettlement Policy.

6.5.1 MINFENG RAW WATER CONVEYORS PROJECT of Upper Huangpu Raw Water Intake System

① Impacts of Permanent Land Acquisition

The permanent land acquisition of Minfeng Line Project affects 11.17 mu of cultivated land of No. 13 and No. 14 teams in Pengdu Village, Maqiao Town, Minhang District; 8.68 mu of Puxiu Village, Zhuanghang Town, Fengxian District, land acquisition totals to 19.85 mu. The lands are collective land of village through field investigation, and are currently all municipal conservation forests.

The land acquisition of this project is implemented according to *Compensation Standard of Collective Land and Property Acquisition in Shanghai* formulated by Shanghai Municipal People's Government, there will be 11 agricultural labor forces in Pengdu Village be impacted by land acquisition based on the ratio of land and labor in the village impacted by land acquisition, their household register will change from agricultural registered permanent residence to non-agricultural registered permanent residence, the local government will implement their social security and bring them to the coverage of small township insurance of Shanghai.

② Analysis of Indirect Impact on Surrounding Area Caused by Land Acquisition

Although there is no house demolition in the land acquisition range of this project, the house sites of 36 households of No. 13 team in Pengdu Village and 3 households of No. 14 team all locate in the conservation forest belt. In particular, the southern side of village land has been fully requisitioned by Minhang WTP, the northern side of land has been requisitioned by No. 704 Research Institute, removal and relocation were not carried out at that time, the construction of a reservoir in western side may give rise to reactions of resettlement in villagers of No. 13 team.

During construction period, construction unit will create temporary passages for surrounding residents and guarantee causing no influence on their walking. Meanwhile, actively carry out protective measures of construction to prevent cases of cracking in building due to construction. As for residents did not

relocate, the project unit will actively communicate with the local government and coordinate with its propaganda and explanation works.

The construction unit will make compensations for the auxiliary facilities above and below ground such as greening, roads, pipelines, etc. that need to be temporarily relocated due to construction, and they will be restored after completion of the construction.

6.5.2 Jinze Reservoir Project of Upper Huangpu Raw Water Intake System

① Permanent land acquisition: the total land acquisition area of Jinze reservoir project includes land acquisition area of reservoir project, intake gate and diversion channel, which totals area is 4050 mu. The project fully utilizes existing water to improve land utilization and minimize land acquisition; land acquisition range mostly consists of lakes, ponds, woodlands, farmland, etc.

② Temporary land acquisition: the temporary land acquisition of Jinze reservoir project mainly includes temporary land acquisition of construction living and production facilities, temporary construction roads and spoil ground. According to construction design, the temporary land acquisition of construction living and production facilities accounts for 15 mu, spoil ground accounts for 2845.01 mu, temporary construction roads accounts for 154.8 mu, and all temporary land acquisition totals to 3014.81 mu. Currently, the owner has entrusted a professional unit to conduct evaluation on the demolition and compensation costs of project land acquisition, and the compensation fee of project land acquisition is RMB 1,711,047,400, in which permanent land acquisition fee is RMB 1.62 billion, temporary land acquisition fee is RMB 91,047,400.

6.5.3 Pipe Routing Project of Upper Huangpu Raw Water Intake System

The connection pipe project will use land includes the permanent land acquisition of Songjiang midway Pumping Station, Qingpu Diversion Chamber, Jinshan Diversion Chamber, Minfeng Diversion Chamber and temporary land occupation of pipeline during construction process. In which permanent land area totals to 6.45hm^2, Songjiang midway Pumping Station land accounts for 5.13hm^2, Qingpu Diversion Chamber land accounts for 0.4hm^2, Jinshan Diversion Chamber land accounts for 0.42hm^2 and Minfeng Diversion Chamber land accounts for 0.5hm^2.

7 Public Participation and Information Publication

According to China's environmental protection laws, regulations and World Bank environmental assessment policy (OP4.01), public participation shall be carried out during environmental assessment to communicate with the people that are directly and indirectly related to the project.

7.1 Public Participation and Information Publication in MINFENG RAW WATER CONVEYORS PROJECT

7.1.1 Public Participation and Information Publication of Environmental Impact Assessment

(1) Public Participation Survey

Pay key attention to the local people and enterprises that are impacted by the proposed project, which totals to 7 administrative villages and 21 sensitive targets and mainly involves Lianzhuang Village, Pengdu Village, Yanjing Village, Dongqin Village, Xinye Village, Yuli Village, Puxiu Village, etc., and 10 units including Villagers' Committee of Lianzhuang Village, Chedun Town, Songjiang District, Villagers' Committee of Pengdu Village, Maqiao Town, Minhang District, Villagers' Committee of Yanjing Village, Yexie Town, Songjiang District, Villagers' Committee of Dongqin Village, Yexie Town, Songjiang District, Villagers' Committee of Xinye Village, Zhuanghang Town, Fengxian District, Villagers' Committee of Xinye Village, Zhuanghang Town, Fengxian District, Villagers' Committee of Yuli Village, Zhuanghang Town, Fengxian District, Villagers' Committee of Puxiu Village, Zhuanghang Town, Fengxian District, Shanghai Water Plant Fengxian Co., Ltd, Songpu Raw Water Plant, Shanghai Water Plant South Co., Ltd, etc.

Public Participation Survey was conducted from September to October in 2013 which adopted the methods of questionnaires and field investigation. The local people and enterprises that will be impacted during the project are paid key attention. The distributed individual questionnaires totals to 258 in which 255 were collected and the collecting rate is 98.8%. The coverage rate of written questionnaires of sensitive targets within the assessment scope of the project reached 95.5%, 10 group questionnaires were prepared and collected, the collecting rate of which is 100%. Seen from the process and results of the investigation with public participation, the degree of Public Participation Survey in project area is relatively high. There are respectively 50.5% and 17.3% of the respondents are in favor of or support the project construction conditionally, 32.2% of the respondents hold indifference and no individual respondent holds opposing views. There are respectively 40% and 50% of the investigated groups are in favor of or support the project construction conditionally, 10% of the investigated group (Villagers' Committee of Lianzhuang Village) holds opposing views.

The main issues public are concerned about the project construction include: various types of pollution (waste water, waste residue, dust, etc.) on the surrounding environment during construction, pollution on raw water intake system, impact on the living environment of habitation and ecological environment health, etc. There is 1 investigated group holds opposing views and its ground of objection mainly lies in that the project occupies agricultural land and project construction may cause environmental pollution

which is not conducive to economic development, by paying a return visit, it still holds reservations.

(2) Information Publication

The first Internet publication was carried out on the website of Shanghai Environment Online on July 23, 2013 which mainly includes: description of the basic situation of project construction, project owner name and contact information, name of EIA institution and contact information, EIA procedures and job duties, the main issues for seeking public comments and the main ways of public comments. Publication link: http://www.envir.gov.cn/docs/2013/20130910247.htm.

The second Internet publication was carried out on the website of Shanghai Environment Online (http://www.envir.gov.cn) on September 10, 2013 which includes project overview, environmental impact, mitigation measures, evaluation findings, the ways and means to obtain environmental impact assessment executive summary and detailed ways of collecting public views. Publication link: http://www.envir.gov.cn/docs/2013/20130910247.htm.

Field publication was carried out on September 11, 2013, posting places are: Villagers' Committee of Lianzhuang Village, Chedun Town, Songjiang District, Villagers' Committee of Pengdu Village, Maqiao Town, Minhang District, Villagers' Committee of Yanjing Village, Yexie Town, Songjiang District, Villagers' Committee of Dongqin Village, Yexie Town, Songjiang District, Villagers' Committee of Xinye Village, Zhuanghang Town, Fengxian District, Villagers' Committee of Yuli Village, Zhuanghang Town, Fengxian District, Villagers' Committee of Puxiu Village, Zhuanghang Town, Fengxian District, while providing environmental impact assessment report for public inspection.

Field Publication of Villagers' Committee of Lianzhuang Village, Chedun Town, Songjiang District

Field Publication of Villagers' Committee of Pengdu Village, Maqiao Town, Minhang District

Field Publication of Villagers' Committee of Yanjing Village, Yexie Town, Songjiang District

Field Publication of Villagers' Committee of Dongqin Village, Yexie Town, Songjiang District

Field Publication of Villagers' Committee of Xinye Village, Zhuanghang Town

Field Publication of Villagers' Committee of Yuli Village, Zhuanghang Town

Field Publication of Villagers' Committee of Puxiu Village, Zhuanghang Town

Newspaper publication was carried out on Songjiang News, Minhang News and Fengxian News from September 11, 2013 to September 13, 2013 respectively.

Newspaper Publication on Minhang News **Newspaper Publication on Fengxian News**

Newspaper Publication on Songjiang News

Due to the slight adjustment of contents in the report, the third information publication towards public was carried out in accordance with the national and local laws and regulations and upon agreement of the project undertaker, the content of environmental impact assessment is publicized. Publication link: http://www.envir.gov.cn/docs/2013/20131127629.htm.

The publication of full text was carried out on Shanghai Environment Online before the project is submitted for approval, publication contents are the full text of environmental impact assessment document of the construction project (text, graphics, etc. involving state secrets, commercial secrets and

personal privacy are deleted), publication time was from June 16, 2014 to 2014 June 20. Publication link: http://www.envir.gov.cn/docs/2014/20140616964.htm.

7.1.2 Public Participation Survey and Information Publication of Resettlement

(1) Public Participation

Table 7-1 Public Participation Survey Process of Impacted People

Time	Place	Participants	Contents	Remarks
June 3, 2014	Fengxian Water Authority	Representatives of project owner, township authorities and impacted units	Preliminary liaison meeting for project implementation	Project description and hear the views of local government concerning the project
June 3, 2014	Minhang Water Authority	Representatives of project owner and relevant departments of town government, villagers' committee	Preliminary liaison meeting for project implementation	Project description and hear the views of local government concerning the project

(2) Publicizing Process of Policy

Table 7-2 Publicizing Process of Policy

Document	Language and Publicizing Pattern	Publicizing Date	Publicizing Place
Introduction of relevant projects	Chinese, project introduction leaflet	August 2014	Impacted villages and towns
General introduction of demolition information of project land acquisition	Chinese, preliminary estimation list	October 2014	Impacted villages and towns
Notification of public	Chinese, text report	After passing the	Community or

Document	Language and Publicizing Pattern	Publicizing Date	Publicizing Place
RAP		pre-assessment by the World Bank	villagers' committee
Resettlement information booklet	Chinese, issue into the hands of immigrants	After passing review by the World Bank	Community or villagers' committee
RAP Report	Chinese, English	After passing review by the World Bank	Library

7.2 Public Participation Survey and Information Publication of Associated Projects

7.2.1 Jinze Reservoir Project of Upper Huangpu Raw Water Intake System

(1) Public Participation Survey and Information Publication of Environmental Impact Assessment

① Public Participation

There are a total of 225 questionnaires distributed in this field investigation and 209 effective questionnaires are collected, collecting rate of which is 92.9%, the covering rate of questionnaires towards sensitive targets reaches 100%, the questionnaires issued at sensitive points take up 100% of the total number. The constitution of number of samples, distribution, age, gender, occupation, etc. is relatively reasonable and meet the requirements of validity, universality and representativeness. The distribution of questionnaires are mutually completed by project owner and assessment unit, the issuing process is transparent, real and effective which meets the authenticity requirements of public participation. The statistics of questionnaires show that: 87.6% of the respondents are in favor of the project, 10.0% of the respondents hold indifference, only 4 respondent hold opposing views (1 respondent indicated that the present situation of surrounding environment will impact the water quality of reservoir and worried about the implementation of management department supervision, 1 respondent indicated that it would destroy the original ecology, 1 respondent supported relocation, another 1 respondent did not fill out the reasons for opposing) , the opposing rate is 1.9%. By paying a return visit, 1 respondent supported conditionally, 1 respondent supported, 1 respondent opposed, another 1 respondent was not contacted and was deemed to insist opposition, the opposing rate is 1%. Facing the objections and suggestions, the project owner indicated that it would pay full attention to the worries of surrounding people, and implement environmental protection measures in strict accordance with environmental impact assessment report, guarantee safety of water intake from the reservoir and improve various flood control and drainage measures, strive to minimize the impact on the ecological environment surrounding the project.

② Information Publication

The first Internet publication of basic project information was carried out on the Internet from April 9, 2014 to April 22, 2014. Publication link: http://www.envir.gov.cn/docs/2014/20140409309.htm. The second Internet publication was carried out on the website of Shanghai Environment Online from July 17, 2014 to July 30, 2014 upon basic completion of report preparation and obtaining preliminary conclusions. Publication link: http://www.envir.gov.cn/docs/2014/20140717297.htm.

On July 21, 2014, Xinmin Evening News quoted the second publication content made by the research team on Shanghai Environment Online, and published the environmental impact assessment information of Jinze reservoir on Layout A10; it conducted publication of the Qingpu District newspapers involved in project assessment range on July 29, 2014 and published an announcement of project environmental impact.

Newspaper Publication on Xinmin Evening News

Newspaper Publication on Qingpu News

Field publication was carried out on July 28, 2014 and the posting units include: Qingpu District, Shanghai (Gongdu Village, Dongxi Village, Tianshanzhung Village, Xuli Village, Jinze Village, Jinxi

Neighborhood Committee, Jinze middle school, Jinze primary school, Jinze kindergarten, Jinze Town Health Service Center, Jianguo Village, Cenbu Village, Rentun Village, Jinxiu middle school, Liansheng Neighborhood Committee, Qiansheng Village, Central Health Center of Qiansheng Village, Xinchi Village) and Jiashan County, Zhejiang Province (Beicai Village (※now merged into Yinshuimiao Village), Dingzha Town (※now merged into Yaozhuang Town).

Field Publication of Gongdu Village

Field Publication of Dongxi Village

Field Publication of Xuli Village

Field Publication of Jinze Village

Field Publication of Jinze Middle School

Field Publication of Jinxi Neighborhood Committee

Field Publication of Jinze Primary School

Field Publication of Jinze Kindergarten

Field Publication of Tianshanzhung Village

Field Publication of Jinze Town Health Service Center

The publication of full text was carried out on Shanghai Environment Online before the project is submitted for approval, publication contents are the full text of environmental impact assessment document of the construction project (text, graphics, etc. involving state secrets, commercial secrets and personal privacy are deleted), publication time was from August 26, 2014 to September 1, 2014. Publication link: http://www.envir.gov.cn/docs/2014/20140826631.htm.

(2) Public Participation survey in Resettlement

Field publication was carried out in surrounding Jinze reservoir from late June to the end of August in 2014. Meanwhile, Investigations were carried out in 5 villages of Gongdu Village, Rentun Village, Tianshanzhung Village, Dongxi Village and Xuli Village involved in Jinze Town, Qingpu District, Shanghai and Beicai Village, Yaozhuang Town, Jiashan County, Zhejiang Province, sampling questionnaires were conducted in villagers' residence by 10% of residential users. And consulted

opinions in Planning Office, Letters and Visits Office, Comprehensive Management Office and other comprehensive departments in Jinze Town on the issue of project social stability risks.

7.2.2 Pipe Routing Project of Upper Huangpu Raw Water Intake System

(1) Public Participation survey and Information Publication of Environmental Impact Assessment

① Public Participation survey

Two times of questionnaires were carried out in the town residents around the project from June 24, 2014 to July 25 and from August 20, 2014 to August 22, 2014, and the environmental impact assessment report is provided for inspection by the units or individuals being investigated. There are a total of 20 group opinion questionnaires distributed in this public participation investigation and 20 effective questionnaires are collected, collecting rate of which is 100%. There are a total of 190 individual opinion questionnaires distributed and 182 effective questionnaires are collected, collecting rate of which is 95.8%. The covering rate of sensitive targets is 100%.

81.32% of the respondents are in favor of the project, 9.89% of the respondents support conditionally, 8.79% of the respondents hold indifference and no respondent holds opposing views. There are respectively 85% of the investigated groups are in favor of the project construction, 10% of the investigated group support conditionally and 5% of the investigated group hold indifference towards the project construction, no respondent holds opposing views. On account of the project implementation is conducive to promoting regional economic development and improving people's living standards as well as benefiting people, hence the public expressed concern, understanding and support for project construction and the overall public support rate is relatively high. The respondents that support the project construction consider it will be conducive to promoting economic development and benefiting people after implementation of project.

② Information Publication

The first Internet publication was carried out on Shanghai Environment Online from February 27, 2014 to March 12, 2014. Publication link: http://www.envir.gov.cn/docs/2014/20140227141.htm. The second Internet publication was carried out on Shanghai Environment Online from June 10, 2014 to June 24, 2014 on the basis of completion of the first draft of report. Publication link: http://www.envir.gov.cn/docs/2014/20140610915.htm. Field Publication was carried out on June 11, 2014, posting places are: Villagers' Committee of Yegang Village, Liantang Town, Qingpu District, Villagers' Committee of Dongtian Village (formerly Liandong Village), Liantang Town, Qingpu District, Villagers' Committee of Maoxin Village (formerly called Gusong Village), Shihudang Town, Songjiang District, Villagers' Committee of Xinyao Village, Shihudang Town, Songjiang District, Villagers' Committee of Dongxia Village, Shihudang Town, Songjiang District, Villagers' Committee of Xushe Village, Maogang Town, Songjiang District, Villagers' Committee of Fanjia Village, Maogang Town, Songjiang District, Villagers' Committee of Maogang Village, Maogang Town, Songjiang District, Villagers' Committee of Xinjian Village, Maogang Town, Songjiang District, Villagers' Committee of Sicun

Village, Yexie Town, Songjiang District, Villagers' Committee of Xuyao Village, Yexie Town, Songjiang District, Villagers' Committee of Tuanjie Village, Yexie Town, Songjiang District, Villagers' Committee of Yanjing Village, Yexie Town, Songjiang District, while providing environmental impact assessment report available for public inspection. **Newspaper publication was carried out on Jinshan News, Qingpu News and Songjiang News from June 9, 2014 to June 10, 2014 respectively.**

Field Publication of Yegang Village, Liantang Town, Qingpu District

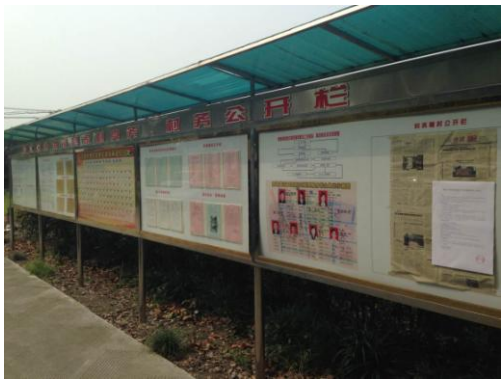
Field Publication of Dongtian Village, Liantang Town, Qingpu District

Field Publication of Maoxin Village, Shihudang Town, Songjiang District

Field Publication of Xinyao Village, Shihudang Town, Songjiang District

Field Publication of Dongxia Village, Shihudang Town, Songjiang District

Field Publication of Xushe Village, Maogang Town, Songjiang District



Field Publication of Fanjia Village, Maogang Town, Songjiang District

Field Publication of Villagers' Committee of Xingong Village, Maogang Town

Field Publication of Maogang Village, Maogang Town, Songjiang District

Field Publication of Xinjian Village, Maogang Town, Songjiang District

Field Publication of Xuyao Village, Yexie Town, Songjiang District

Field Publication of Sicun Village, Yexie Town, Songjiang District

Field Publication of Xuyao Village, Yexie Town, Songjiang District

Field Publication of Tuanjie Village, Yexie Town, Songjiang District

Field Publication of Yanjing Village, Yexie Town, Songjiang District

Newspaper Publication on Jinshan News

Newspaper Publication on Songjiang News

Newspaper Publication on Qingpu News

The publication of full text was carried out on Shanghai Environment Online before the project is submitted for approval, publication contents are the full text of environmental impact assessment document of the construction project (text, graphics, etc. involving state secrets, commercial secrets and personal privacy are deleted), publication time was from August 4, 2014 to August 8, 2014. Publication link: http://www.envir.gov.cn/docs/2014/20140804442.htm.

(2) Public Participation survey in Resettlement

Investigations were carried out from June to July in 2014. Key consultation was made in Yexie Town, Songjiang District, Shanghai, Liugang Town, Songjiang District, Shihudang Town, Songjiang District, Liantang Town, Qingpu District in the meantime. Later on, specially visited Leading Group Office of Maintaining Stability in Songjiang District, District Planning Bureau, District Letters and Visits Office, Shanghai Songjiang District Water Authority, Shanghai Songjiang Water Supply Company, Shanghai West Water Supply Company and other government departments and sought for opinions on the issue of project social stability risks.

8 Environmental Management Plan

8.1 Target of the Environmental Management Plan

The purpose of Environmental Management Plan is to formulate a set of environmental countermeasures with feasible technology and sustainable and operable finance according to inevitable environmental impact and determine environment mitigation, environment management and organization building measures and arrangement implemented by Project Contractor, Supervisor, Operator and Environmental Management Department during project construction and operation to eliminate or compensate harmful effect on the society and environment and reduce it to the acceptable level as far as possible.

8.2 Implementation Organization for Environmental Management Plan

For MINFENG RAW WATER CONVEYORS PROJECT of Upper Huangpu, environmental protection management organization must be set, leader responsibility system of project owner shall be implemented and professional environmental management personnel shall be equipped to be responsible for environmental supervision, meanwhile, environmental protection training for management personnel shall be strengthened. The purpose of constructing project environmental management is to implement relevant environmental protection responsibility according to relevant national, provincial and city environmental protection laws and regulations and *Environmental Impact Statement* approved by Competent Administrative Department for environmental protection and carry out the principle of “Three Simultaneity” , strengthen environmental management for the project during construction and operation, implement all environmental protection measures, relieve adverse impact on environment by project construction and reach harmonious development of economic benefit and environmental benefit of project construction.

8.2.1 Setting and Tasks of Environmental Management Organization

Table 8-1 Setting of Environmental Management organization

Organization nature	Organization name	Organization task
Supervision organization	Shanghai Environmental Protection Bureau	1. Responsible for examining and approving *Environmental Impact Statement*; 2. Make final approval for the feasibility of project on environmental protection; 3. Responsible for uniform supervision on environmental protection of project; 4. On the basis of environment assessment provided by the qualified monitoring unit and monitoring plan

Organization nature	Organization name	Organization task
		provided by the execution unit, make supervision and random inspection for environmental protection during construction and operation to ensure that all environmental protection measures are implemented.
	Songjiang District, Minjiang District and Fengxian Environmental Protection Bureaus	1. Make daily supervision for environmental management of project.
Management organization	Shanghai Chengtou Environment Asset Management Co. Ltd.	1. Responsible for plan and design of project and supervision on environmental protection procedure of project;
	SHANGHAI CHENGTOU RAW WATER CO.LTD	1. Accept supervision on environmental protection from all levels of environmental protection departments; 2. Require Design Tendering Company to bring all environmental management measures in the Environmental Management Plan into design and expression specification so as to implement environmental protection laws and regulations and environmental protection measures in Environmental Impact Assessment Report and environmental protection plan; 3. Ensure normal operation of environmental protection facilities, the environmental department makes inspection by itself, establishes environmental protection archives, and reports to Project Office and all levels of environmental protection management departments; 4. Sign entrust monitoring agreement (contract) with Environmental Monitoring Department and implement Environmental Management Plan;

Organization nature	Organization name	Organization task
		5. Formulate emergency treatment scheme for sudden accident and participate in emergency treatment for sudden accident; 6. Entrust and implement environmental supervision and write the environmental supervision plan in the contract; 7. Select strong and qualified contractor and write the Environmental Management Plan into contract to ensure effective implementation of Environmental Management Plan.
Implementation organization	Construction unit	1. Implement environmental protection countermeasures during construction specified in the tendering document or design document in the project and make auxiliary supervision; 2. Accept supervision on environmental protection from SHANGHAI CHENGTOU RAW WATER CO.LTD and Environmental Protection Bureau
Consulting service organization	Environmental Impact Assessment consulting unit	1. Accept entrust and prepare Environmental Impact Assessment report of project.
	Design consulting unit	1. Accept entrust, prepare feasible research report and construction design scheme and ensure that measures and scheme in Environmental Management Plan are implemented to preparation results.
	Environmental supervision unit	1. Accept entrust, make supervision for daily production of construction unit.
	EMP external management monitoring organization	1. Make monitoring of environmental index and preparation for English and Chinese report of external supervision, etc. every half year.

Organization nature	Organization name	Organization task
Quality monitoring organization	Environmental quality monitoring organization	1. Accept entrust of SHANGHAI CHENGTOU RAW WATER CO.LTD, responsible for supervision on environmental quality in project area during project construction and operation.

8.2.2 Setting and Responsibility of Environmental Management Organization during Construction

Responsibility and personnel allocation of each project organization during construction is as shown in Table 8-2.

Table 8-2 Setting and Responsibility of Environmental Management Organization during Construction

Organization nature	Organization name	Organization task
Supervision organization	All levels of environmental protection departments, Water Plant department, greening city appearance and environmental sanitation department, traffic administrative department and sanitation and anti-epidemic department	1. Make overall process environmental monitoring and supervision for the project pursuant to the law, including: approval of Environmental Impact Assessment Report of project, environmental monitoring and supervision at the stages of project construction and operation.
Management organization	Shanghai Chengtou Environment Asset Management Co. Ltd.	1. Supervise for implementation of *Environmental Management Plan*; 2. Urge and coordinate the implementation of domestic and world bank environmental management requirements;

Organization nature	Organization name	Organization task
		3. Coordinately solve major environmental problems with other relevant departments.
	SHANGHAI CHENGTOU RAW WATER CO.LTD	1. Set project environmental management office, define personnel and responsibility of “project environmental management office”; 2. Formulate environmental protection management procedure and system during construction; 3. Responsible for bringing the environmental protection measures into tendering document and construction contract; 4. Formulate annual plan for environmental protection; 5. Check and arrange annual environmental protection expenditure; 6. Arrange annual environmental monitoring and entrust; 7. Organize and implement environmental protection measures responsible by project owner and arrange monitoring; 8. Supervise implementation of environmental protection measures taken by construction unit; 9. Coordinate environmental protection between environment protection management department, environment monitoring department and other relevant departments; 10. handle environmental pollution accident and dispute caused by the project construction and report them to relevant upper level departments; 11. Arrange preparation of monthly, quarter, half year and annual report of environmental protection and report them to the upper level department;

Organization nature	Organization name	Organization task
		12. Provide relevant data and technology support for preparing of external supervision report. 13. Organize and launch environmental protection publicity, education and training.
Implementation organization	Contractor	1. Formulate annual work plan of environmental protection; 2. Check construction protection work schedule, quality and operation and inspection conditions of environmental protection facilities and handle relevant problems during implementation; 3. Check use condition of annual environmental protection expenditure; 4. Report execution condition of environmental protection conditions in the contract to the project owner and construction supervision unit regularly. 5. Residence of construction personnel and occupational health management. 6. In order to ensure construction safety during construction, safety prevention measures shall be adopted, for example, set prompt mark on construction site, and fence the boundary of construction site, establish communication channels with the public to ensure construction safety.
Consulting service organization	Environmental Impact Assessment consulting unit	1. Make field visit for each project and make assessment for their environment; 2. Assist to prepare contents of *Environmental Management Plan.*
	Environmental supervision unit	1. Review environmental protection qualification and implementation of environmental protection measures of each construction unit and contractor. 2. Responsible for standard acceptance of

Organization nature	Organization name	Organization task
		environmental protection of each contractor during construction, formulate signal evaluation reward and punishment system for each environmental protection. 3. Supervise environmental impact caused by implementation of project along the line and implementation of relevant environmental protection measures, and construction plan and fund implementation of ecological protection and all kinds of pollution prevention measures. 4. Make overall monitoring for engineering quality, expense and schedule implementation of project, propose strict requirements and prevent problems and ensure that environmental benefit and social benefit will be developed after project operation. 5. Make an inspection tour for environmental protection during project construction and organize environmental quality monitoring, if a problem is found, propose suggestions and coordinate to solve it timely, and report monthly or stage supervision report to SHANGHAI CHENGTOU RAW WATER CO.LTD and environmental protection authorities. 6. Participate in environmental protection completion acceptance of project and submit final report of environmental supervision, make assessment and summary for implementation of laws and regulations, standards, technical specification as well as all measures of construction project during construction. And the assessment and summary is regarded as the important basis of project acceptance.
	EMP external management monitoring organization	1. Monitor the environmental index every half year and prepare external Chinese and English report.

Organization nature	Organization name	Organization task
Quality monitoring organization	Environmental quality monitoring organization	1. Make monitoring for the environment during project construction and operation in accordance with *Environment Monitoring Plan* and keep it in archives and report to Project Office of each district.

8.2.3 Management for the Contract Parties

(1) The policy of “Three Simultaneity” must be implemented during project construction. The project owner shall ensure that facilities to prevent pollution and other public nuisance and main engineering project are designed, constructed and operated simultaneously. After completion of project, the project owner shall submit completion acceptance report or special completion acceptance report with contents of environmental protection. After acceptance from the environmental protection competent department is qualified, the project can be put into operation;

(2)According to national and Shanghai environmental protection regulations, make pollutant emission declaration registration to Shanghai Environmental Protection Bureau timely. After getting approval of environmental protection department, the pollutant can be emitted according to distributed index;

(3)Strengthen statistics for environmental monitoring data, establish perfect pollution source and material loss archives, strictly control total emission of pollutant to ensure that pollutant emission index reach design requirements;

(4)Strengthen supervision and management function on environmental protection facilities, establish perfect technology archives including operation, maintenance and repair for environmental protection facilities, and strengthen technical training for operating personnel of environmental protection facilities to ensure that the environmental protection facilities are under normal operation and pollutant emission reaches standards continuously;

(5) Strengthen monitoring for abnormal working condition and surrounding environment and formulate effective measures which can control pollution enlarge and prevent pollution accident;

(6) During formulating operating specification, requirements of environmental protection shall be considered;

(7) Launch environmental education and improve environmental awareness of cadres and large employees in the project owner;

(8)Bring the environmental protection into system of post responsibility and uniform grade and reward index and bring it into production system. Make urge, inspection, praise, reward or punishment by administrative means to make each department complete the environmental protection task better;

(9)Bring the environmental management into total management plan of enterprise, through operation

and continuous improvement of environmental management system, reach requirements of reducing pollution, saving energy and protecting environment, and then improve environmental benefit and economic benefit of enterprise.

8.2.4 Environmental Management Organization during Operation

After the project enters operation, environmental management function of “Project Environmental Management Office” during the original construction is transferred to operation management unit of the project. The operation unit shall equipped with professional personnel of environmental protection and be responsible for environmental protection during operation. Relevant environmental protection measures are entrusted and undertaken by qualified unit through signing contract. The main environmental management responsibilities are as shown below:

(1) Manage implementation of environmental protection measures in the project;

(2) Coordinate relevant environmental problems with environmental supervision and management department and surrounding residents;

(3) Entrust the municipal monitoring station to make routine monitoring for three wastes emitted by the project facilities and area environmental quality;

(4) If environmental accident happens, adopt emergency disposal for environmental risk;

(5) Responsible for reporting relevant information of enterprise environment management to the Municipal Environmental Protection Bureau;

(6) File for enterprise environmental management archives records, and arrange them.

8.3 Estimation for Investment Cost of Environmental Protection

Minfeng Project belongs to municipal waterline project, during the operation, there is no waste gas, waste water and noise, and the project will not have adverse impact on surrounding environment. Therefore, environmental protection investment of Environmental Management Plan in the project is mainly environmental protection investment during construction. Environmental protection investment is RMB 6.3044 million (the actual investment shall prevail). Environmental protection investment of Jinze Reservoir Project is about RMB 18.292 million (the actual investment shall prevail), environmental protection investment of Pipe Routing Project is RMB 5.7729 million (the actual investment shall prevail). Environmental protection investment of Jinze Reservoir Project and Pipe Routing Project has been listed in total investment of project.

8.4 Environmental Monitoring Plan

For environmental monitoring plan of Minfeng Line Project, see Table 8-3. For environmental monitoring plan of Jinze Reservoir Project, see Table 8-4. For environmental monitoring plan of Pipe Routing Project, see Table 8-5. **Table 8-3 Environmental Monitoring Plan of Minfeng Raw Water Line Project**

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Monitoring organization
Construction period	Environmental air	Set 1 environmental air monitoring point at each front row of 9 relatively sensitive residences respectively where near to the construction area	TSP	One stage per season, once per day. Nine stage in total	SHANGHAI CHENGTOU RAW WATER CO.LTD	Environmental monitoring organization
	Noise	Set 1 noise monitoring point at each 22 relatively sensitive residences respectively where near to the construction area	LeqdB(A)	One stage per season, 1day per stage, one measurement during day and one measurement during night. Nine stages in total		

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Monitoring organization
	Construction wastewater	Total 3 construction areas, set 1 wastewater monitoring port at each construction area.	pH, CODcr, SS, petroleum	One stage per season, 2 day for one stage, take two time per stage, nine stages in total		
	Domestic sewage	1 Minhang sewage treatment tank and 2 Fengxian sewage treatment water	COD_{Cr}, BOD_5, NH_3-N and animal and vegetable oil	One stage per season, 2day per stage, take two time per stage		
	Surface water	Set 6 surface water monitoring points and 2 surface water monitoring sections along the project. The 6 surface water monitoring points include Xihejing, Qingshuigang, Nanshagang and 3 riverways for emission of construction	Water temperature, pH, DO, SS, CODmn, BOD_5,	Monitor one stage before surface water quality construction,		

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Monitoring organization
		wastewater of construction camp. The 2 surface water monitoring sections include upper stream 500m of Huangpu Songpu Raw Water Plant and downstream of Huangpu Fengxian pressure regulating tank	ammonia nitrogen, total phosphorus, volatile phenol, petroleum	monitor one stage in each quarter during construction, ten stages in total, take two time per stage.		
Operation period	Surface water	Set 6 surface water monitoring points and 2 surface water monitoring sections along the project. The 3 surface water monitoring points include Xihejing, Qingshuigang, Nanshagang and there are 3 riverways for emission of construction wastewater of construction camp. The 2 surface water monitoring sections include upper stream 500m of Songpu Raw Water Plant and downstream of Fengxian pressure regulating tank	Water temperature, pH, DO, SS, CODmn, BOD_5, ammonia nitrogen, total phosphorus, volatile phenol, petroleum	Monitor one stage at the beginning of operation	SHANGHAI CHENGTOU RAW WATER CO.LTD	

Table 8-4 Environmental Monitoring Plan of Jinze Reservoir Project

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Monitoring organization
Construction period	Environmental air	Set 1 monitoring point at each construction plant, there are 4 monitoring points in total	TSP	One stage for each quarter during construction, 7day per stage, take four times every day, monitor eight stages in total	Shanghai Upper Huangpu Raw Water Company	Environmental monitoring organization
	Noise	Set 4 flowing sound environmental monitoring points in the project area, and they are arranged in 4 construction camps respectively	Leq dB(A)	One stage per season, 1day per stage, take once during day and night, nine stages in total		
	Construction wastewater	Set 4 monitoring points at wastewater outlets of construction area	pH, COD_{cr}, SS, petroleum	One stage per season, 2day per stage, take twice per stage, eight stages in total		
	Surface water	Set 1 surface water quality monitoring section at Taipu River, Babaimu, Taipu River	Water temperature, pH, DO, SS, COD_{mn}, BOD_5, ammonia nitrogen, total	Monitor one stage before construction of surface water quality, monitor one stage in		

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Monitoring organization
		intake section respectively, three vertical lines are set in each section respectively, and 2 water samples of ebb and flow are taken by each vertical sample.	phosphorus, volatile phenol, petroleum	each quarter during operation, monitor one stage after construction, monitor ten stages in total, ake twice per stage		
Operation period	Surface water	Set 1 surface water quality monitoring section at Taipu River, Babaimu, Taipu River intake section respectively, three vertical lines are set in each section respectively, and 2 water samples of ebb and flow are taken by each vertical sample.	Water temperature, pH, DO, SS, CODmn, BOD_5, ammonia nitrogen, total phosphorus, volatile phenol, petroleum	Monitor one stage at the beginning of operation	Shanghai Upper Huangpu Raw Water Company	
	Noise	Set 4 monitoring points around the pumping station boundary	Leq dB(A)	Monitor one stage at the beginning of operation, once during the day and night respectively		

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Monitoring organization
	Oil fume and waste gas	Set 1 environmental air monitoring point at kitchen chimney of management district	Oil fume and waste gas	Monitor once at the beginning of operation, take sample one day every time, take sample once during the day		
	Electromagnetic radiation	Set 1 monitoring stationing at 110 KV transformation substation and Gongdu Village Gongtan	Power frequency electric field strength (V/m), power frequency magnetic flux density (nT), radio interference frequency (MHz) and quasi-peak value, etc	Monitor one stage at the beginning of operation		

Table 8-5 Environmental Monitoring Plan of Pipe Routing Project

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Supervision organization
Construction period	Environmental air	Set at 8 sensitive points along the line including Zhongfan residential buildings, Nanzhangjia residential buildings, Jinjiadai residential buildings, Hujiazhai residential buildings, Nanbang residential buildings, Shijiabang residential buildings, Ruijiali residential buildings and Wangjiatang	TSP	One stage per season, 7day per stage, take once per day, seven stages in total	Shanghai Upper Huangpu Raw Water Company	Environmental supervision organization
	Noise	Set at 23 sensitive points along the line including Gaojiagang, Yeku Village, Liantang nursing home, Maoxin Village, Yangsijing, Xinyao Village, Yaojia Village, Xiaxu, Huangnijing, Beiyexu, Zhangjiaku, Sanjia Village, Gujiadai, Shihejing, Zhuanghangbang, Yujia Village, Tangkou, Shenjiadai, Dongxiejing, Beixing, Gujiajiao, Sunjiabang, Chuantangfang	Leq dB(A)	One stage per season, 1day per stage, once during day and night respectively, eight stages in total		
	Construction wastewater	Set 1 monitoring point at the outlet of construction wastewater treatment facilities at the base	pH, COD_{cr}, SS, petroleum	One stage per season, 2days per stage, take twice per stage, 15		

Supervision period	Environmental elements	Layout of monitoring points(quantity)	Supervision project	Supervision frequency	Responsible person	Supervision organization
				stages in total		
	Domestic sewage	Set 1 monitoring point at the each outlet of domestic sewage treatment facilities at the base respectively	COD_{Cr}, BOD_5, NH_3-N and animal and vegetable oil	One stage per season, 2day per stage, take twice per stage, 15 stages in total		
Operation period	Noise	Set sound environmental monitoring points at each Songjiang Midway Pumping Station 4 boundary, four in total	Leq dB(A)	Monitor one stage at the beginning of operation, once during day and night	Operator	Environmental supervision organization
	Oil fume and waste gas	Set 1 environmental air monitoring point at kitchen chimney of Songjiang Midway Pumping Station	Oil fume and waste gas	Monitor once at the beginning of operation, take sample one day every time, take sample once during day and night respectively		