SFG1155 REV

World Bank Financed Jingzhou Historic Town Conservation Project

Environmental and Social Management Plan

(APPRAISAL REVISED)

Project Management Office of World Bank Financed Hubei Jingzhou

Historic Town Restoration and Protection Project

July, 2015

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1 Introduction

The *Environmental and Social Management Plan* (ESMP) is prepared by Hubei Academy of Environmental Sciences (HAES) for World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project. ESMP is formulated on the basis of the main conclusions and suggestions of Environmental Impact Assessment (EAR), mainly containing: setting up of organization for implementing ESMP, key environmental issues in project implementation and operation, environmental mitigation measures at each project phase, monitoring plan and reporting system, training plan and expense budget. In project evaluation phase, ESMP will be reviewed and approved by the Construction Office of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project, fully implemented in project implementation phase.

Environmental assessment is to forecast the potential impacts of proposed projects on social and natural environment and to formulate environmental impact mitigation plan, which is essential to the preparation of the proposed project. In project preparation phase, EAR is prepared to ensure that all the environmental issues it mentioned can be solved and taken into consideration in each project phase; while ESMP is formulated to put forward the measures and methods that can reduce, mitigate or relieve adverse environmental impacts to an acceptable level. As a part of environmental assessment, ESMP has already been carried out. Final plan will be determined upon considerations such as engineering, cost and minimum impact on environment during project design and environmental assessment phase.

As a part of project preparation and evaluation, EAR works has already been conducted. As a part of EAR, ESMP is formulated on the basis of the findings of environment impact assessment, especially those adverse impacts identified in project construction and operation. ESMP also puts forward corresponding mitigation measures which could lower the impacts to be in compliance with national and local environment standards and applicable safeguard policies of the World Bank. EAR documents, including the ESMP, combine project design with protection plan for environmentally sensitive items. The implementation of EAR documents will minimize the potential impacts of the proposed project on environment and society.

In order to implement ESMP effectively and practically, in project preparation phase, expense budget for environmental measures will be incorporated into project budget, environmental mitigation measures into technical specification documents of engineering procurement, training cost and consultation fee for the implementation of ESMP into the total investment estimate of the project. In the meantime, project owner will employ qualified and experienced external monitoring consultant (EMC) for ESMP to independently conduct external monitoring. EMC shall monitor whether construction entity carries out all environmental measures specified in bidding documents and whether all environmental measures put forward in project preparation phase are effective and reasonable, so as to submit better suggestions to owner for strengthening environmental management in project construction and operation.

1.1 Objectives

Proposed World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project (hereinafter referred to as "Jingzhou Historic Town Restoration" or Proposed Project) is located in Jingzhou, Hubei. The Project received a World Bank loan of 100 million USD. The project development objectives (PDO) are to enhance the historical and cultural heritage of Jingzhou Historic Town Area through protecting and restoring the historic city wall, to improve water environment and ecological system of historic town through governing water environment and ecology, to improve the traffic convenience for residents in historic town, and to regulate vehicle running routes to realize separation of pedestrian and vehicles and separation of motor and non-motor vehicles through traffic engineering.

See Figure 1.1-1 for the specific location of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project in Jingzhou Downtown.

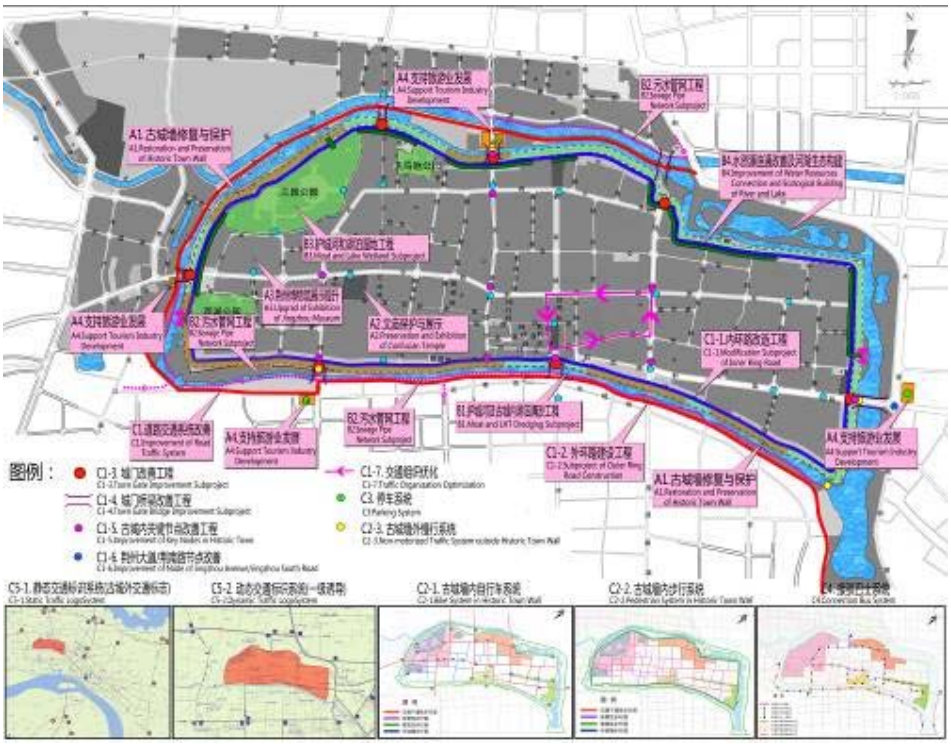

Figure 1.1-1 Layout of Construction Works

1.2 Project overview

Located in Jingzhou District of Jingzhou city, Hubei Province, the Proposed Project falls into the category of comprehensive environmental treatment, consisting of three sub-projects, i.e. cultural heritage protection and tourism development promotion, improvement of ecological and water environment in historic town, and improvement of traffic situation in historic town. Cultural heritage protection and tourism development promotion includes protection of west city wall, construction of retaining wall of historic city wall, environmental improvement of Kaiyuan Taoist Temple , improvement of museum display, visitors' center, construction parking lot, restoration and reutilization of historic buildings, construction of Phase II Xiongjiazhong national

Archaeological Park, visitors' center and parking lot, Garden, information guide. Improvement of ecological and water environment in historic town covers dredging of moat and lakes within historic town, sewage pipeline network, moat and lake wetland, water resources connectivity and ecological construction of rivers and lakes. Traffic improvement contains upgrading of inner-ring roads, improvement of key traffic nodes of the inner-ring roads and improvement of key traffic nodes in and outside historic town, slow traffic system, bus system, and static and dynamic traffic sign systems.

Total project investment is 1.081 Billion CNY, of which the World Bank loan is 0.1 Billion USD (about 0.615 billion CNY) and investment of environmental protection is 7.88 million CNY, accounting for 0.7% of the total investment. The Construction phase is from 2015 to 2020.

1.3 Legal framework

1.3.1 Laws and regulations

(1) *Environmental Protection Law of the People's Republic of China*, revised on April 24, 2014, effective as of January 1, 2015;

(2) *Environmental Impact Assessment Law of the People's Republic of China*, effective as of September 1, 2003;

(3) *Amendment to Regulations and Normative Documents of Environmental Protection Department*, Decree of State Environmental Protection Administration (No.6), effective as of July 8, 1999;

(4) *Water Pollution Prevention and Control Law of the People's Republic of China*, revised on February 28, 2008, effective as of June 1, 2008;

(5) *Law on Prevention and Control of Air Pollution of the People's Republic of China*, revised on April 29, 2000, effective as of September 1, 2000;

(6) *Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise*, promulgated on October 29, 1996, effective as of March 1, 1997;

(7) *Law of the People's Republic of China on Prevention of Environmental Pollution Caused by Solid Waste*, revised on December 29, 2004, effective as of April 1, 2005;

(8) *Law of the People's Republic of China on Promotion of Cleaner Production*, effective as of July 1, 2012;

(9) *Land Administration Law of the People's Republic of China,* adopted and implemented on August 28, 2004;

(10) *Water and Soil Conservation Law of the People's Republic of China*, effective as of March 1, 2011

(11) *Law of the People's Republic of China on the Protection of Wild Animals,* Order of the President of the People's Republic of China (No. 9), effective as of March 1, 1989;

(12) *Catalogue for Guiding Industry Restructuring (2011 Version)*, Order of the National Development and Reform Commission (No. 9), effective as of June 1, 2011;

(13) *Decision of the National Development and Reform Commission on Amending the Relevant Entries under the Catalogue for Guiding Industrial Restructuring* (2011 Version), Order of the National Development and Reform Commission (No. 21), effective as of May 1, 2013;

(14) *Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects*, Order of Ministry of Environmental Protection (No.2), October 1, 2008;

(15) *Notice on Further Strengthening Environmental Impact Assessment Management to Prevent Environmental Risks*, Order of Ministry of Environmental Protection (No.77) [2012]

(16) *Suggestions of the State Council on Strengthening Major Environmental Protection Work*, issued by the State Council document, GF [2011] No.35;

(17) *Notice of the State Council on Issuing the 12th Five-year Plan for National Environmental Protection*, issued by the State Council document, GF [2011] No.42

(18) *Guidelines on the Government Disclosure of Information about Construction Project Environmental Impact Assessment (Trial)*, issued by General Office of the Ministry of Environmental Protection, November 14, 2013;

(19) *Provisional Measures on Public Participation in Environmental Impact Assessments*, issued by State Environmental Protection Administration, HF[2006] No.28;

(20) *Notice on Promulgating the List of the First Group of Alien Invasive Species of China*, issued by State Environmental Protection Administration, HF[2003] No.11;

(21) *Notice on Promulgating the List of the Second Group of Alien Invasive Species of China*, issued by State Environmental Protection Administration, HF[2010] No.4;

(22) *Regulations on Environmental Protection Administration in Hubei*, implemented on December 2, 1994;

(23) *Notice on Prohibiting Mixing Concrete at the Scene in Cities from a Certain Time*, jointly issued by Ministry of Commerce, Ministry of Public Security, Ministry of Construction and Ministry of Transportation, SGF[2003] No. 341;

(24) *Regulations on Environmental Protection Administration in Hubei*, implemented on December 2, 1994;

(25) *Regulations on Prevention and Control of Air Pollution in Hubei,* adopted at the 31st Meeting of the Standing Committee of the Eighth People's Congress of Hubei Province on December 3, 1997; revised on the 10th Meeting of the Standing Committee of the Tenth People's Congress of Hubei Province on July 30, 2004;

(26) *Suggestions of the People's Government of Hubei Province on Strengthening Protection and Administration of Lakes,* issued by General Office of the People's Government of Hubei Province on October 26, 2012;

(27) *Notice of General Office of the People's Government of Hubei Province on Issuing Methods of Examining and Approving Environmental Impact Assessment Documents of Construction Project in Different Levels in Hubei*, EZBF [2012] No.25;

(28) *Notice of General Office of the People's Government of Hubei Province on Forwarding the Document of Category of Environmental Functions of Surface Water in Hubei Issued by Hubei Environmental Protection Bureau*, EZBF [2000] No.10;

(29) *Regulations on Prevention and Control of Water Pollution in Hubei (adopted at the 2nd Meeting of the Standing Committee of the Twelfth People's Congress of Hubei Province*;

(30) *Decision of the State Council on Implementing Scientific Outlook on Development and Strengthening Environmental Protection*, GF[2005] No. 39, on December 3, 2005;

(31) *Guideline for Ecological and Environmental Protection,* November 26, 2000;

(32) Provisional Regulations on the Supervision and Administration of Ecological Works of Water and Soil Conservation, SJG No.79;

(33) *Provisional Measures on Public Participation in Environmental Impact Assessments*, HF[2006] No.28;

(34) Cultural Relics Protection Law of the People's Republic of China, adopted at the 3rd Meeting of the Standing Committee of the Twelfth National People's Congress on June 2013.

1.3.2 Technical standards

(1) *Technical Guidelines for Environmental Impact Assessment - General Programme* (HJ2.1-2011);

(2) *Technical Guidelines for Environmental Impact Assessment – Air Environment* (HJT2.2-2008);

(3) *Technical Guidelines for Environmental Impact Assessment – Surface Water Environment* (HJ/T2.3-93);

(4) *Technical Guidelines for Environmental Impact Assessment – Noise Environment* (HJT2.4-2009);

(5) *Technical Guidelines for Environmental Impact Assessment – Ecological Impacts* (HJ19—2011);

(6) *Specifications for Environment Impact Assessment of Highway Construction Project* (JTGB03—2006) ;

(7) *Method for Estimation of Air Pollution from Vehicular Emission in Urban Area* (HJ/T180-2005).

1.3.3 Policy planning

(1) *Outline of the Twelfth Five-year Plan for Jingzhou Economic and Social Development*;

(2) *Statistical Communiqué of Jingzhou on the 2011 National Economic and Social Development*;

(3) *Outline of the Twelfth Five-year Plan for Jingzhou Hydraulic Development*;

(4) *Preliminary Design Report of Flood Control Works in Jingzhou (2003);*

(5) Flood Control Analysis Report of Jingzhou (2011);

(6) *Special Planning for Draining Works in Jingzhou Downtown*;;

(7) *Results of Planning for Jingzhou Famous Historical and Cultural Town Protection*;

(8)*Design Description of Overall Planning of Jingzhou Tourist Area Around the Historic Town;*

(9)*Proposal of Hubei Jingzhou Historic Town Restoration and Protection Project Financed by the World Bank*;

(10)Feasibility Study Report of Hubei Jingzhou Historic Town Protection and Environmental Improvement

(11)*Planning for the Protection of Jingzhou Famous Historical and Cultural Town* (2010-2030);

(12)*Jingzhou Overall Urban Planning* (2011~2020);

(13)*Overall Planning for Jingzhou Area as Part of Ecological and Cultural Tourism Circle in West Hubei* (2009);

(14)*Overall Planning for Tourist Area in Jingzhou Historic Town* (2011-2020);l

(15)*Overall Planning for Protection of Culture Relics on Jingzhou Historic Town Wall* (2009);

(16)*Specific Planning for Control of Tourism Development in Jingzhou Historic Town Scenic Area* (2011-2020);

(17)*Evacuation Planning for Jingzhou Historic Town* (2002);

(18)*Notice of the General Office of the State Council on Strengthening Protection and Administration of Wetland* (GFB[2004] No.50) ；

(19)*Planning for Prevent and Control of Water Pollution in the Drainage Basin of Four Lakes* (2008);

(20)*Short-term Planning for Jingzhou Urban Construction* (2011-2015);

(21)*Planning for Jingzhou Urban Green Land System* (2011-2020);

(22)*Planning for Jingzhou Blue Line*;

(23)*Function Zoning of Jingzhou Water Environment*;

(24)*Planning for Comprehensive Treatment of Jingzhou Urban Water Environment* (2010-2020).

1.3.4 Project documents

(1)*Project Entrustment Letter*;

(2)*Proposal of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project*, Jingzhou Institute of Urban & Rural Planning & Design, 2014.1;

(3)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project – Main Report*, T.Y. Lin International 2014.9;

(4)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project – Restoration and Protection Jingzhou Historic City Wall*, T.Y. Lin International2014.9;

(5)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project –Protection and Exhibition of Confucius's Temple*, T.Y. Lin International2014.9;

(6)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration*

and Protection Project –Report on Tourism Analysis, T.Y. Lin International2014.9;

(7)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project – Report on Water Environment Analysis and Technology,* T.Y. Lin International2014.9;

(8)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project – Report on Traffic Analysis and Technical Proposal*, T.Y. Lin International2014.9

(9)*Feasibility Study Report of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project – Report on Administration of Jingzhou Historic Town*, T.Y. Lin International2014.9;

(10)*Environmental Impact Assessment of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project*, Research Center for Involuntary Resettlement , Wuhan University, 2014.7;;

(11)*Study Group Memorandum of Hubei Jingzhou Historic Town Restoration and Protection Project in China* (December 11 to 13, 2013);

(12)*Review Group Memorandum of Hubei Jingzhou Historic Town Restoration and Protection Project in China* (April 21 to 26, 2014);

(13)*Preparatory Group Memorandum of Hubei Jingzhou Historic Town Restoration and Protection Project in China* (October 13 to 17, 2014);

(14)*Meeting Minutes of Public Participation in Environmental Impact Assessment of Hubei Jingzhou Historic Town Restoration and Protection Project* (November 28, 201);

(15)*Pre-evaluation Group Memorandum of Hubei Jingzhou Historic Town Restoration and Protection Project in China* (January 26 to 29, 2015);

1.3.5 Applicable standards

According to the function zoning of Jingzhou environment and *Reply to Execution Standards of World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project* (issued by Jingzhou Environmental Protection Bureau on January 21, 2015), the applicable standards for environmental impact assessment of the Project are as follows:

Table 1.3-1 Schedule of Assessment Standards

Category of standard	Standard No.	Standard name	Item evaluated	Level
Quality standard	GB3095-2012	Ambient Air Quality Standards	Assess ambient air quality	Level 1, 2
	TJ36-79	Hygienic Standard for Industrial Enterprise Design		One-time value
	GB3838-2002	Environmental Quality Standards for Surface Water	Moat, Taihugang Channel, North Lake, West Lake, Xima Pond, Gangnan Channel, Jingsha River, other connected water systems proposed	Category III
	GB3096-2008	Environmental Quality Standards for Noise	Roads; residential areas (buildings of 3 floors and above) in the first row	Category 4a

Category of standard	Standard No.	Standard name	Item evaluated	Level
			against road; adjacent areas where category I and II standards applicable; areas (buildings of less than 3 floors) within 50m, 30m around road red line	
			Schools (beyond the scope of category 4a)	Category 1
			Other areas (beyond the scope of category 4a)	Category 2
	GB/T14848-93	Quality Standard for Ground Water	Ground water in each sub-project site	Category2
Emission standard	DB11/501-2007	Integrated Emission Standard of Air Pollutants	Exhaust gas in parking lot	Level II standard
	Offensive Odor Control Law (Japan)		Odor at storage yard	——
	GB8978-1996	Integrated Wastewater Discharge Standard	Wastewater in Construction phase	Level III
			Visitors' center	
	GB22337-2008	Emission Standard for Community Noise	Category 4 areas around visitors' center	Category 4
			Category 2 areas around visitors' center	Category 2
			Category 1 areas around visitors' center	Category 1
	GB1495-79	Allowable Noise Limits for Motor Vehicle	Vehicle on roads under upgrading and reconstruction	—
	GB12523-2011	Emission Standard of Environment Noise for Boundary of Construction Site	Noise for boundary of construction site	—
	HJ350-2007	Standard of Soil Quality Assessment for Exhibition Sites (Trial)	Dredging and desilting	—

Table 1.3-2 Schedule of Ambient Air Quality Standards Unit: mg/Nm^3

Standard No.	Standard name	Evaluation factor	Hour (one time)	Daily average	Annually average	Item evaluated
GB3095-2012	Ambient Air Quality Standards	PM_{10}	-	0.15	0.07	Assess ambient air quality Level II
		SO_2	0.50	0.15	0.06	
		CO	10	4		
		NO_2	0.20	0.08	0.04	
TJ36-79	Hygienic Standard for Industrial Enterprise Design	NH_3	0.2	-	-	Ambient air quality in residential area
		H_2S	0.01	-	-	

Table 1.3-3 Schedule of Surface Water Quality Standards Unit: mg/L, except for pH

Standard No.	Standard name	Evaluation factor	Category Ⅲ (mg/L)	Item evaluated
GB3838-2002	Environmental Quality Standards for Surface Water	pH	6~9	Moat, North Lake, West Lake, Xima Pond, other connected water systems proposed
		Water temperature	Average weekly maximum temperature rise ≤1 Average weekly maximum temperature drop ≤2	
		Dissolved oxygen	≥5	
		SS	≤30	
		COD	≤20	
		BOD_5	≤4	
		Petroleum	≤0.05	
		Ammonia nitrogen	≤1.0	
		Total phosphorus	≤0.2(lake, reservoir 0.05)	
		Total nitrogen	≤1.0	

Standard No.	Standard name	Evaluation factor	Category Ⅲ (mg/L)	Item evaluated
		Fluoride	≤1.0	
		Fecal coliform	≤10000	

Table 1.3-4 Schedule of Environmental Noise Standard in Areas Unit: dB(A)

Standard No.	Standard name	Evaluation factor	Day	Night	Item evaluated
GB3096-2008	Environmental Quality Standards for Noise	Equivalent sound level L_{Aeq}	70	55	Roads; residential areas (buildings of 3 floors and above) in the first row against road; adjacent areas where category I and II standards applicable; areas (buildings of less than 3 floors) within 50m, 30m around road red line
			60	50	Schools (beyond the scope of category 4a) Category 2
			55	45	Other areas (beyond the scope of category 4a) Category 1

Table 1.3-5 Environmental Quality Standard for Ground Water Unit: mg/L

Standard No.	Standard name	Evaluation factor	Category Ⅲ (mg/L)	Item evaluated
GB/T14848-93	Quality Standard for Ground Water	pH	6.5~8.5	Each sub-project area
		Total hardness	≤450	
		Total dissolved solids (TDS)	≤1000	
		Permanganate index	≤3.0	
		Ammonia nitrogen	≤0.2	
		Nitrate	≤20	
		Nitrite	≤0.02	
		Volatile penol	≤0.002	
		Total cyanide	≤0.05	
		Fe	≤0.3	
		Mn	≤0.1	
		Pb	≤0.05	
		Cd	≤0.01	
		As	≤0.05	
		Hg	≤0.001	
		Cr6+	≤0.05	
		Total coliform group	≤3.0	

Table 1.3-6 Schedule of Air Pollutants Emission Standards

Standard No.	Standard name	Evaluation factor	Control item	Allowable maximum emission concentration (mg/m^3)	Allowable maximum emission rate	
					Exhaust funnel (m)	Rate of emission (kg/h)
DB11/501-2007	Integrated Emission Standard of Air Pollutants	Exhaust gas in parking lot	NO_2	0.6	2.5	0.0034
			CO	15	2.5	0.076

Note: (1) When exhaust funnel is lower than 15m; emission concentration of air pollutants in exhaust funnel shall be 5 times the "concentration limits at non-organized emission control point" in Table 1; (2) When exhaust funnel is lower than the lowest funnel height listed in Table 1, emission rate shall be 50% of the emission rate limits calculated based on extrapolation method; When exhaust funnel cannot be 5m above the buildings within 200m radius, emission rate shall be further 50% of the emission rate in (2).

Table 1.3-7 Standards of Wastewater Discharge

Standard No.	Discharge standard	Pollution factor	Unit	Discharge value	Source of pollution
GB8978-1996 Integrated Wastewater Discharge Standard	Level III	pH	-	6～9	Construction wastewater and domestic wastewater
		SS	mg/L	400	
		BOD_5	mg/L	300	
		COD	mg/L	500	
		Petroleum	mg/L	30	
		NH_4-N	mg/L	45	

Table 1.3-8 Schedule of Noise Control Standard Value Unit: [dB(A)]

Standard No.	Control standard	Item controlled	Day	Night	Control category
GB12523-2011	Emission Standard of Environment Noise for Boundary of Construction Site	Noise for boundary of construction site	70	55	—
GB22337-2008	Standard of Soil Quality Assessment for Exhibition Sites (Trial)	Category 4 areas around visitors' center	70	55	Category 4
		Category 2 areas around visitors' center	60	50	Category 2
		Category 1 areas around visitors' center	55	45	Category 1
GB1495-79	Allowable Noise Limits for Motor Vehicle	Car	82		—

Table 1.3-9 Schedule of Control Standard Values of Sludge and Sediment Unit: mg/kg

Index	Level II in Environmental Quality Standard for Soils	Control Standards for Pollutants in Sludge from Agricultural Use	Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant	The Disposal of Sludge from Municipal Wastewater Treatment Plant - the Quality of Sludge used in Gardens or Parks	The Disposal of Sludge from Municipal Wastewater Treatment Plant – the Quality of Sludge used in Mixed Filling and Bury	Standard of Soil Quality Assessment for Exhibition Sites (Trial)
pH	6.5~7.5	≥6.5	≥6.5	≥6.5	5~10	——
Moisture	——	——	——	40	60	——
Organic	——	——	——	≥25	——	——
Cyanide	——	——	——	——	10	8
Total nitrogen	——	——	——	≥0.3	——	——
Total phosphorus						
Hg	0.5	15	15	15	25	50
Zn	250	1000	3000	4000	4000	1500
Cu	200	500	1500	1500	1500	600
Cd	0.3	20	20	20	20	22
Pb	300	1000	1000	1000	1000	600
Total chromium	300	1000	1000	1000	1000	610
Total selenium	——	——	——	——	——	1000
Ni	50	200	200	200	200	2400
As	30	75	75	75	75	80

1.4 World Bank Safeguard Policies

As stipulated by World Bank, special attention shall be paid to public interests during project implementation, which is the purpose of conducting environmental impact assessment. Therefore,

the institution that carried out the EAR checks the safeguard policies item by item as per the stipulations in environmental documents of the World Bank. See Table 1.4-1 for details.

Table 1.4-1 Screening of Safeguard policies of the World Bank

No.	World Bank Safeguard Policies	Yes	No	Remarks
1	OP4.01 Environmental assessment	X		OP 4.01 is triggered, and the EAR, ESMP, EA summary (both Chinese and English versions) will be prepared according to the requirements of OP 4.01.
2	OP4.04 Natural Habitats	X		The proposed project is involved the definition of the natural habitats in the OP4.04.
3	OP4.09 Pest Management		X	The restricted insecticide and herbicide definite by OP4. 09 are not involved in both the construction and operation stage of the project.
4	OP4.10 Indigenous People		X	The project does not involve ethnic minority issues.
5	OP4.11 Physical Cultural Resources	X		The project involves protection and restoration of cultural relics. The cultural heritages involved in the project are confirmed and a special chapter is written to analyze the impact of the project on cultural relics.
6	OP7.6 Projects in Disputed Areas		X	There is no controversial area in the project.
7	OP4.37 Safety of Dams		X	There is no dam in the project area.
8	OP7.50 Projects on International Waterways		X	There are no international waters in the project area.
9	OP4.36 Forest		X	There is no natural forest or artificial forest in the project area.
10	OP4.12 Involuntary resettlement	X		The East Gate Visitors' center subcomponent involves resettlement and special analysis is done on resettlement.

1.5 Sensitive receptors

The construction of the Project covers a large area, involving Jingzhou District in Jingzhou city and Chuandian Town. Sensitive receptors include schools, hospitals, residential areas and cultural heritage sites.

1.5.1 Sensitive receptors of Component: Preservation of cultural heritage and promotion of tourism development

Component: Preservation of cultural heritage and promotion of tourism development comprises of: Restoration and protection of Jingzhou historic town wall, Environmental improvement of Kaiyuan Taoist Temple, Upgrading of Jingzhou Museum Treasure Hall display, Restoration and reutilization of historic buildings, Xiongjiazhong National Archeological Park Phase II project and Promotion of tourism development. Among these 6 subcomponents, the former 5 have construction works going on, while the last one "Promotion of tourism development" is mainly about capacity building of institutions. All the works are within the construction site, and the sensitive receptors are mostly cultural relics themselves and a few sensitive receptors around the construction site. See Table 1.5-1 and Figure 1.5-1~3 for cultural relic protection and sensitive items which could support tourism development.

Table 1.5-1 List of sensitive receptors of Component: Preservation of cultural heritage and promotion of tourism development

CH Sites			
No.	Name	Location	Class of protection
1.1	West Wall	Jingzhou historic town	National (forth group, approved in 1996)

CH Sites			
No.	Name	Location	Class of protection
1.2	Xiongjiazhong Chu Tombs	45km north of downtown Jingzhou	Provincial (second group, approved in 1981)
1.3	Jingzhou Museum	North of Jingzhou Middle Road	AAAA level scenic area (2000)
1.4	Historic buildings	13 buildings in total on East Dam Street and South Gate Avenue	No. 18 East Dam Street, No. 10 folk house, and No. 46 folk house are provincial level cultural sites, others are ordinary cultural relics and folk houses.
1.5	Kaiyuan Taoist Temple	West of Jingzhou Museum	National (sixth group, approved in 2006)
School			
1.6	Jingzhou Westgate High School	East of West Historic Town Wall	43 classrooms, with 2500 students
Note: Since construction is not carried out in the night, it has minor impacts on the residents. For this reason, residents are not selected as sensitive receptor of this project.			

Figure 1.5-1 Geographic Locations of Jingzhou Historic Town and Xiongjiazhong

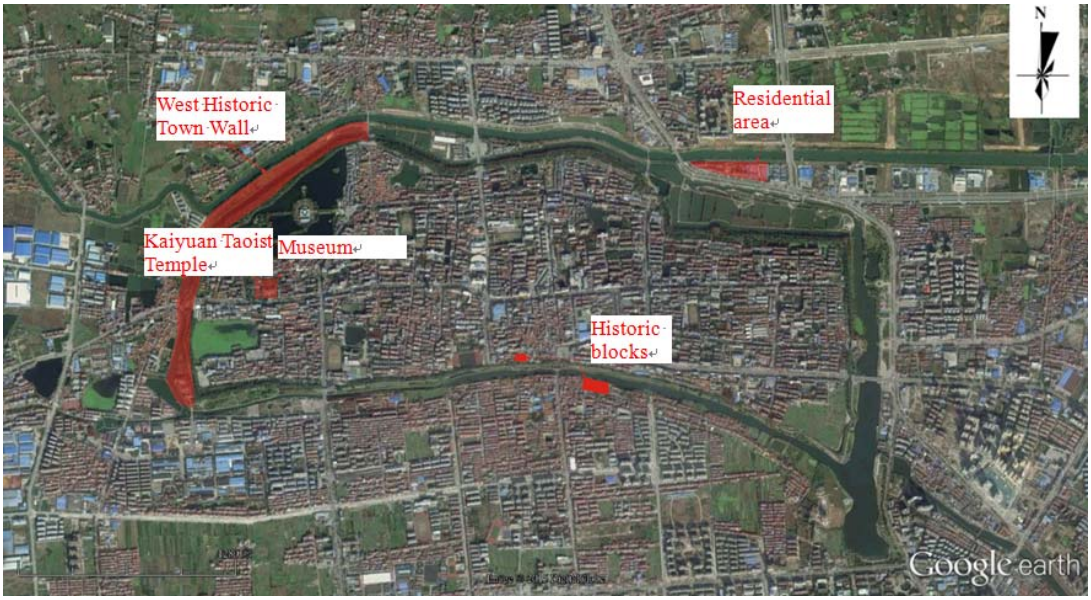

Figure 1.5-2 Distribution of sensitive receptors in the historic town area of Component:

Figure 1.5-3 Xiongjiazhong – a sensitive receptor of Component: Preservation of cultural heritage and promotion of tourism development

Figure 1.5-4 Jingzhou Westgate High School

1.5.2 Sensitive receptors of Project Component: Improvement of ecological system and water environment

The Component: Improvement of ecological system and water environment is located in the historic town area, including: dredging of rivers and lakes, sewage pipeline networks, river and lake wetland, and water system interconnection. Construction scope includes not only the construction sites but also the temporarily occupied land. Construction is mainly by mechanical equipment. The affected targets are mainly the waters such as fish ponds occupied temporarily and the residents surrounding the construction area, and the environmental Sensitive receptors are mainly the water systems in the historic town and nearby residents. Sensitive receptors of the water environment and ecological system subcomponent are shown in Table 1.5-2 and Figure 1.5-5.

Table 1.5-2 List of sensitive receptors of the water environment and ecological system subcomponent

1	**Rivers and lakes**			
No.	Name	Position	Function	
1.1	Moat	Outside the Historic Town Wall	Landscape	
1.2	West Lake	West in the Historic Town Wall	Landscape	
1.3	Northeast Water Pond	Northest in the Historic Town Wall	Landscape	
2	Residential Area			
No.	Name	Position	Number of households	Number of residents
2.1	Residents in Fanrong Street	West of the West Gate	37	150
2.2	Jingzhou District Disabled Person Recover Center	North of the South Gate Avenue		170
2.3	Jingzhou Dongfanghong Middle School	East in the historic town		1800
2.4	Jingzhou Institute of Socialism	Near the Horse Horse Pond		110
Note: Since construction is not carried out in the night, it has minor impacts on the residents. For this reason, school and recovery center are selected as sensitive receptors. Fanrong Street is selected as sensitive receptor because it is in the west side of the temporary site for stacking sludge.				

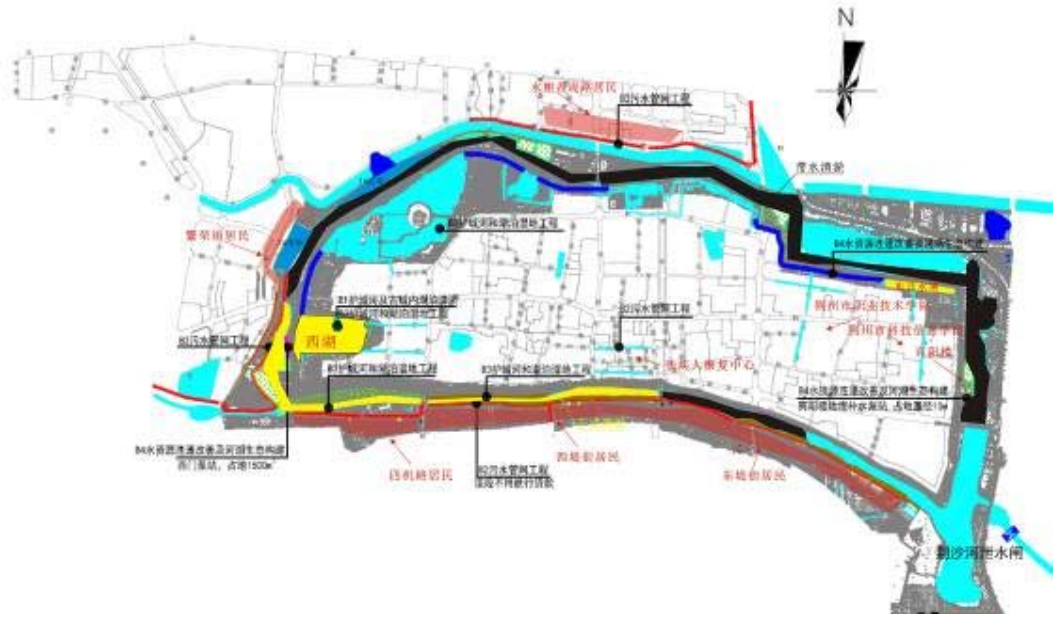

Figure 1.5-5 Distribution of sensitive receptors of Component: Improvement of ecological system and water environment

1.6 Safeguard policy framework

Since the proposed Project covers a wide scope and consists of several components, it is unavoidable to have further modification on scale, technologies and schemes during construction and operation. The management plan requires that all the modifications should timely complete environmental procedures and comply with the following requirements:

1. Conduct environmental impact evaluation on the changed project content not covered in this report or the management plan;

2. Disclose the newly-added project content in an appropriate manner;

3. Supplement relevant environmental management measures.

2 Organization Institutional Arrangement

The effective implementation of ESMP requires the joint efforts of all concerned parties, including environmental protection administration bureaus (EPB) at each level, project initiator, i.e. project management office (hereinafter referred to be as Project Owner or Project Office), contractor, i.e. construction entity (CET), construction supervision engineer (CSE) hired by Owner, and external monitoring consultant (EMC) for ESMP, also employed by Owner.

In order to realize the objectives of ESMP, CSC entrusted by the Project Owner will assign persons to monitor the environment during Construction phase. In addition, the Project Owner will employ its own fund or the competence building fund of World Bank Loan to hire qualified and experienced EMC through competitive procurement. EMC will independently and externally monitor the implementation of ESMP, and conduct regular and special checks on construction site and environmental monitoring. See Appendix A for the outline of EMC's job. See Figure 2-1 for the organization set-up, organization chart and working system for implementing ESMP during construction.

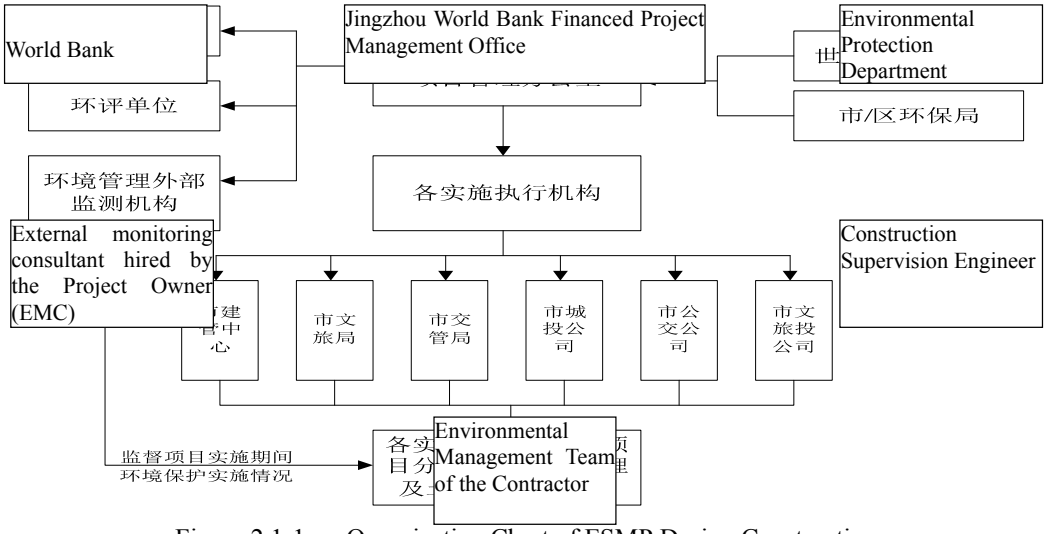

Figure 2.1-1 Organization Chart of ESMP During Construction

See Table 2.1-2 for the main responsibilities of mainly concerned parties and personnel arrangement in each project phase

Table 2.1-2 Arrangement and Responsibilities of Project Environmental Management Organization

Phase	Concerned party	Environmental responsibility
Project preparation phase	Hubei Environmental Protection Bureau (HBEPB)	Review and approve EAR
	Jingzhou Environmental Protection Bureau (JZEPB)	Issue letter of standards for executing EAR; assist Project Office in EAR at project preparation phase.
	Set up project coordination office (PCO) at Jingzhou Municipal Develop and Reform Commission	Direct, supervise and coordinate; organize overall
	Set up project management office (PMO) AT Jingzhou Urban Construction & Investment Development Co., Ltd.	Be responsible for the implementation of ESMP; ask design unit to incorporate environmental mitigation measures into technical specifications when they are preparing bidding documents.
Construction	Project Management Office (PMO)	1. Direct, supervise and coordinate various works during

Phase	Concerned party	Environmental responsibility
phase		construction; 2. Submit progress report (half-year report and annual report) of the implementation of ESMP to the World Bank
	Contractor (CET)	1. Be responsible for the implementation of ESMP and other environmental protection measures; 2. Be responsible for organizing environmental protection training for construction personnel.
	Construction Supervision Engineer (CSE)	1. Supervise the construction every day to ensure the implementation of environmental protection measures 2. Actual implementation of environmental protection measures and existing issues shall be recorded in the monthly report of CSE.
	EMC for ESMP	1. Provide trainings to construction entity, owner or other entities as required in job outline; 2. Inspect the site regularly. Conduct sampling check on discharged pollutants, such as wastewater, waste gas and noise, if necessary; verify the authenticity of environmental protection log record of construction supervision engineer, and the effectiveness of environmental mitigation measures in EAR.
	Jingzhou Environmental Protection Bureau (JZEPB)	Inspect environmental management during construction
Operation	PMO and the Project Owner	Same as Construction phase
	Jingzhou Municipal Administration Bureau	1. Be responsible for the implementation of environmental protection measures and ESMP; 2. Be responsible for the normal operation of environmental protection facilities.
	Jingzhou Environmental Protection Bureau (JZEPB)	Organize the acceptance of environmental protection facilities under the standard of three-simultaneity (works designed, constructed and put-into-operation simultaneously); Check the environmental management during operation.
	Institution with monitoring qualification	Monitor operation and accident
	Jingzhou Urban & Rural Planning Bureau	Control the construction of sensitive items around project construction area

2.2 Environmental Protection Bureau (EPB)

As the supervising and regulating authority, environmental protection bureau (EPB) at each level shall lay down environmental regulations and policies for project construction and operation, and laws, regulations, standards and guides for all organizations in its jurisdiction, and shall be responsible for the enforcement of relevant environmental policies.

The Ministry of Environmental Protection, the highest authority for environmental protection in China, will instruct Hubei Environmental Protection Bureau (HBEPB) to enforce relevant regulations. HBEPB will review and approve EAR and instruct Jingzhou Environmental Protection Bureau for the overall environmental management of the Project. Jingzhou Environmental Protection Bureau will directly take charge of the supervision and enforcement of environmental protection regulations and standards.

The roles and responsibilities of Hubei Environmental Protection Bureau as a provincial environmental monitoring and administration agency are as follows:

(1)Supervise the implementation of ESMP;

(2)Enforce applicable laws, regulations and standards;

(3)Coordinate environmental protection works among different departments;

(4)Inspect and supervise the construction, completion and operation of environmental facilities;

(5)Instruct environmental protection bureaus at municipal and provincial level to manage environment.

The roles and responsibilities of Jingzhou Environmental Protection Bureaus are as follows:

(1) Supervise the implementation of ESMP by construction entity and enforce applicable regulations and standards;

(2) The role and responsibility of Hubei Environmental Protection Bureau

(3) Inspect and supervise the construction, completion and operation of environmental facilities within its power.

2.3 Project Management Office (PMO)

A project leading group (PLG) led by deputy mayor shall be set up by the People's Government of Jingzhou City to take charge of the overall decision-making and coordination of the project. A project coordination office (PCO) under the leadership group shall be set at Jingzhou Municipal Development and Reform Commission. PCO is responsible for coordinating works among departments in Jingzhou city and communicating with the World Bank as well as concerned authorities in Hubei in project preparation and execution phase.

The PMO of World Bank Financed Jingzhou Historic Town Restoration Project (hereinafter referred to as Jingzhou Project Office, PMO) set up by Jingzhou Urban Construction & Investment Development Co., Ltd., will take the ultimate responsibility for the environmental performance during project construction and operation. PMO, a routine management institution under Jingzhou Urban Construction & Investment Development Co., Ltd., will be responsible for all works in project preparation and implementation. PMO will also be fully responsible for works related to the safeguard policies of the World Bank during project preparation and implementation project, including but not limited to the following 5 aspects:

First, organize qualified and experienced institutions to prepare EAR of the project in preparation phase, including providing support to and supervising the compilation of EAR report and ESMP which shall meet the requirement of relevant domestic laws, regulations, standards, technical guides, and safeguard policies of the World Bank. Ensure the EAR and ESMP approved by local environmental administration departments and security policy department of the World Bank.

Second, guarantee the interaction among EA Consultant, project feasibility study unit and project design unit, so as to incorporate programs and requirements into project design, and cost of environmental measures into total project investment by taking mitigation measures and other environmental considerations into account.

Third, be the ultimate supervisor of environmental mitigation measures and other environmental measures in Construction phase, including incorporating environmental requirement into construction contract, providing training to contractor, construction supervisor and local PMO, implementing other environmental management programs and conducting regular check on construction site.

Fourth, implement and supervise environment monitoring procedures, review the log record of construction supervision engineer (CSE) and external monitoring report of EMC, inspect the environmental performance of contractor, and take necessary actions to timely respond to issues and suggestion provided in external monitoring report, including emergencies and accidents in construction.

Last but not the least, consult local public, people affected by the project, concerned organizations, the World Bank and other parties of interest. Ensure that all the parties mentioned above have completely understood the whole project, potential environmental issues and mitigation measures. Listen to all the parties and respond to their questions and suggestions about environmental protection.

2.4 Contractor (CET)

During construction, project contractor is a key node in environmental management, pollution control and impact mitigation. The Contractor shall be aware of its environmental protection obligations and take a range of measures to guarantee the performance of its obligations. The obligations of contractor and its environmental management personnel include but not limited to the following contents.

(a) The Contractor shall incorporate the mitigation measure listed in EAR into the bidding documents of civil works, attach them to the construction contract, and strictly implement the measures specified in ESMP;

(b) The Contractor shall perform its environmental obligations initiatively and submit its environmental performance logs once a day or a week to construction supervisor. PMO and construction supervision engineer shall review these logs and carry out certain rectifying activities;

(c) The Contractor shall comply with the requirements of relevant environmental laws;

(d) The Contractor shall carry out construction within the scope of contract and other bidding conditions;

(e) One specially-assigned person of the Contractor shall be responsible for the implementation of environmental protection measures, and shall work together with EMC to carry out mitigation measures, on-site inspection and any corrective measures instructed by the Project Owner and/or EMC.

(f) Upon receiving the instruction of the Project Owner or EMC entrusted by the Project Owner, the Contractor shall stop construction activities which have adverse impacts; if necessary, the Contractor shall adopt another construction method to minimize the environmental impacts.

(g) The Contractor shall allow public participation from communities around construction site, set up eye-catching signs & boards at each road to describe main construction contents and Construction phase at the site. There shall be contract name and name and telephone No. of contact on the boards, so that the public can express their concerns and complaints about construction activities.

(h)Prior to the commencement of construction, the Contract shall receive mandatory environmental training, including:

1. National and local laws, regulations and standards;
2. EAR;
3. Environmental mitigation measure;
4. Culture, evaluation and protection rules;
5. Emergency measures;
6. Environmental monitoring method and requirements specified in contract, and reporting procedure;
7. Long-term public consultation and response'
8. Environmental obligations of contractor.

2.5 Construction supervision engineer (CSE)

CSE is responsible for supervising the project construction activities and environmental due diligence of the Contractor during construction, ensuring that the construction meets the requirements of relevant environmental laws, regulations, technical guides, standards, specifications and contract. The duties of CSE are to

(a)Review construction organization design and make sure that it complies with the engineering design of project and ESMP, so that corresponding environmental protection and mitigation measure can be put forward. Construction cannot start until environmental measures obtain the approval of supervision engineer;

(b)Provide assistance to the Owner and EMC hired by the Owner in the course of environmental management and supervision;

(c)Inspect the environmental management of the Contractor regularly and ask the Contractor to replace its environmental management personnel if in CSE's opinion the environmental management personnel fail to perform its obligations or fails to comply with contract requirements.

(d)Require the Contractor to take rectifying measures within specified time limits. If there is default and violent public complaints, CSE shall order the Contractor to rectify, alter or stop its works and report the situation to concerned organization and the Owner.

(e)Supervise the operations of the Contractor and ensure that those operations meet the requirements specified in ESMP and mitigation measures specified in contract;

(f) Instruct the Contractor to take actions to minimize the impacts and prevent default as per the requirements of ESMP;

(g)In case the Contractor violates environmental requirements, the Contractor cannot get paid until it solves the environmental issue and get approval from CSE within the same month.

(h)In case the Contractor discovers cultural relics during construction, CSE shall order the Contractor to protect the site and inform concerned organizations and the Owner;

(i) Strictly follow the procedures to investigate complaint.

(j) On-site supervision: through regular on-site inspections, CSE can supervise construction activities, identify potential environmental problems, and timely provide mitigation (preventive) measures to the Contractor. Inspections cover construction area and areas outside construction site but directly or indirectly affected by construction. CSE organizes routine regular on-site inspections (e.g. every week or every month), and CET and PMO participate. CSE shall record environmental changes in project construction and environmental performance of the Contractor in its log book which could have an influence on breaches specified in EAR and suggestions given in ESMP or project contract. That log book shall be submitted to the Contractor, EMC and other concerned parties.

(k)Punish system: as per the contract, if CSE finds operations against environmental regulations during on-site supervision, the Contractor shall rectify those within specified time limit (e.g. 2 weeks). If the Contractor completes those rectifications as required, there will be no punishment. If not, the Contractor shall at its own cost hire a third party to complete those rectifications.

(l) Complaint system: CSE shall initiate complaint investigations if receiving environmental complaints during construction. Complaint investigation procedures are as follows:

1) Record the received complaints and the dates into complaint database, and inform the Contractor;

2) Investigate the complaints to determine their validity and evaluate that whether the issues complained are caused by construction activities;

3) If complaints are valid and caused by construction activities, CSE shall lay down mitigation measures and provide them to the Contractor;

4) If complaints are forwarded by environmental protection bureau, CSE shall submit interim report of complaint investigation to environmental protection bureau and take further actions within time limits specified by environmental protection bureau;

5) Investigate to verify the situation and take measures to prevent same complaints.

6) Report investigation results and actions taken as required by the person who launches the complaint. (if complaints are from environmental protection bureau, results shall be reported within the time limits required by it);

7) Record complaint, investigation and follow-up actions, and monthly results of ESMP.

The CET and CSE shall work together to investigate complaints. The Contractor shall provide all the necessary information for investigation. If mitigation measures have been determined during investigation, the Contractor shall immediately carry out those measures. CSE shall ensure that the Contractor has carried out those measures.

(m) CSE shall strictly supervise the various construction activities; in case of activities such as setting up temporary bridges to facilitate construction, CSE shall conduct stringent review and approval.

2.6 External monitoring consultant of ESMP (EMC)

EMC monitors on behalf of the Owner whether the Contractor completely conforms to the requirements of ESMP, directly reports to the Owner and bears responsibilities to the Owner. The Owner shall employ qualified consultant through competitive procurement to conduct external monitoring of ESMP. EMC shall have at least 5 years' experience in similar projects and consultation services, and be familiar with relevant environmental laws, regulations, technical standards, specifications and guides. The EMC hired shall get familiar with its job duties by reviewing relevant reports, including ESMP approved by the World Bank. EMC shall also be responsible for environmental issues and protection needs during construction of urban roads, bus hub, etc. The main responsibilities of EMC are as follows:

(a) As entrusted by the Owner, EMC shall review whether construction organization complies with the requirements of approved EAR and ESMP, especially requirements about on-site environmental management and impact mitigation.

(b) Monitor and inspect the on-site environmental management system of the Contractor, and environmental performance, experience and capacity to handle on-site environmental problems of CSE; if necessary, EMC has the right to advise the Owner of replacing the environmental management personnel specially assigned by the Contractor and CSE;

(c) Inspect regularly the implementation of ESMP by the Contractor and CSE;

(d) Review the effectiveness of environmental protection measures in *Environmental Impact Report*, check and determine the effectiveness of impact mitigation measures, and regularly submit consultation report to the Owner;

(e) In case of emergency, EMC shall play a part in coordination and handling;

(f) Supervise the environmental protection actions of the Contractor; if necessary, order the Contractor to temporarily stop construction, and submit rectification measures or suggestions about punishment to the Owner, if EMC finds the Contractor violating the contract or ESMP;

(g) Timely submit half-year and annual consultation report to the Owner;

(h) Participate into the environmental checks initiated by the World Bank Project Group or other authorities, if required by the Owner;

(i) In case of environment pollution accidents during contract period, EMC shall conduct investigations and submit independent investigation report to the Owner as required the Owner.

(j) As per the requirement of the Owner, EMC shall assist the Owner and CSE in complaint investigation and evaluation.

3 Environmental Impact and Mitigation Measures

The construction dust, sewage, noise, and solid waste will be produced in the implementation of this proposed project, which will bring certain impacts on the surrounding environment. In this chapter, these environmental issues and impacts caused by this proposed project during the construction and Operation phase will be analyzed from five aspects of ecological environment, water environment, acoustic environment, air environment, solid waste etc., and the corresponding pollution prevention and treatment measures will be offered.

3.1 Environmental Impacts

3.1.1 Ecological environment

(1)The damages on natural vegetation are long-term, un-restorable in the evaluation area of permanent occupation of this project. The regional vegetation affected by construction are compensated by artificial planting and landscaping and ecological slope protection after this project. The impacts on natural vegetation caused by temporary land occupation are temporary, and the vegetation can be gradually recovered after the construction is finished. The regional vegetation are less affected by construction.

(2) The terrestrial animals such as bird, amphibians are affected to certain extent by this project during Construction phase. The parameter of bird community structure will also be influenced, and its number and species diversity will be reduced. After completion of this project, most of birds, amphibians and other terrestrial animals will be restored with the river lake greening and re-vegetation.

(3) Part of the project will result in the decrease of plankton during the period of construction, but this effect is temporary and its scope is limited. The plankton will be recovered quickly after construction. After the completion of this project, due to the improvement of water environment, the biomass of plankton will increase. The dredging activities of the project will post a great threat on the survival of benthic creatures in the construction area. According to the river improvement project, the benthic creatures will be recovered to certain extent after dredging activities, but its process is slow. The recovery of benthic creature is relatively slow after completion of this project. The fish are local common fish in the project area.

(4) The river slope is repaired and improved by a combination of natural revetment and hard revetment. The visual landscape benefits will be greatly enhanced by garbage cleaning of river and regional greening. At the same time, the construction of artificial wetlands will increase the surrounding green area, and also attracts waterfowl and other animal, which will improve the natural landscape benefit of city the moat.

(5) The route selection, general layout, construction method, and design with the function of water and soil conservation in feasibility study of main work can basically meet the requirements of

water and soil conservation. The construction is feasible from the angle of water and soil conservation. The construction is not a restrictive factor of water and soil conservation.

3.1.2 Water environment

3.1.2.1 Construction phase

The waste water during Construction phase of this project is mainly come from dredging sediment rainwater by construction workers, sewage, and construction waste water.

(1) When the runoff normally discharges from construction site, the COD, ammonia nitrogen, TP, TN at 1500m downstream all can't meet the requirements of << Surface Water Environment Quality Standards>>(GB3838-2002)class III. The main reason for this is high concentration of background value. In fact, the contribution values of COD, ammonia nitrogen, TP, TN are not high. At the point of 1500m upstream, the concentrations of COD, TP are lower than the background concentration, while the contribution rate of ammonia nitrogen and TN is less than 5% of the background concentration. In general, the runoff from the construction site contributes less to the contribution values of river. Considering the elimination of endogenous pollution in the dredging process, the normal discharge of runoff from construction site has fewer effects on surface water quality.

(2) The concrete casting is required in the projects such as steel reinforced concrete. The slurry water will be produced in the process of concrete casting and tank washing and its main pollutants are SS, pH (usually 9-12) that are discharged intermittently dispersedly. After treatment of neutralization and sedimentation, the slurry water can meet the standards of *The Concrete Water Standards* (JGJ63-2000), and is used to mix concrete again. Therefore, the slurry water has no impacts on environment. The wastewater from automobile and mechanical rinsing in construction site mainly contains SS and oil, and the SS concentration is 300mg/L, the oil concentration is 20mg/L. The oily water can reach the gold level standards in Table 1 in *GB8978-1996 Wastewater Integrated Discharge Standards* after treatment of oil separation and sedimentation, which has no effects on environment.

For part of this project, the bagged soil is used for cofferdam, which will produce cofferdam seepage water, excavation face wastewater, and pit wastewater from rainfall. These wastewater needs to be discharged constantly. According to the similar analysis estimation, the maximum frequent drainage intensity is 150m3/h, and the water is discharged out of the cofferdam by water pump. The pit wastewater mainly contains silt with a maximum concentration of 2000mg/L. These wastewater are required to be treated through sedimentation and meet the gold level standards in Table 1 in GB8978-1996《Wastewater Integrated Discharge Standards》. After that, it can be used for road sprinkling.

(3) Construction works are dispersed, and should try to use the existing living facilities around the construction site. Based on the strict implementation of the sewage disposal measures above,

sewage from project construction workers has no influence on the river water of the ancient city.

3.1.2.2 Operation phase

The main wastewater sources are from tourist's center in the east and sewage from Xiongjiazhong. In addition, it also comes from interference on sediment and release of rivers and lakes connection.

(1) The main wastewater is the sewage from visitors' center in the east during the Operation phase of this project. After pre-treatment of septic tank, the sewage from the east visitors' center is discharged through municipal sewage pipe and treated in the wastewater treatment plant in Caoshi Town. According to "analysis of water pollution sources during the period of operation", the discharge concentrations of pH, COD, BOD_5, SS, ammonium nitrogen in drainage water are 7~8, 238mg/L, 124.6mg/L, 74.2mg/L, 30.56mg/L respectively. And its concentrations that accepted by wastewater plant in Caoshi Town are 300mg/L for COD, 160mg/L for BOD_5, 200mg/L for SS.

The wastewater discharge in this project is about 8.82m^3/d to wastewater plant in Caoshi Town, which is about 0.029% of treatment capacity of this plant. Therefore, it is feasible to treat the sewage from this project for wastewater treatment in Caoshi Town. The drainage water quality in this project is acceptable by waste water plant in Caoshi Town. The waste water in this project is not discharged directly into surface water system. Therefore, as long as strengthening management and monitoring, and cleaning septic tank regularly, the wastewater from this project has less impacts on surrounding environment.

(2) After implementation of related projects in Xiongjiazhong, the sewage is expected to increase by 27.36m^3/d. The amount of pollutants produced is 0.996t/a for COD, 0.15 t/a for ammonia nitrogen. The discharge concentration is 100mg/L for COD, 15mg/L for ammonia nitrogen. These discharges can meet the gold level standards in Table 4 in nation's *Integrated Waste Water Discharge Standards* (GB8978-1996), and it has fewer impacts on water environment of agricultural irrigation ditch.

(3) After implementation of rivers and lakes channeling project, the effects of water environment is mainly from the sediment disturbance caused by the change of hydrological condition. Therefore, the improvement efficiency of water quality of rivers and lakes from water supplement and regulation will be affected. During the period of water supplement, the hydrological conditions in lakes are changed are disturbed, which will lead to sediment disturbance and then pollutants discharging to lakes. As a result, the lake water quality will be affected. The sediment disturbance in lake is determined by water flow rate. Therefore, sediment in most area in lakes is disturbed slightly. The disturbance is mainly distributed near the entrance of communication channel. At the beginning of water supplement, the sudden change of hydrological situation in lakes will lead to redistribution of years of accumulated sediment in local area along with flow pattern change. After a period of time, the sediment in the flushing point will be reduced gradually and reach a balance of scouring and silting, while the sediment disturbance will be no longer

significant. In addition, the dredging project has significantly reduced regional endogenous contaminants in rivers and Lakes. As a result, water system connection has little influences on water environment quality.

3.1.3 Acoustic environment

3.1.3.1 Construction phase

According to prediction, generally when the construction machinery is 50m away from the site barrier, the noise value of construction machinery can be reduced to 62-70dB (A). And the construction field noise can meet daytime emission standards of GB12523-2011 *Construction Site Environmental Noise Emission Standards*. When the construction machinery is 110-280m away from the site barrier, the construction field noise can meet nighttime emission standards of GB12523-2011 *Construction Site Environmental Noise Emission Standards*. Therefore, if no noise control measure is taken, the effects from construction machinery noise will reach standard limit at 50m away from the construction site at daytime, and 300m away at nighttime. Some enterprises and institutions and residents on both sides of construction area are affected by such noise. The construction will cause some effects on their normal life, work, and rest, especially at night.

The affected area is large during the Construction phase. The affected area is different at different time. In general, the effect is random and intensive. At certain area and certain period of time, the effect is clearly temporary, which will cause difficulties for the management during the period of construction. And the noise source is flowing, so it is not easy to take noise reduction measures. The effective and temporary noise reduction measures will be formulated in this project according to local conditions, such as strengthening the construction organization and management, reasonable construction schedule. Nighttime construction is not allowed for construction areas located in residential areas.

3.1.3.2 Operation phase

In order to reduce noise generated by operation of public utilities, low noise facilities are selected for underground garage fan, water pumps etc. The garage fans and water pumps are installed underground and covered with 1.5m thickness of soil. The basic shock absorber is used at the time of equipment installation. The facilities and the pipes are connected by hose and flexible joint. The pipeline is supported by elastic supporting and hanging frames. The inlet and outlet of water pipes are installed with shock proof box. The contact area of pipeline going through wall is wrapped with elastic materials. Various pumps and underground garage fans are installed in separate equipment rooms. The measures above will reduce equipment noise to 30dB (A) in this project.

The multiple refrigerant flowing central air conditioning system is used in visitor center, which is a frequency conversion multiple air conditioning system. The outdoor machine is air cooling unit with operation noise of 65-70dB (A). The outdoor machine is installed on the roof, and the basic vibration reduction measures are used. In general, there are fewer impacts on the surrounding environment.

The noise from pump station is acceptable in this project. To further reduce the noise impacts during the Construction phase, the noise control should start from the source as far as possible, namely selecting low noise equipment. The mechanical equipment damping is used to isolate vibration in the pump station and sound isolation cover is also installed. For the plant, double wall is adopted, while indoor sound absorption materials and outdoor sound isolation green belt are used to reduce noise impacts.

3.1.4 Air

3.1.4.1 Construction phase

(1) Influence analysis of Construction fugitive dust

Mixing station is used for lime soil mixing in the construction of pipeline and building projects. Mixing station refers to the lime and soil are mixed according to the designed ratio of lime and soil, and then transported to construction site by vehicles. Under the effect of wind, the concrete mixing will generate TSP pollution on the construction site. According to real survey data from similar projects that have been built, the TSP is 8.90mg/m^3at the point of 50m downwind, and 1.65mg/m^3 at 100m downwind. The TSP at 150m downwind meets the daily average value 0.3mg/m^3 of the 2nd level standard in the *Environmental Air Quality Standards* (GB3095-2012).

During the period of construction, the transportation, loading, and uploading of power materials will pose TSP pollution in the area around. According to field monitoring of swirling dust caused by vehicle transportation at the construction site, the swirling dust is11.625mg/m^3 at 50m downwind of lime soil transport vehicles, 9.694mg/m^3 at 100m, and 5.093mg/m^3 at 150m. The content of swirling dust at 150m exceeds the 2rd level standards of *Environmental Air Quality Standards* (GB3095-2012). The swirling dust pollution caused by transport vehicles is serious for the area around.

From the analysis above, the dust pollution caused by construction activities can't be ignored, and it will have some impacts on the air environment of sensitive points around construction area. In the process of project design and construction, the measures should be taken accordingly to reduce the impacts of dust pollution on surrounding air environment.

(2) Mechanical exhaust gas

According to a monitoring result from a similar project, the main pollutants from exhaust gas of excavators will affect 15m - 18m downwind with concentrations of 0.016mg/m^3 - 0.18mg/m^3. According to project construction design, a small number of machines are used in this project, and its emission height is limited, so its affected area is confined to the construction site and with limited reach. This pollution is in small range and short time. Therefore, it is expected that the exhaust gas emitted by construction machines has less impact on surrounding environment, which will not obviously worsen regional environmental air quality. However, it will have certain effects on the residents around the construction site and the transportation line. Therefore, it is necessary

to take some protective measures to reduce the effects of exhaust gas caused by construction activities on the residents around the transportation line.

(3) Stench from sludge disposal sites

The project set up two sites for disposing sludge. Each site is located at the low-lying areas within the blue and green scope of the rivers. The location of the site should be convenient for dredging, but it also should keep far from surrounding sensitive receptors as much as possible. Fanrong Street is the nearest sensitive receptor of the disposing site. Due to this reason, the Fanrong Community may be affected during disposing of sludge. Therefore the EAR requires that the storage of sediment should be 30m away from the community. The other disposing site will not have impact on the sensitive site. For this reason, dredging shall avoid using the storage yard of sludge near Fanrong Street.

3.1.4.2 Operation phase

During the Operation phase of garage, the sensitive sites around the historic city can meet the standard limit of 2rd level in GB3095-2012 *Environmental Air Quality Standards.* After completion of construction, the underground parking lot has little effects on surrounding environment.

3.1.5 Solid waste

3.1.5.1 Operation phase

The total amount of sludge is 301.9 thousand m^3, while the size of dewatered sludge is 160 thousand m^3 after dewatering and consolidation. The monitoring indicators of dry sludge can meet the corresponding standard limits in The *Evaluation Standards of Soil Environment Quality for Exhibition Land Use (Provisional)* (HJ350—2007)and GB/T23486-2009 *Sludge Disposal in Urban Waste Water Treatment Plant and Mud Quality for Landscaping* . The wetlands project need 163,000 m^3 of soil: 54,000 m^3 for backfill in the constructed wetland of the moat, 49000 m^3 for backfill in constructed wetland of the West Lake, 48000 m^3 for backfill in the constructed wetland of North Lake; 9,000 m^3 for backfill in Horse Wash Pond, 3000 m^3 for backfill in Northeast Pond. All the sediment generated in the dredging can all be used for backfill, which has minor impact on the environment.

There is a small amount of construction waste, packaging waste, demolition waste etc. produced during the Construction phase in this project, which will impact the urban landscape, traffic, and environment air quality if it is not cleaned timely. The construction wastes including damaged masonry, tiles, and waste dregs of cement etc. are produced in the process of construction. Most of these wastes are inorganic and have less direct influences on water, environmental air quality, but it occupied the land and may pose the secondary contamination. Therefore, the construction wastes should be cleaned timely, and reused in the construction process if possible, or used for filling and smoothing the potholes.

The sites of this project are concentrated, and mainly located in historic town and its around area. The workers come from the surround area of the town and not living in construction site together. They are working in the construction sites at daytime and going back their home at night. Due to the workers going home after work and going to work from home in the morning, they are living scattered. Most of the living garbage from workers are directly going into city health treatment system and is disposed by sanitation department. The waste pipes are generated in the process of pipe network installation, and going back to the supplier for recycling.

The impacts of archaeological exploration project on environment are reflected on the comb wall curing protection. The curing agent is prepared on site and sprayed on the wall with less penetration. After exploration party, the soil with curing agent on the surface of the wall and the remaining agent are sent to Jingzhou museum for harmless treatment. Therefore, the soil with curing agent and remaining agent has less impact on the surrounding environment.

3.1.5.2 Operation phase

According to analysis of engineering pollution source, during the period of operation, the solid wastes are mainly from visitor's living garbage and sludge and sediment produced regularly in the pipe culvert pump station in the operation process. These wastes are removed and treated centrally by city sanitation department. So it has no influence on environment.

3.2 Mitigation measures of pollution

3.2.1 Environment pollution mitigation measures in the design phase

3.2.1.1 Selection of sludge disposal method

From the point of environment, the reuse of the disposed sludge on land use not only reduces the amount of sludge, but also saves the costs of land use. In addition, if the quality of sludge can meet standards, it will have no significant effects on water environment, and ecological environment.

Considering the transit priority benefit, city development, construction cost, and environmental impact etc., this evaluation agrees to dispose the sludge through reusing as the final direction.

3.2.1.2 Comparison and selection of city water system channeling methods

Considering the landscape, construction, investment etc., it is recommended that all water systems are connected in this historic town. The current situation and planned river reach are affected slightly during the period of construction. With the restoration of ecological environment during the period of operation, the landscape will be improved to some extent.

3.2.2 Environment pollution mitigation measures in the construction phase

The construction activities will have disproportionate effects on the environment of surrounding area, especially the environment of sensitive point. The contractor is responsible for environment protection and pollution mitigation. Environmental impact mitigation measures during Construction phase will be written into the bidding documents, and are treated as an important

term in the construction contract to implement in the process of construction. Therefore, the workers are supervised to take effective environmental protection measures in the construction site and adjacent areas in construction process. And the safety of local residents and construction worker is guaranteed.

3.2.2.1 Mitigation measures on air pollution

(a) Dust mitigation

Main sources of construction related dust are earthwork excavation, mixing of ash and earth during construction of visitors' center, wetland construction, construction of river-way revetment work, demolition of buildings, land expropriation, temporary stacking of powder materials, transportation and other processes. To mitigate the impact of dust on the environment, following measures should be taken:

(1) Maintain permissible humidity at construction site, sprinkling and cleaning system musts be established for storage area of powder materials, dedicated person should be appointed for sprinkling and cleaning at construction site, the frequency of sprinkling should be adjusted in terms of weather dryness degree.

(2) Effective and clean construction enclosure should be erected around construction site.

(3) Construction material should be stored in the shed as possible; Construction material storing in outdoor area should be shielded with tarpaulin; powder construction materials like cement and lime should be transported as bulk materials by tank car; storage bunker of powder material should be kept far from residential community as possible.

(4) Materials such has earth, gravel and the like should be covered with tarpaulin during handling; overloaded transport is prohibited for fear of secondary pollution as a result of spillage, leakage and overflow along the way,

(5) Wheel cleaning equipment should be installed at the exit of construction site; dedicated cleaner should be assigned for cleaning wheels and sweeping entry/exit at site; vehicles with mud-carrying wheels are banned for transportation.

(6) Under weather condition of strong wind, construction operation producing dust is banned within 200m from sensitive points such as residential area, school, kindergarten, hospital and the like.

(7) From the perspective of protecting human health, operators should be provided with dustproof respirator.

(b) Fuel exhaust mitigation

Excavator, bulldozer, transport vehicles and the like used during construction of the project will produce fuel exhaust during operation. To mitigate such environmental impact, following protective measures against fuel exhaust are taken for the project:

(1) Standard fuel should be used for transport vehicles and fuel-fired construction machinery, low-grade fuel is prohibited for use; in addition, driving route of transport vehicles should be arranged reasonably to ensure driving at a safe speed and reduce idle time, so as to reduce

emission of exhaust gas by motor vehicle.

(2) Strengthen servicing and maintenance of fuel-fired mechanical equipment, and maintain equipment operation under normal and good condition; furthermore, fuel-fired machinery should be installed with exhaust gas emission purifier to ensure emission of standard exhaust gas.

(c) Sludge stink mitigation

At present, the PIA determines construction sludge dredging to be conducted in dry season (winter and spring) to avoid construction in summer, and sludge dump is far from surrounding residential area. Presently, mitigation measures against stinking storage yard are rational and feasible. These measures should also be taken during final stage of construction, and no further requirements and suggestions are proposed herein. Regular air quality monitoring is required construction period of the project to confirm whether applicable emission and ambient air quality standards are complied with.

3.2.2.2 Mitigation measures of impact on water

(1) Selection of dredging method

Secondary pollution during dredging construction is mainly represented by release and diffusion of pollutants sediment in local area agitated by dredger cutter, of which release arte of nitrogen and phosphorus pollutants contained in sediment is multiple times to that in static state, leading to secondary pollution in water area. To avoid water area from secondary pollution, non-polluting dredger cutter with anti-diffusion device is used to remove polluting sediment of the river during dredging.

Design of non-polluting dredger cutter is as shown in Figure 3.2-1. the assembly of dredger cutter is driven to rotate by hydraulic drive; the arm of assembly of dredger cutter first contacts sediment, the blade on the cutter arm loosens clay and collect the clay in cutter cavity with rotating dredger cutter; screw conveyer in the assembly of dredger cutter conveys clay collected in feeding cavity from spiral face to the outlet of mud suction pipe; under suction of dredge pump, dredging clay is conveyed via mud suction pipe and mud discharge pipe to mud dumping area. Non-polluting dredger cutter has following features: (1) adjustable angle of dredger cutter bit ensures cutting contour of dredger cutter fully matching polluting sediment all the time for higher dredging precision; (2) mechanical cutting of clay, formation of clay-water mixture suitable for hydraulic conveying via mud suction pipe; (3) prevention of whirling current in dredger cutter cavity from diffusion into water area out of the protective shield under the effect of centrifugal force that could cause secondary pollution, and help increasing suction concentration, decreasing turbidity of water area, thus dredger cutter meets technical requirements of non-polluting dredging operation.

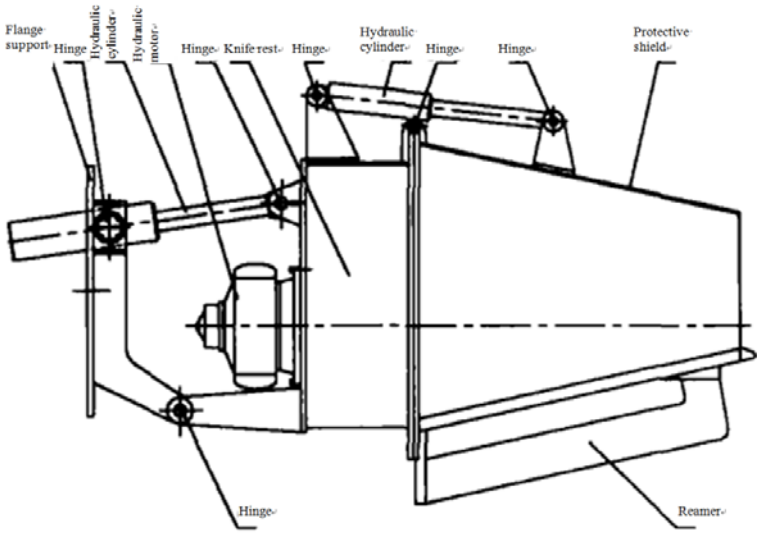

Figure 3.2-1 Schematic Diagram of Non-polluting Dredger Cutter

Practice shows that SS diffusion range of water area agitated by the cutter used for West Lake cutter suction and dredging is 15m; beaver-type non-polluting dredger cutter imported from Holland is used to control diffusion range within 5m, which has manor impact on surrounding water environment. Therefore, environmental impact evaluation concludes that it's feasible for dredging construction of the historic town with non-polluting dredging cutter.

Besides, after the dredged sediment goes into the sludge pipes under negative pressure, the connecting pump station sends the sediment to the dehydration and solidification plant. The dried sediment will then be sent to the temporary stacking filed for storage and will be used afterwards. The whole dredging process does not involve operation of large dredging machines or cofferdam water discharge for rivers or lakes. Therefore, the dredging scheme of this project has only small impacts on environment.

(2)Storage yard of residual water

Storage yard of residual water mainly consists of filtrate from dewatering and solidification and supernatant in spill pit during sludge dewatering and solidification. Coagulating sedimentation is applied for treatment of storage yard residual water.

Technical key points: under the effect of coagulant, colloid and fine SS in wastewater are coagulated into floccule before removal by water separation treatment. Coagulation-flocculation is widely used in feed-water and wastewater treatment for reducing apparent indicators of raw water such as turbidity, color as well as removing many types of venomous and deleterious pollutants. Treatment effect of pollutants in water with various flocculating agents is as listed in Table 9.3-1。

Table 3.2-1 Treatment Effect of Pollutants with Various Flocculating Agents

Control & analysis item	**Basic aluminum chloride (BAC)**	**Ferric sulfate**	**Aluminum chloride**	**Ferrous sulfate**	**Aluminum potassium sulfate**	**Aluminum potassium sulfate + polyacrylamide**

Control & analysis item	Basic aluminum chloride (BAC)	Ferric sulfate	Aluminum chloride	Ferrous sulfate	Aluminum potassium sulfate	Aluminum potassium sulfate + polyacrylamide
pH	7	8	7	7.5～8	7	7
Supernatant CODcr/(mg·L^{-1})	6201	6854	6038	7262	6527	2366
CODCr removal rate/%	56.3	51.7	57.5	48.9	54.0	83.3
Supernatant turbidity /NTU	32.48	4.8	34.99	30.91	94.2	25.8
Turbidity removal rate/%	70.9	95.7	68.7	72.2	0.1	76.9
Note: indicators of raw water quality are CODcr14191mg/L, turbidity 111.62NTU and pH7						

It's obvious from Table 9.2-1 that, aluminum potassium sulfate and polyacrylamide used as flocculating agent achieve 83.3% COD removal rate and 76.9% turbidity removal rate of supernatant, which are better in effect than other flocculating agents including basic aluminum chloride (BAC), ferric sulfate, aluminum chloride, ferrous sulfate, aluminum potassium sulfate and etc. The flocculating agent made of aluminum potassium sulfate and polyacrylamide is used to mitigate the impact of moat by storage yard residual water. Base on the concentration of pollutants in residual water from dewatering and solidification dewatering and solidification works of Wuhan Donghu Tunnel Construction Project, the concentration of pollutants discharged after treatment of storage yard residual water of this project meets Grade-A standard. Treatment process of storage yard residual water is shown in Figure 9.3-2.

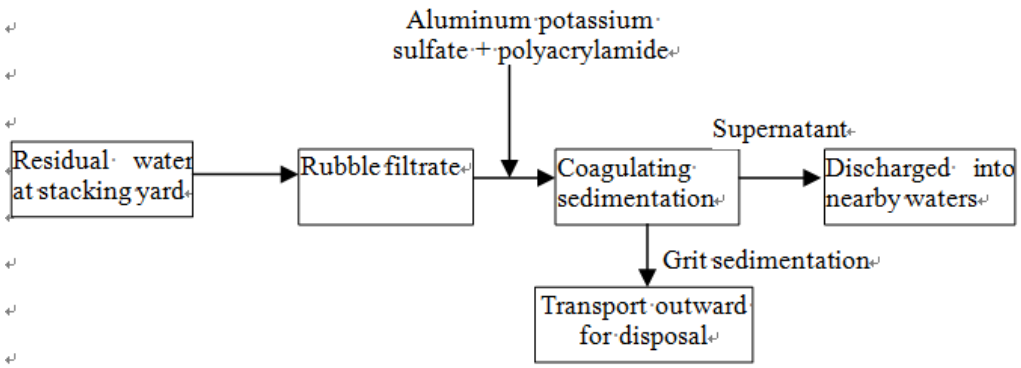

Figure 3.2-2 Treatment Process of Storage yard Residual Water

In addition, hydraulic staying time of sludge in the water should be prolonged as possible in the process of dewatering and solidification to reduce concentration of original SS in storage yard residual water.

To ensure standard quality of residual water from dredging the moat and in the historic town, residual water quality at the discharging outlet of sedimentation tank must be monitored strictly according to environment monitoring plan based on the report of environmental impact evaluation. Once substandard residual water quality is found, engineering measures must be taken immediately, together with adjustment of chemical dosage and additional staying time of residual water, so as to ensure standard quality of discharged residual water.

(3) Basic Washing Wastewater

It's known according to Studies on Recycling Waste Sludge of Ready-mixed Concrete (By Zhang Yi, 2010) and test results (Table 9.3-2) of PH value, soluble matter, insoluble matter, chlorides, sulfate radical and alkali content in clarified liquor of basic washing wastewater, that all indicators of clarified liquor meet the requirements of Standard of Water for Concrete (JGJ63-2000). Therefore, for basic washing wastewater produced by mixing concrete for the project, wastewater sedimentation tanks should be set up in various construction areas, and wastewater after standard treatment should be used as water for concrete.

Table 3.2-2 Analytical Results of Compositions in Clarified Liquor of Wastewater

Test item		**pH value**	**Soluble matter (mg/L)**	**Insoluble matter (mg/L)**	**Chlorides**	**Sulfate radical**	**Alkali content**
Quality indicator		>4	<10000	<5000	<3500	<2700	<1500
test results	1	12.6	1850	55	35.0	34.5	205.5
	2	13.5	1900	Clear, nil	29.0	2.9	266.6
	3	13.8	1650	155	16.5	30.5	305.1
	4	10.6	2050	160	22.0	16.5	199.5
Comments on test results		Qualified	Qualified	Qualified	Qualified	Qualified	

Treatment process of basic washing wastewater:

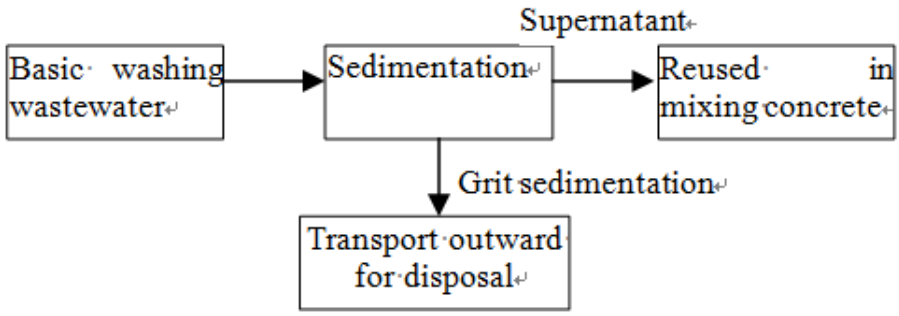

Figure 3.2-3 Technical Treatment Process of Sludge Wastewater (English version to be added)

(4)Foundation Pit Wastewater

Bagged soil cofferdam is adopted for part of project construction, which would produce seepage inside cofferdam, cut surface wastewater and foundation pit wastewater after rainfall, thus drainage is required on a regular basis. Main inclusion of foundation pit wastewater is sludge, with content up to 2000mg/L. for treatment of foundation pit wastewater, secondary sedimentation is applied by following technical process:

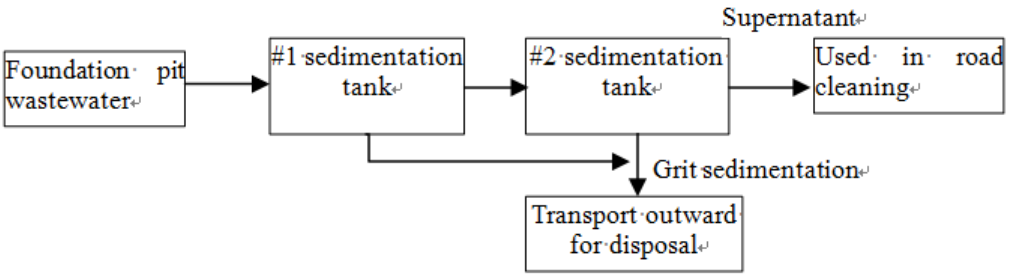

Figure 3.2-4 Technical Treatment Process of Foundation Pit Wastewater

(5) Construction Vehicles & Machinery Washing Wastewater

To prevent environmental pollution in construction area by construction machinery maintenance and washing wastewater, catch drain is designed in repair and replacement yard of construction machinery to collect oily wastewater from washing and maintenance. Parallel plate-type oil separation and sedimentation tank is set up in construction area for treatment of oily wastewater; treatment efficiency of floating oil is 70%~80%, and oily wastewater after treatment is sued for washing road. Technical treatment process of construction vehicles and machinery washing wastewater is as follows:

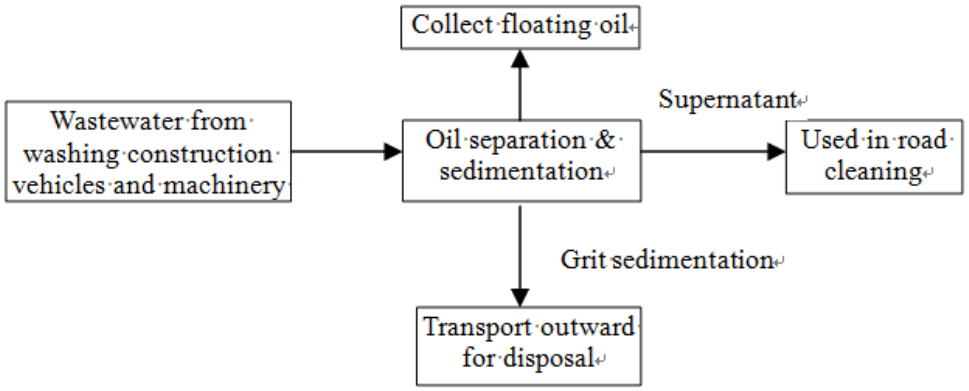

Figure 3.2-5 Technical Treatment Process of Construction Vehicles and Machinery Washing Wastewater

(6) Construction Living Sewage

Discharging of living sewage from construction site should be under strict control. For linearly distributed construction process, construction personnel are dispersive, so existing living utility near construction site should be used as possible. Discharging of living sewage at construction site is prohibited.

(7) The main pollutant of pile foundation drilling mud and waste residue is SS.

The mud wastewater and waste residue should be discharged in the construction and most of pollutants can be excreted to surface in the process of discharge. And then they are disposed in the sedimentation tank. After drying, they are transported to slag field for disposing. The supernatant

is used for washing of vehicles.

(8) Other mitigation measures for water pollution at the construction phase

1) The construction machinery and vehicles should be strictly managed. No oil leakage and dumping of waste oil are allowed, so as to avoid soil and water environment pollution. The oily solid waste can't be littered, and should be buried with waste oil residue. It is strictly prohibited to throw sewage, garbage into the surrounding water

2) The bulk powder materials such as gravel, cement etc. should be covered with tarpaulin if placed in the construction site and should stay away from water source, in order to avoid going into water system with the surface runoff caused by heavy rain during the rainy season to affect water quality.

3.2.2.3 Mitigation on acoustic pollution

Impact on the acoustic environment is mainly concentrated in the construction phase. To minimize the impact of construction machinery noise on the environment, it is recommended that the following measures should be taken during the construction phase.

(1) The layout of construction sites

The construction sites are reasonably arranged. A large number of power machines and facilities should not be placed at the same site, in order to avoid local high level noise. The position fixed machinery should be operated as more in the operating room as possible.

(2) The management of machinery

The selection of low noise equipment and processes can fundamentally reduce the noise source intensity. The noise level of low noise type vehicles is 10~15dB(A) lower than that of similar vehicles but with different noise level in the moving process. The difference of noise level between different types of excavators, mixer is 5dB (A).

Strengthening the inspection, maintaining and repairing of machinery, maintaining lubrication, fastening each part are measures to reduce the running noise. The whole equipment should be installed firmly, and maintain good contact with the ground. If possible, the vibration attenuation engine base should be used to reduce noise.

(3) Construction plan

The construction time is reasonably arranged. The operations that cause acoustic pollution should be avoided during the period of night 22:00 - 6:00 the next day and afternoon naptime. If the project is badly in need of construction at night, it should be reported to the local environmental protection department. If approved, the construction should be taken place at the specified date, and the Construction phase should be announced to the surrounding residents.

The construction traffic noise should be mitigated. Due to great impacts of transportation on the

environment during the Construction phase, the transportation volume at night should be reduced as much as possible, and the speed of large load-carrying vehicles should be limited, while the speed of vehicles should be limited at residential community. The transportation vehicles should be inspected, maintained regularly. Whistling should be reduced or prohibited. The transportation route should be designed rationally.

(4) Others

The development organization should instruct construction units to issue a notice and complaint call. After receiving complaints, the construction unit should contact with the local environmental protection department in a timely manner in order to deal with environmental disputes timely.

In construction, if there are sound environmental sensitive points (new or has not been demolished Village) 50m within construction site, temporary barriers or coaming should be set up.

The management system should be established by strengthening the management, advocating civilized construction, trying to control man-made noise, reducing man-made loud noise, enhancing the worker's awareness of preventing noise and residence disturbance. And effective management measures should be established for human activities noise to eliminate beating, shouting, uncivilized loading and unloading noise etc. and minimize noise disturbance.

At the same time, the project should maintain ongoing communication with the surrounding existing and planned villages in the construction process, in order to obtain understanding and support of surrounding residents to the greatest degree.

3.2.2.4 Mitigation of solid waste

Dewatered sediment should be well disposed in the process of construction. The construction units and the units for sludge dewatering and consolidation should contact with project headquarter in Jingzhou in advance according to the plan of dredging, dewatering, and consolidation, and inform the possible volume of dried sludge recently to facilitate the final disposal of dried sludge. Waste generated in the process of construction shall be transported out in time. After construction, the site should be cleaned. The construction waste is prohibited to pile up on site in order to avoid affect appearance and sanitation of the city. The temporary garbage dump should be set up on site, while the domestic garbage generated during the Construction phase should be piled up collectively and transported out on time.

According to the FSR provided by T.Y. Lin International, it is proposed that dredged sediment shall be reused in situ. Its feasibility is analyzed below.

In sediments at all monitoring points, contents and limits of all heavy metal pollutants, including Hg, Zn, Cu, Cd, Pb, total Cr, Ni, Se, As and others, are in conformity with Standard of Soil Quality Assessment for Exhibition Sites (Provisional)(HJ350-2007). Therefore, on the basis of dewatering and solidification of dredged sediment, analysis is made with sludge composition of dredged sediment, and it’s feasible to reuse dredged sediment for wetland fill and revetment

construction.

Water content of sediment at all monitoring points fails to meet the requirements of physical and chemical properties listed in Table 2 (＜40%) of Disposal of Sludge from Municipal Wastewater Treatment Plant-The Quality of Sludge Used in Gardens or Parks (GB/T23486-2009). Minimum water content is 2-2 (72.1%). Therefore, water content of sediments at 9 monitoring points is reduced to less than 40% after drying disposal, appropriate quantity of organic fertilizer is added, by adding of appropriate quantity of N, K and P at monitoring points 1-2, 2-1, 2-2, 2-3 and 3-2, the sediment can be used as construction and curing soil for municipal greenbelt system or suburb woodland.

According to feasibility study report of the project submitted by T.Y. Lin International, dredged sediment of the project is about 301,900m^3, the volume of which is 160,000m^3 after drying. Dredged sediment after dewatering can be reused in other components. Considering construction schedule, 2 temporary yards are proposed for stacking dry sediment to be reused. The volume of dredged sediments after dewatering is 160,000m^3, while backfilling wetland and revetments needs 163,000m^3: specifically, 54,000m^3 for artificial wetland at moat, 49,000m^3 for wetland at West Lake, 48,000m3 for artificial wetland at North Lake, 9,000m^3 for Horse Wash Pond and 3,000 for Northeast Pond. This is to say that all the sediment produced in dredging can be all recycled.

3.2.2.5 Ecological environment pollution mitigation measures

(1) Vegetation protection measures

To minimize the effects and recover the ecological environment rapidly, the following measures are proposed to mitigate the impacts on ecological environment.

(a) Before construction, the construction unit should draw protection lines to clarify the protection objects and scope, coordinate related construction sites etc., so as to minimize the vegetation occupation and destroy of river bank etc.

(b) The construction units should arrange the general construction layout reasonably in the organization of construction. The current street in historical town should be used as much as possible to reduce the temporary land occupation.

(c) After construction, the construction waste should be cleaned timely and recover vegetation for temporary occupied construction land. Except for the permanently occupied land by building and water, the vegetation should be recovered for other used land as soon as possible.

(d) In order to prevent large soil erosion caused by the layout of sewage interception pipe net, the intercepting ditches and drain channel should be constructed according to the related requirements in the *Soil Water Conservation Plan Report* of this project to prevent runoff discharging into moat. The building coaming and sedimentation tanks are built to reduce soil loss and runoff. The construction and material disposal should be limited during the period of raining and strong wind. The interception slope, embankment etc. working area that are vulnerable to erosion should be

stabilized. The temporary sludge storage area should be covered with water proof tarpaulin, and wetted with water in the condition of dry and windy weather. All area interfered by earthwork should be stabilized and recovered immediately after construction. The landscape of temporary occupied land should be recovered.

(2) Protection of aquatic organisms

(a) In order to reduce the influence of construction, management should be strengthened during the Construction phase. Before construction, the fish expert from local fisheries department should be hired to teach the construction workers the related national laws and regulations, the popular science of rare aquatic animals, making the workers to understand the significance of water ecological environment protection, improving worker's awareness of water environment protection. Fishing by workers is prohibited during the period of construction. The above behavior should be supervised and managed jointly by the fisheries and environmental protection departments. Expenses incurred shall be borne by the employer.

(b) In order to reduce the damage of construction on fish, the construction is not allowed before have the consent of local fisheries department, and the related experts or experience fishermen are hired to guide on site. Before construction, the ultrasonic technique etc. can be used for eviction of fish in adjacent water area, especially deep pool with intensive fish, backwater zone. The construction area can be separated with other area using net in order to avoid fish entering construction area.

(c) In order to reduce the influence of construction on aquatic ecosystems, the scattering of gravel should be reduced as much as possible in the construction process. Dredging should be segmented in favor of migration of benthic animal.

(d) Later in the design process of project, further researcher should be carried out on dredging depth, range, and dredging depth should be strictly controlled, to avoid affecting the benthic animal in the bottom mud and roots submerged plant seriously. Construction should be segmented.

(e) Because a small amount of swimming and wading birds, and amphibians and reptiles in the water, we must strengthen health management of workers (such as personal hygiene, feces, and sewage). Construction waste should be based on the existing sewage treatment facilities. Construction materials storage should be away from the water source, especially the powdery materials and hazardous materials. The materials should not be blown into water by rain or wind, in order to avoid ecological environment pollution.

(f) Fishery management should strictly implement the system of closed fishing seasons. Fishing is prohibited in any way in the river of historic town during the period of closed fishing season. The protection of fish resources should be strengthened.

(3) Mitigation of soil erosion and runoff

The removed surface soil from sediment dredging, visitors' center, underground parking lot,

sewage interception pipes, sewage branch pipes etc. in the project are transported to nearby temporary storage yards for storing, and temporary mitigation measures are taken. The total removed surface soil with rich humus is about 0.30 million m^3, stacked in two temporary storage yards. The soil will be reused in later projects such as revetment, wetland, greening etc.

(a) Requirements on soil pile

In order to avoid soil erosion and runoff, the soil should be piled up strictly in the specified sites according to design. The soil is not allowed to dump randomly along the roads, rivers, and ditches.

The amount and height of soil pileup varies greatly in different storage sites. In order to ensure the stability, the procedures of piling up of soil should be strictly abided by in the construction process. And the surface of soil pileup should be compacted and wetted.

The self-stability of soil should be fully used to maintain its stability in the temporary storage sites. The practical experiences of already finished projects should be referred. The slope of temporary soil pileups should be built according to a ratio of 1:2.

(b) Recovery measures of soil pileup sites

Since the original landform is the fish ponds, the aquaculture of occupied fish ponds should be recovered after construction.

(c) Temporary measures

a) Temporary supports: The temporary soil pileup sites covers 3.1hm^2. The average height of temporary soil pileups is 2.5m. The soil pileups are walled using bagged soil. The temporary supporting wall is 751m long in total, 1m wide at the top, 1.5m wide at the bottom, and 2m high. The bagged wall is stacked 1m higher than the top of the soil pileups with a slope ratio of 1:2. After the treatment of surface soil, the temporary supporting wall should be removed.

b) The soil drainage ditches are built around the temporary soil storage sites before soil piling up, with a trapezoid section, a dimension size of 30cm * 30cm, a slope ratio of 1:1. And the surfaces of ditches are compacted, and the longitudinal slope is determined by terrain. These ditches collect runoff from construction sites. The detritus chamber is built at the outlet of ditches. The internal dimension of the chamber is 1.5m wide, 1.2m wide, 1m deep. The thickness of side wall and floor is 30cm, and the wall is upright. The cross section of import and export is a trapezoid with a dimension of 30cm wide (bottom) and 30cm high. The import and export of the chamber are not on a straight line. The chamber is built using masonry, and the M7.5 mortar is plastered on the inner surface. The chamber is used to precipitate the silt in the flowing water and discharge the water into the ditches near downstream.

c) Temporary coverage: the surface of temporary soil stacks should be covered with plastic film to prevent surface soil loss.

The amount of the construction is 0.21hm^2 of rehabilitation, 8,400 of planting trees, 0.03hm^2 of

greening, 124m of supporting wall, 350m of temporary drainage ditches, 6 of detritus chambers, 0.16hm^2 of temporary cover.

3.2.3 Mitigation measures in the operation stage

3.2.3.1 Air pollution mitigation measures

Air pollution mitigation measures during the operation phase are as follows:

(1)The underground parking lots are installed with forced ventilation facilities in this project, and the facilities run 12h each day. The air outlet is 2.5m higher than the ground. The air outlet with green belt is arranged in a place with good air circulation, so the exhaust has fewer impacts on surrounding environment.

(2)The greening ratio within the land of project is 30%, and the vertical planting is implemented if possible. The protection forest belt is built around the construction area, which not only can purify the air, but also reduce the impacts of traffic noise on the construction area.

3.2.3.2 Water environment pollution mitigation measures

(1) Mitigation of domestic sewage

After completion of this project, the domestic sewage will be produced in the visitor center and exhibition center regularly. After treated at the septic tank, the domestic sewage can meet the acceptance standards of wastewater treatment plant in Caoshi Town and is discharged into the plant. The collected sewage go through the course grids first and then the fine grids and detritus chamber to remove the relatively large floating debris and sand. The sand is separated by spiral separator and transported out. The outflow from the debris chamber is discharged into the modified oxidation ditch for biochemical treatment, and then discharged into the secondary detritus chamber for follow-up treatment, tail water discharge measurement. After the amount is estimated, the tail water is discharged. The designed treatment capacity of this wastewater plant is 120000m^3/d, while the current actual capacity is 30000m^3/d. Since the east visitor center is within the coverage of wastewater treatment plant in Caoshi Town, the domestic sewage from east visitor center is discharged into this plant for treatment. The amount of domestic sewage from the east visitor center is 8.82t/d.

After completion of this project, the wastewater will increase by 27.36t/d in Xiongjiazhong. The increased wastewater will be treated by the to-be-built sewage disposal facilities. Up to now, the facilities have not yet been completed until the end of 2015.

(2) Other related measures

The project itself can improve the city sewage collection rate (85% after completion of the project). The layout of sewage interception pipes for residential area outside the city moat is designed to lead the wastewater to treatment plant to avoid directly discharge. Therefore, the current water environment will be improved with the investment and operation of this project.

3.2.3.3 Mitigation measures on acoustic noise

(1) The garage noise

In order to reduce the noise generated by utility equipment operation, low noise equipment is selected such as underground garage fan, water pump etc. The garage fans and water pumps are installed underground and covered with 1.5m thickness of soil. The basic shock absorber is used at the time of equipment installation. The facilities and the pipes are connected by hose and flexible joint. The pipeline is supported by elastic supporting and hanging frames. The inlet and outlet of water pipes are installed with shock proof box. The contact area of pipeline going through wall is wrapped with elastic materials. Various pumps, and underground garage fans are installed in separate equipment rooms. The measures above will reduce equipment noise by 30dB (A) in this project.

(2) Equipment noise

The multiple refrigerants flowing central air conditioning system is used in visitor center, which is a frequency-conversion air conditioning system. The outdoor machine is air cooling unit with operation noise 65-70dB (A). The outdoor machines are installed on the roof, and the basic vibration reduction measures are used. In general, there is less impacts on the surrounding environment.

(3) The noise control in pump station

The noise from pump station is acceptable in this project. To further reduce the noise impacts during the Construction phase, the noise control should start from the source as far as possible, namely selecting low noise equipment. The mechanical equipment damping is used to isolate vibration in the pump station and sound isolation cover is also installed. For the plant, double wall is adopted, while indoor sound absorption materials and outdoor sound isolation green belt are used to reduce noise impacts.

(4) Solid waste pollution mitigation measures

The solid waste is mainly the domestic garbage and general waste produced in the visitor center, Xiongjiazhong scenic spot, lifting water pump station, and box culvert operation. The solid waste produced in the Operation phase is stored according to the requirement of domestic garbage and cleaned regularly by the sanitation department. The disposal of various solid waste is clear, rational. The treatment requirement of solid waste is to reduce them and render them harmless. Therefore, there is no adverse effect on environment. The production amount and treatment of solid waste during the operation phase is shown in the Table 3.2-3 below.

Table 3.2-3 Main solid waste production

Solid waste source	No. of solid waste	Type of solid waste	Amount produced t/a	Disposal
Garbage from visitor center	S2-1	Domestic garbage	182.5	Removed by sanitation department regularly
Garbage from local activity center	S2-2	Domestic garbage	36.5	

Solid waste source	No. of solid waste	Type of solid waste	Amount produced t/a	Disposal
Sludge from lifting pump station and box culvert	S2-5	General waste	4.7	
Total			**223.7**	

Table 3.2-4 The summary of pollution sources in the proposed project and its mitigation measures

Time bucket	Type	Pollution produced procedures	Pollution Sources	Main pollutants	Mitigation measures adopted
Construction period	Exhaust gas	G1-1	Building projects	The swirling dust, the main pollutant is	——
		G1-2	Mechanical fuel	Exhaust gas，the main pollutants are SO_2, NO_2 etc.	——
		G1-3	Sludge treatment	In the stirring and stacking process of dredging, organic matter in the anaerobic condition can be decomposed into malodorous gas such as ammonia, hydrogen sulfide etc.	——
	Noise	N1-1	Noise produced by large construction machines	104dB for dredger, 98dB excavator, 100dB for bulldozer	Reasonable arrangement of construction time
	Waste water	W1-1	Basic washing wastewater	Suspended materials, pH	used for mixing with concrete after treatment in the sedimentation tank
		W1-2	Oily wastewater produced by transporting vehicles	Mainly contain oil and silt etc.	Used for flushing road after oil separation and precipitation treatment
		W1-3	Pit wastewater	Mainly contain silt	Used for flushing road after two-stage precipitation treatment
		W1-4	Domestic sewage produced by workers	The main pollutants are COD, BOD5, Ammonia nitrogen etc.	Use existing living facilities nearby
		W1-5	Runoff from soil storage sites	The main pollutants areTP, TN, SS	Discharged to surface water system after coagulation precipitation treatment
		D1-1	Leachate from sludge storage sites	The main pollutants are TP, TN, SS	Leakage preventation
	Solid waste	S1-1	Construction and demolition waste		Used for construction
		S1-2	Domestic sewage by workers		Treated by sanitation department
		S1-3	Dewatering and consolidation of dredging sediment	Dried sludge， water content40%	Uesed in wetlands and revetment earthwork
		S1-4	Waste pipe		Recycled by supplier
		S1-5	Curing agent-stained soil and remaining curing agent		Treated by Jingzhou Museum
		S1-6	Preservatives such as formaldehyde		Can't be discharged
	Ecology	E1-1	Damaged vegetation caused by site cleaning, soil and water loss of exposed surface caused by excavation		Reduce the temporary occupied area and construction time as more as possible
		E1-2	Effects on aquatic ecosystem caused by sediment dredging, ecological disturbance such as effects on ecological		Reduce the temporary occupied area and construction time as more

Time bucket	Type	Pollution produced procedures	Pollution Sources	Main pollutants	Mitigation measures adopted
			environment on site from sludge treatment site		as possible
		E1-3	Damaged soil and vegetation caused by excavation		Layered excavation, storage, backfill
Operation period	Exhaust gas	G2-1	The underground parking lot of visitor center	NO_2, CO	Discharged by an outlet higher than the ground 2.5m
	Waste water	W2-1	Domestic sewage from visitor center	The main pollutants are COD, NH_4-N	Discharged to wastewater treatment plant in Caoshi Town after treated by the secondary wastewater treatment plant of city
		W2-2	Sewage produced by visitors and workers in Xiongjiazhong	The main pollutants are COD, NH_4-N	After being treated by the integrated sewage disposal facilities and meet related standards, it is discharged to agricultural irrigation ditches
		W2-3	Wastewater disturbed by river and lake water	The main pollutants are COD, NH_4-N, TP, TN	——
	Noise	N2-1	Vehicle noise from the parking lot of visitor center	noise	——
		N2-2	Equipment operation noise from visitor center	noise	Reduced by basic vibration damping and insulated by building
		N2-3	Social life noise from visitor center	noise	——
		N2-4	Pump station	noise	Select low noise equipment，Install sound insulation cover, use double wall for plant
	Solid waste	S2-1	Domestic garbage from visitor center		Cleaned regularly by sanitation department
		S2-2	Domestic garbage from Xiongjiazhong		Cleaned regularly by sanitation department
		S2-3	Sludge or sediments produced regularly in pumping station, box culvert running process		Cleaned regularly by sanitation department

3.2.4 Protection of CHs

According to the *Law on the Protection of Culture Relics of the P.R.C* and requirements of related management bureaus, the protection measures are as follows: reversible repairs and engineering on CH structures; reinforcing the supports of CHs; conduct monitoring and preventive measures against natural disasters. Major protection works include:

Historic town wall: repair all the brick walls, piled walls, top footpath and earthen wall. Build up retaining wall, improve plantation and maintain the ancient roads.

Xiongjiazhong: lay asphalt on the access road, upgrade security facilities of the whole area, build up display halls and temporary stores for unearthed CHs.

Jingzhou Museum: upgrade of Treasure Hall.

Historic buildings: improve the grounds, repair houses, and transform modern buildings.

Kaiyuan Taoist Temple: greening and environmental improvement.

3.3 Communication and sustainable public participation

In the construction phase of the project, the public communication and negotiation is an ongoing work. The measures are shown below:

(1) The signs should be set up in somewhere visible of construction sites, and the engineering information should be listed, including a brief description of the project, Construction phase, main construction activities, the project manager's name and phone number, the chief engineer's name and phone number. And the public people are invited to provide their own management personnel in the area of interest.

(2) The contractors are required to hold public meetings in the villages where the construction sites locate, at least once a year. At the meeting, the on-site management personnel explain the construction activities, and respond to the issues the villagers concern.

(3) The project office should assign a full-time security staff to receive complaint of construction and operation from public people. The staff's names and contact numbers in project office should be notified to local public through pamphlets and public meeting.

(4) The staff in project office and the contractor may visit the key environmental sensitive points occasionally, such as schools, residential areas, to understand their concerns, and the feeling about the impact of the construction and operation.

(5) In preparing of special construction activities with big influences, such as unavoidable construction at night, the contractors are required to visit the potentially impacted communities to explain their activities and the resulting impacts (such as security risk, high noise etc.), and listen to the public concerns. The appropriate and responsible measures should be taken to solve the public issues.

4 Social Impacts

4.1 Social impacts and mitigation measures

4.1.1 Social impacts of city wall restoration

(1) Positive impacts

Compare to other similar cities, the absolute number of tourist attracted by Jingzhou Historic City Wall still has a large space to improve. The restoration of Historic City Wall will bring more tourists to the Historic Town and promote the economic development in historic town. In addition, the restoration of Jingzhou Historic City Wall holds positive and demonstrative significance to the restoration of other historic buildings. It also will become a valuable experience of cultural relic administration organizations.

With no doubts, Jingzhou Historic City wall after restoration will facilitate the economic and social development of Jingzhou Historic Town which will present a new look, and give great momentum to the social and economic development of streets in East and West cities.

(2)Negative impacts

During restoration, there will be noise and air pollution as well as the pollution brought by large transportation vehicles. The construction of the restoration project will occupy the public space around the city wall. Traffic controls will be implemented on certain roads. All of these will cause inconvenience to pedestrians and residents. Project construction will disturb the life of surrounding residents, pose safety hazards, and bring inconvenience to the traffic at city gate. The business of surrounding stores will be affected too. However, a large number of labors will be required for project construction, such as construction workers, loaders, etc. which could provide a lot of jobs to local residents. A certain number of technical personnel and workers will also be needed for the operation of the completed project, which brings jobs as well. What is most affected by the restoration of historic city wall is that residents outside and inside the historic town will suffer the inconvenience of getting in and out. This is because the traffic pressure at the city gate, which already hinders getting in and out, will intensify due to restoration construction.

4.1.2 Social impacts of water treatment

According to the information gathered so far, the institution that carries out social impact assessment thinks that water treatment subproject is of good social impacts, high operability and wide support from all levels of the society. No obvious social risks are present because:

1. First, Jingzhou Water Conservancy Bureau attaches great significance to the treatment on waters outside and inside the historic town and seeks good ways to solve the environmental issues of moat. The Bureau has accumulated a lot of failures in water treatment. Though the river reach at East Gate is successfully treated, environmental problems still exist in other river reaches which have been technically treated. Water treatment now is mainly challenged by insufficient fund. Once water treatment subproject is incorporated into the World Bank Financed Project, water

treatment quality will be improved substantially.

2. The treatment of moat is urgent for surrounding residents, because the pollution there has already affected their normal lives. They hope the treatment can be started as soon as possible, so as to eliminate the pollution in the moat.

3. Tourists are interested into the tourism projects on moat. The sustainability of treatment and administration of waters inside and outside the historic town can be guaranteed due to the interests of tourism development products.

4.1.3 Social impacts of traffic improvement and tourism infrastructure improvement

According to the information gathered so far, the institution that carries out social impact assessment thinks that traffic improvement and tourism infrastructure subproject has great social impacts.

The subproject has positive impacts on scenic spot development and tourism promotion. For instance, parking lot at East Gate, a relatively well-equipped scenic area, is scarce due to the small area of the Historic Town. Tourist vehicles (bus and private cars) always park at the roadside of inner-ring road, which puts greater pressure on the already jammed traffic on inner-ring road. Interviews and questionnaires have shown that residents greatly support the construction parking lot to ease the traffic pressure.

The construction of parking lot and reception center is mainly on the north side of Mingyue Park, involving small-scale resettlement. After field survey and interview, the group which carries out social assessment learns that if resettlement can meet the demand of residents to improve living environment, resistance against resettlement could be small.

In the meantime, potential risks posed by resettlement are:

(1) Resettlement will greatly influence the lives of local residents. The living standard of residents on the land where tourist reception center is proposed is not high. Therefore, the residents could be unable to afford the risks during resettlement.

(2) Resettlement will affect tenants. Due to the poor living environment, the rent is low. In addition, the living standard of tenants is not high. Resettlement means tenants have to seek another place to live. Therefore, they could be exposed to risks of higher rent and increased traffic cost.

4.2 Social and environmental impact mitigation measures

By summarizing all aspects of social impacts of the Project, research group has drawn 3 conclusions:

Conclusion I: Jingzhou Historic Town Restoration and Protection Project is urgent for realizing economic structure optimization, constructing ecological resident-friendly city and realizing sustainable development of Jingzhou. The Project is highly appreciated and popular by the

majority of citizens and interested parties. Among the subprojects, water treatment ranks No.1 in popularity, over 98%. The least popular is Confucius' Temple and Cultural Heritage Restoration and Demonstration Subproject, mostly because some residents have doubts over the necessity and value of scattered historic buildings restoration and historic block upgrading. On the whole, it is safe to say that the Project combines the wills of government and people and benefits the people.

Conclusion II: Over 60% of citizens know about the basics of the project more or less, while their knowledge of specific contents, technical routes, design proposal and implementation process of each subproject is relatively small. Therefore, the Project Office and concerned function departments shall utilize various channels and media to publicize project information during project preparation and implementation, so as to obtain the maximum understanding and support from citizens and other concerned parties and listen to good advices and suggestions.

Conclusion III: in terms of social risks, no high-risk factors are present at each subproject except parking lot and tourist reception center which involves small-scale resettlement and requires careful plan and arrangement. Therefore, the Project has low potential social risks. However, the lives of citizens could encounter some inconvenient factors during project construction. Therefore, traffic improvement subproject shall be further evaluated and optimized in project preparation phase, and corresponding implementation plans prepared. At the same time, advices and suggestion of citizens about each node of other subprojects shall be listened up to perfect the implementation plan gradually.

According to the actual situation of each subproject, the social impact assessment group puts forward following countermeasures regarding the potential impacts and risks in each subproject based on the summary and conclusions of advices and suggestions from various interested parties.

Table 4.2-1 Potential Impacts and Risks and Corresponding Suggestions of Each Subproject

Subproject	Potential risks	Recommended measures
Historic City Wall and Associated Buildings Restoration	Irreversibility of the look of city wall	Experts shall chose the material matched with the city wall. Restoration shall be conducted on the original base, avoiding modern elements. It is better to keep the ancientness of city wall.
	Safety hazards during restoration	1) Concerned parties shall make precautions. It is better to be guided by experts. Conduct investigation carefully and keep personnel safe. Strengthen management at construction site to guarantee safe construction. 2) Chose appropriate flowers and trees for city wall, which shall have landscaping effect and pose no risk on the stability of city wall and historic town.
	Traffic jam at city gate	Organize the restoration construction reasonably; arrange the traffic during construction to each traffic pressure.
	Repeated restoration of city wall	1) Concerned parties shall monitor and supervise the quality of restoration. It is better to be done at one-time. 2) Both restoration and management shall be paid attention to. A city wall maintenance and management team shall be set up, and related regulations prepared.
	Uncertainty of city development	Concerned authorities combine the restoration with the long-term development planning of historic town, combine the proposal and technical routes of restoration with the development positioning after resettlement, avoiding short-term planning and unnecessary repeat. Jingzhou is one of the cities which has relatively well-conserved historic

Subproject	Potential risks	Recommended measures
		city wall, thus possessing high tourism value. Jingzhou Historic City shall be combined with other tourism projects to form a tourism product chain with more contents and selling points. In this way, more tourist will be attracted to conduct in-depth travels instead of current superficial half-day tours.
Water Treatment Inside and Outside Historic Town	Repeated treatment of waters inside and outside Historic Town	1) Connect the waters inside and outside Historic Town by utilizing water diverting works from Yangtze River to Hanjiang River, realizing water circulation of Historic Town, which lays the foundation for water quality improving. 2) Enhance pollution control; pay attention to both treatment and pollution control to achieve domestic wastewater control inside historic town and pollution source treatment outside moat. 3) Clean out the buildings on moat side and around lakes inside Historic Town to eliminate the factors affecting water quality. 4) During treatment, efforts shall be focused on dredging sediment, striving to completely remove the polluted sediment out of moat.
	Management of sustainable environmental protection of moat	Set up a moat environmental protection team and establish systems and regulations. Concerned authorities shall take measures to eliminate pollution discharge and littering, so as to achieve sustainable environmental protection of moat.
	Coordination with tourism projects developed from water treatment inside and outside Historic Town	Attention shall be paid to details of auxiliary facilities. The design of water tourism project shall consult experts to add the elements of the Three Kingdom Period and historic features of Jingzhou. Water tourism project can also be a participating project involving the history of Jingzhou Historic Town.
Traffic and tourism facilities improvement in Historic Town	Impacts of resettlement on the lives of local residents	1) Publicize the major environmental changes brought by Historic Town Restoration and Protection Project, including the significance of these changes to the living environment of residents including those affected by the Project, to win the support of affected people. 2) Optimize the site selection and scale of tourist reception center to minimize land occupation and scale of resettlement. 3) Communicate with concerned authorities to coordinate with the projects underway and to be implemented and conduct unified planning and arrangement for land acquisition and resettlement. 4) In addition to compliance with urban construction planning, the construction of parking lot and tourist reception center shall be coordinated with the construction of future tourism, traffic auxiliary facilities, resettlement houses and street stores.
	Impacts of resettlement on the tenants around West Gate	
	Impacts of resettlement on the small business owners around resettlement area	
Vegetation restoration and greenbelt construction in Historic Town	Auxiliary facilities demand	1) Consider adding auxiliary facilities to greenbelt construction to meet the leisure and exercise demand of citizens. For instance, open up an exercise square at appropriate place, build more toilets, trash can and stone bench. 2) Traffic improvement and infrastructure subproject also involves this, but different departments are in charge. Therefore, close communication and cooperation among departments is required for linked contents and items.
	Social risks brought by cleaning out vegetable plot	1) Concerned departments are recommended to launch "Tree Adoption" campaign which is very popular currently. Publicize the campaign through website and neighborhood committee. Circle a certain region in greenbelt to let residents who favor natural leisure adopt trees. 2) Refer to the website http://www.green007.cn jointly built by Wuhan Afforestation Committee and Wuhan Municipal Bureau of Parks and Woods
	Management of greenbelt	A portion of budge of greenbelt construction subproject shall be reserved for improving the sanitary control of greenbelt. Proposal I: It is recommended to increase the number of cleaner and afforestation personnel, organize professional training, and clarify duties. Historic Town Park Administration Personnel conduct supervision. Proposal II: Purchase cleaning equipment. The number of workers remains unchanged. Use the budget to purchase environment-friendly and convenient cleaning equipment.
Restoration of blocks	Uncertainty of historic block restoration proposal	Determine flexibly the demolition space and scope upon restoration plan and available fund.
	Public opinion towards	Some historic buildings are of no restoration value. Therefore, the market

Subproject	Potential risks	Recommended measures
	historic building restoration and historic block upgrading	condition to form a historic and cultural block is no longer in existence. Project Owner is recommended to consider the works of this part carefully.

5 External Monitoring

5.1 Overview

During the implementation stage, project owner will employ an external monitoring consultant (EMC) of economic and social management plan (ESMP). The EMC will periodically collect data from environmentally sensitive spots (including water, air, sound, etc.). These indicator data will be provided to the owner as basis for compliances of environment regulations. Formulation of a viable monitoring plan will be helpful for evaluating the overall performance of the project and the short-term effects of the construction activities.

(1) As an important component of the ESMP, the environment monitoring plan consists of the following:

(2) Confirmation of disadvantageous impacts forecasted in EAR;

(3) Determining actual scopes of impacts;

(4) Assessing the effects of mitigation measures at project site;

Identifying and adjusting additional mitigation measures for incidental impacts which may be necessary during project construction or operation.

5.2 Impact monitoring

In order to monitor the impacts during the construction phase, the EMC will conduct periodical environmental monitoring, during the peak of construction works or by request of the owners, the EMC will also utilize portable devices to monitor short-term impacts. In case activities that had violated environmental quality standards have been found, it is also necessary to conduct additional impact monitoring.

Sensitive spots with potential for prominent pollution will be designated as the monitoring sites, based on forecast results from the project's environmental impact report. The monitoring of pollution during the construction and operation stages will focus on aspects with strong impacts: noise, air, and surface water environment. The factors to be monitored will be determined based on the project's characteristic pollution factors.

For analysis methods, the relevant methods defined in *Technical Specification for Environmental Monitoring* issued by the former Administration of Environmental Protection (now the Ministry of EP). The evaluation standards nominated in the environmental impact report will be used. According to the engineering characteristics of the proposed project, a monitoring plan for the construction and operation stages have been designed, as in Table 5.2-1.

Table 5.2-1 Environmental monitoring plan

Stage		Location	Parameter	Frequency	Term	Performed by
Construction	Air	Concrete mixing station; lime mixing station; Jingzhou Shiyan Middle School; Fanrong and other communities	TSP	Once per season (More during peak construction) 3~4 times per season		Jingzhou Municipal EM Station

Stage		Location	Parameter	Frequency	Term	Performed by
		All sludge yards	H_2S, NH_3	Once before sludge-clearing to provide background value; once during peak usage of sludge yard		Same as above
	Noise	Jingzhou Shiyan Middle School; Fanrong and other communities	LAeq	Once per season 2 days Once at day, once at night		Same as above
	Water	Tail water outlets for all sludge yards	Suspended matters, TP, TN, DO	Once each in early, peak and late construction		Same as above
	Bottom mud	One spot each at sludge-clearing areas of the moat, western lake, and northeastern pool	pH, TP, TN, Zn, Cu, Pb, Hg, As, Cd	Once in later construction phase		Same as above
	Aquatic life	7 spots in the moat	Chlorophyll a, phytoplanktons, planktons, benthic animals, aquatic vascular plants, fish	Twice per year at Jul & Nov, for three consecutive years		Same as above
During the construction phase, the associated CHs shall be monitored and managed.						
Operation	Air	Jingzhou Shiyan Middle School; Fanrong, Dongdi Subdistrict and other communities	CO, NO_x	Once per year	1 day 18(12)-hour continuous monitoring	Same as above
	Noise	Jingzhou Shiyan Middle School; Fanrong, Dongdi Subdistrict and other communities; West Gate and Bingyang Tower pump stations	LAeq	Once per year	2 days Once at day, once at night	Same as above
	Water environ.	East, New South, Old South, West, Great North, New North, and Small North Gates; section of bridge over the moat at Guangong Cultural Park; western and northern lakes; Ximachi; northeastern pool	pH, NH_4-N, COD, BOD_5, petroleum, etc	Once per year		Same as above
		Outgoing water of visitors' center	COD, BOD, ammonium & nitrogen	6 times per year at Feb, Apr, Jun, Aug, Oct & Dec		Same as above

In addition, the contractor and supervision engineers will also perform environmental monitoring as stipulated in the contract, including: monitoring noise levels at sensitive spots using portable devices; during periods of heavy construction activities, such as digging, piling, power generation, material transportation and night constructions; monitoring the noise levels at sensitive spots surrounding construction areas.

Visual inspection will be used for determining the water quality at rivers, fishponds and lakes under impacts of construction, including turbidity, smell, color, dead fish, etc., especially water bodies near sites of sludge-clearing and bridges over the moat.

The results will be compiled into formal written reports, submitted to EMC and PMO for review once per month. In case of any incidents, the construction firms will report to EMC and PMO immediately.

5.3 Monitoring devices and records

The monitoring devices and methods used by construction firms and supervisors should comply with relevant regulations and quality standards. The devices should be periodically calibrated

before on-site measurements. All calibration records will be submitted to the EMC. The EMC will preserve all on-site records, reports and related approval documents.

If any necessary changes to devices or methods are to be made, the EMC's prior approval will be needed. During the on-site monitoring and inspection, data recording should be conducted at possible locations. Table 5.3-1 has provided the records to be kept at each site's EMC office.

Table 5.3-1 Table 5.3-1 Typical records to be kept on-site

Type	Record
General	Environmental training record (e.g. attendance record for environmental awareness training meetings); On-site log and inspection record; Environmental work log, complaint work log, and environmental quality non-compliance notification form; Construction process and schedule; Equipment maintenance and repair record; Contacts of related parties and other parties; Meeting records.
Noise control	Updated list of current on-site mechanical and electrical equipment; If any sensitive spot is affected, perform periodical checks and provide detailed results
Water pollution control	Water drainage plan for construction sites; Amounts of construction wastes, demolition wastes, cleared sludge and waste sludge; Maintenance and clearing of sediments and bottom sand; Treatment of toilet wastewater (not connected into current main wastewater pipe); Final quality of outgoing wastewater and waste collection.
Management of solid wastes	Backup of valid certificates from waste delivery vehicles and waste collectors in the ESMP; Amounts of recycled wastes; Amounts of inert wastes converted into active substances on-site (if any); Waste treatment record.
Air	On-site water drainage plan; Material transportation route plan; Mitigation measures for air impacts, such as sprinkling water; Monitoring results of air quality.
Ecological resources	Locations of sensitive ecological resources and related protection records
Emergency response	Incident emergency report

6 Training

The proper functioning of the management activities in this ESMP relies on the knowledge and experience of environmental management workers. The new methods utilized in tasks such as protection of the Wen Miao, treatment of water environment and transportation improvement, are novel to local institutions, which necessitates training. The training plans will be provided to project stakeholders. Overseas trainings will be conducted in countries with rich experience in construction and operation management. Domestic trainings will be led by experts from universities, research institutes and professional consultation organizations.

Based on the experience from previous projects, improving the environmental awareness of construction firms and supervisors is important, as well as reinforcing the monitoring on managing authorities. Training is necessary to achieve this purpose.

Training includes subjects of environment-related regulations, standards, responsibilities and management methods. The details are shown in Table 6.1-1.

Table 6.1-1 Training plan for technical staff

Type	Area	Trainee	Content	No. of Trainee	Term	Date (Year)	Cost (CNY 10,000)
Overseas	Environ. management	Management at relevant departments of project coordination office	Experience and best practices for environ. management during construction	6	10 days	2016	16
		Project management office, professionals at owner	Technical methods for environ. management during construction	20	14 days	2017	40
Domestic	Environ. protection	Environmental protection personnel at construction firm	Fundamentals of environ. and monitoring methods; monitoring records; occupational training; Once per year: ESMP, environ. monitoring and reporting, emergency plans	10～20	4 times per day	2016-2019	8.5
	Supervision	Environ. protection supervision engineer; construction firm environ. management personnel	Legislations, construction planning, environ. monitoring principles and planning, air and noise monitoring and control technologies	5～10	5 times per day	2016-2019	5.5
Total							**70**

7 Reporting

7.1 Submitting contractor project documents

According to the tender documents, the contractor should compile an Environmental Management Plan (EMP) prior to the commencement of construction. EMP should be submitted to the Construction Supervision Engineer (CSE) for review to ensure compliance with legislations and the already approved EAR and ESMP. All changes to submitted files will be reviewed and approved by CSE representatives. Upon CSE's approval, the EMP will also be submitted to EMC for review. Any additional suggestions by EMC will be passed to the contractor via CSE. The relevant documents will be regularly updated.

7.2 ESMP

All ESMP inspection results and suggestions will be recorded in the seasonal (semiannual; annual) environmental management report prepared by the EMC. If necessary, the EMC will also prepare a simple monthly report, particularly when violation of contract occurs. The EMP will be submitted within two weeks after each report date. The Phase I progress report will be submitted in the first month after construction starts.

The seasonal (semiannual; annual) EMP should include at least the following:

(a) Implementation overview (one or two pages)

1) Non-compliances of regulations:
2) Complaint records;
3) Report of changes;
4) Key issues in the future.

(b) Basic project information

1) Project organization, including names and telephone numbers of key personnel;
2) Construction process;
3) Management structure;
4) Tasks to be done this season.

(c) Environmental status

1) Illustrated explanation of tasks of the season (e.g. work locations and activities);
2) Illustration of locations of project area, sensitive spots and monitoring stations

(d) Summary as required by ESMP

1) All monitored parameters;
2) Suitability of the environment;
3) Environment evaluation report, and implementation status of mitigation measures recommended by the ESMP;
4) Requirements of the environment provided by the contract.

(e) Implementation status

Protection and pollution prevention; suggestions of mitigation measures as recommended by evaluation report and ESMP are provided in the summary.

(f) Monitoring results

Results and the following information

1) Methods;
2) Laboratory name, devices and calibration details;
3) Monitored parameters;
4) Monitored location (and depth) ;
5) Date, time, frequency and terms;
6) Weather condition during monitoring;
7) Other factors that may influence the results;
8) Quality assurance, quality control results, and limitations.

(g) Reporting violations, complaints, notifications, etc.

1) All records of non-compliance in environmental quality performance;
2) All received complaints (oral or written), including location of receiving complaint, type, methods of survey or consultation, actions and followup, results and conclusion;
3) All activities in violation of local environmental protection legislations.

(h) Other

1) Explanation on reviewing future key factors from work plans and work method declarations.
2) Suggestions on management of noise, air, water and solid wastes.

7.3 Data preservation

It is not required to incorporate on-site documentation, such as monitoring records, laboratory analysis reports, videos and images in the ESMP reports submitted each season. However, such files should be kept by the owner's CSE, and should be ready for submission at any time. All relevant information should be clearly and systematically recorded in the documentation.

Electronic copies are required for monitoring data. All documents will be preserved during Construction phase, and be available to the owner at any time within the year after project completion.

8 ESMP Budget Estimate

The environmental management budget estimate includes costs of environmental facilities, monitoring, training and external monitoring consultation services, all of which are already incorporated in the project's overall budget estimate.

8.1 Environmental investment estimate

The total investment is estimated to be RMB 1.081 Billion CNY. Environmental investment includes costs for facilities, equipment, and environmental monitoring costs during construction, etc. Based on the proposed environmental protection measures planned in this report, the early estimate for the one-off environmental investment is 7.88 million CNY, accounting for 0.7% of total investment, consisting of 1.37 million CNY for engineering investment, and 6.51 million CNY as newly-added environmental investment.

Table 8.1-1 Environmental protection estimate

	Measures			**Effect**	**Qnt.**	**Investment (CNY 10,000)**	**Remark**
	Part I: monitoring						
	Monitoring during construction			0.1 million/year	5 years	50	New
	Environ. acceptance and monitoring after completion				-	70	New
	Part II: measures						
Construction	Wastewater	Alkalic washing water	Recycled after sedimentation	Discharging into the moat is forbidden to prevent impacting water environ.	13 sets	8	New
		Washing water	Recycled after sedimentation with oil removal	Discharging into the moat is forbidden to prevent impacting water environ.	9	8	New
		Excavation wastewater	Recycled after two-stage sedimentation	Discharging into the moat is forbidden to prevent impacting water environ.	17	8	New
		Sludge yard discharge water	Released after consolidation and sedimentation	Meeting "*Discharge standard of pollutants for municipal wastewater treatment plant*" Class 1A	2 facilities	150	New
	Emission	Dust	\Small sprinklers for sprinkling at roads and sites	Reducing dusts	Self-made	10	Original project investment
	Noise	Noise	Noise reduction, e.g. temporary sound boarding near communities	Meeting requirements on construction site noise	10 sites	16	Original project investment
	Solid wastes	Construction and demolition waste	Recycled for construction	Prompt removal to ensure sanitation	5550t	14	Original project investment
		Living wastes	Into existing urban sanitation system	Unmanaged piling is forbidden to prevent environmental impact	375t	5	Original project investment
		Bottom sludge	Used for wetlands and docks after conslidation	Fully recycled	300,000 m3	32	Original project investment
	Ecological	Restoration of temporarily occupied sites, water and soil restoration		Preventing soil erosion and restoring vegetation		187	New
	Society	Popul	Publicized announcements;		30 sites	4	Original

	Measures			Effect	Qnt.	Investment (CNY 10,000)	Remark
		ation	notification signs				project investment
Operation	Wastewater	Living wastewater	Septic tank preparation for Class 2 wastewater plant processing	Meeting "*Discharge standard of pollutants for municipal wastewater treatment plant*" Class 1B	1 facility	4	Original project investment
		Passageways	Sludge clearing		9 sites	5	Original project investment
	Emission	Vehicle emission	Compulsory exhaustion system	Meeting DB11/501-2007 "*Integrated emission standard of air pollutants*" requirements	1 set	15	Original project investment
	Noise	Reduction	Noise reduction at pump stations	Meeting GB3096-2008 requirements	2 sites	12	Original project investment
	Soild wastes	Living wastes	Classified dustbins with prompt removal	Prompt removal to ensure sanitation		20	Original project investment
		Normal wastes					
	Part III Environmental management						
	Training of environ. management personnel during construction					70	New
	ESMP EMC cost					100	New
	Total Investment					**788**	

8.2 Annual operation cost of environmental protection facilities

The operation cost of environmental protection facilities in the first 3 years in the operation phase is to be incorporated in the World Bank loan and the operation cost after the third year of operation will be incorporated in the cost of the operation company. The total cost for the first three years will be 1.14 million CNY as listed in Table 8.2-1.

Table 8.2-1 Annual operational cost for the environmental protection facilities

No.	Item	Cost (10,000 CNY RMB)	Notes
1	Environmental monitoring	12	
2	Energy cost	2	
3	Maintenance	20	Bridge runoff collection, Domestic sewage treatment, solid waste collection, etc.
4	Labor	4	
Subtotal		38	
Total in operation phase		114	3 years

Annex I ECOP for General Construction of Contractors

1.1 General

As a guideline, the ECOP lays the rules of environmental management for the project construction of contractor, and shall be read with national and local regulations. Contractors and their employees shall follow the measures specified in the ECOP in a strict manner, so as to minimize the adverse effect of construction on environment.

Following measures shall be faithfully implemented upon the completion but before the acceptance of the project.

1) Landscaping and land restoration shall be carried out at affected areas. In land restoration, waste shall be cleaned out, and vegetation restored to original level.

2) Rivers, roads, drainage pipelines and channels in affected area shall be cleaned to check whether sewage and traffic run smoothly in drainage ditches and on roads respectively.

3) All construction sites shall be cleaned, remaining materials properly handled.

4) Land temporarily occupied for construction shall be restored.

1.1.1 Institutional arrangements and responsibilities

According to the relevant policies of the World Bank on loan and actual needs, a management institution devoted for the project is established to implement the ECOP and take charge of environmental management and supervision. It is proposed to establish an internal environmental management framework consisting of the PMO, the Project Component Office, the outsourced Design Institute, EA Consultant, EMC, and the supervision department of the proposed World Bank Financed Hubei Jingzhou Historic Town Restoration and Protection Project. This institutional framework shall be obliged to carry out environmental management and supervision. See figure 1.1-1 and table 1.1-1 for institutional arrangements and respective responsibilities.

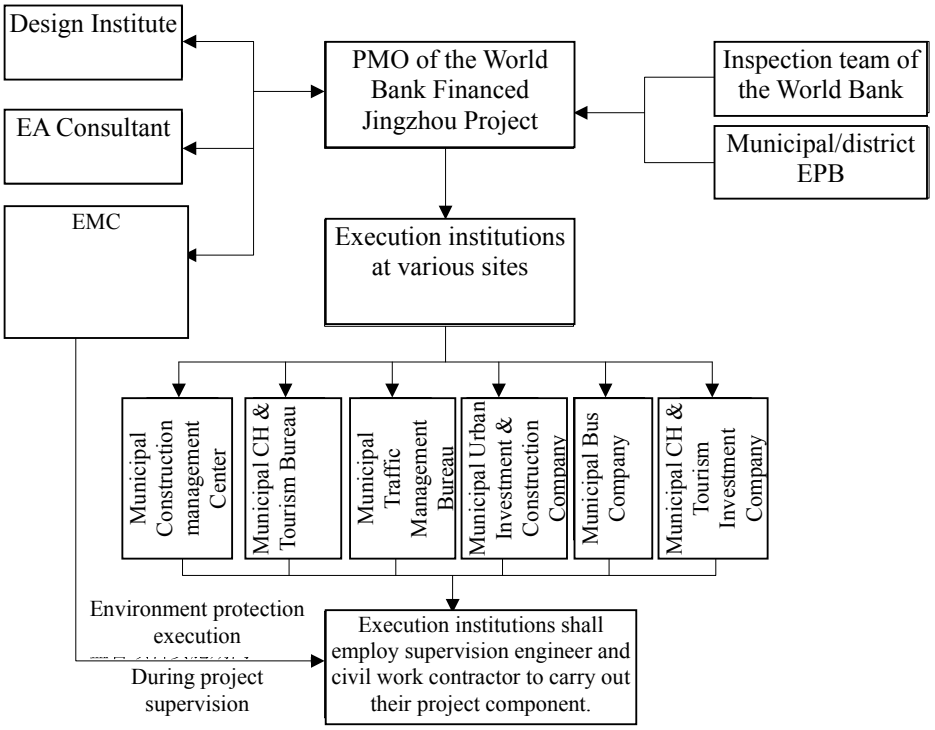

Figure 1.1-1 Environment Management Framework

Table 1.1-1 Institutions in Environment Management System and their Main Responsibilities

Name of institution	Task	Main Responsibilities
PMO	In charge of overall project coordination and management	① Take charge of project planning and design; guarantee that environmental protection meets the procedure requirements of the State and the World Bank. ② Carry out coordination, supervision and overall tracking & report, and solve major environmental problems. ③ Be responsible for employing EA consultant and EMC.
Execution institution	In charge of the implementation and management of various project components	① Take charge of the environment protection & management during project design and preparation. ② Handle the fund for environmental protection. ③ Be responsible for liaison and coordination with PMO for environmental management. ④ Appoint environment management personnel; implement ECOP and tracking & reporting; timely coordinate Contractor and CSE to carry out environment management; receive and handle environment complaints.
Provincial/municipal EPB	In charge of reviewing and approving the EAR of proposed project as a governmental supervision & regulatory institution	In charge of reviewing and approving the EIA of proposed project as a governmental supervision & regulatory institution
Contractor	Implementation institution, in charge of implementing relevant environmental protection measures specified in ECOP	Inspect construction site and review the ECOP/EIA before commencement; implement ECOP; protect environment; guarantee that the environment quality will not fall due to project construction.
Engineering supervisor & environmental supervisor	In charge of supervising and inspecting the emission of pollutants and ecological destruction events during construction, and dealing with such events.	① Conduct on-site environmental inspection weekly; fill in checklist of environmental inspection during construction and keep document archived. ② Put forward rectification plan for items not in compliance with ECOP and supervise its implementation.
EA Consultant	Carry out independent environment	Formulate ECOP and prepare domestic EAR documents.

Name of institution	Task	Main Responsibilities
	impact assessment of the project; provide technical support for the environment protection and formulate ECOP	
Consultant	In charge of preparing feasibility study, preliminary design, shop drawing and bidding documents of the project	① Ensure that engineering proposal has the minimum impact on environment. ② Incorporate various environmental measures in feasibility study report, preliminary design, and EIA into design proposal and budget and also into the technical specifications in bidding documents.
EMC	Provide assistance to PMO in preparing EAR, and supervise the implementation of environmental protection during project implementation	① Submit an interim report to the World Bank and environmental management implementing institutions prior to June 30 in each year and keep the document archived. ② Submit an annual report to the World Bank and PIA prior to December 31 in each year and keep the document archived. ③ Submit a comprehensive evaluation report of environmental management half year after the completion of all environmental management works and keep the document archived.

1.1.2 Environmental management personnel arrangement and main responsibilities

In the environmental management system, there are some internal project institutions, some outsourced consultants, some external institutions. For better performance of the main responsibilities of environmental management institutions, environmental management institutions are recommended to arrange environmental management personnel as per table 1.1-2.

Table 1.1-2 Arrangement of Environmental Management Personnel

Environmental management institutions	Personnel arrangement	Main responsibilities	Qualification
PMO	1 manager	① Inspect and coordinate the works of personnel in PMO. ② Organize environmentalists of the World Bank to conduct visits, submit report to the World Bank and implement the environmental management requirements of the World Bank. ③ Summarize environmental management report and submit it to the World Bank, coordinate with other relevant departments, solve major environmental problems. ④ Conduct at least 1 on-site environmental inspection in each year, fill in checklist of environmental inspection during construction and keep document archived.	Environmental management personnel shall be equipped with expertise in environment and management.
	Outsourced independent EMC	① Provide technical assistance and training. ② Provide assistance in preparing restoration plan for ecological environment damaged in construction. ③ Carry out supervision and survey on environmental management according to ECOP requirements. ④ Evaluate the living conditions of affected population and check whether their lives have been restored. ⑤ Prepare external monitoring and evaluation report and submit it to PMO and the World Bank.	
Various execution institutions	6 managers	① Carry out at least 1 on-site environmental inspection in each month, fill in checklist of environmental inspection during construction and keep document archived. ② Organize environmental management training. ③ Supervise the implementation of environmental measures specified in the ECOP.	
	6 complaint receptionists	① Take charge of recording, filing and reporting complaints to managers during construction and operation; handle the complaints from public. ② Cooperate with managers to carry out environmental protection.	
Various Project Component Office	1 manager	Take charge of matters in relation to the implementation of project components; cooperate with PIA to carry out environmental	

Environmental management institutions	Personnel arrangement	Main responsibilities	Qualification
		protection.	
Institutions with Class A qualification for EIA	3 persons	① Conduct field survey to each project and carry out EIA. ② Prepare ECOP	
Contractor	1 Environmental manager	① Take charge of implementing environmental protection measures specified in ECOP during construction. ② Report accidental environmental problems in project area to environmental management director in institutional framework; formulate various environmental protection measures during construction. ③ Accept the supervision and inspection of engineering supervisor, the World Bank and various EPB on environmental protection. ④ Establish a feedback system and complete rectification within 3 working days after receipt of rectification notice (for items requiring coordination of management institution, rectification period can extend to 10 working days). ⑤ Complete checklist at construction site together with engineering supervisor and report it to the local management institution. ⑥ Contractor shall report the progress of works to engineering supervisor on monthly basis.	
Environmental supervisor	1 environmental supervisor, assumed by engineering supervisor	① Conduct environmental inspection on site on weekly basis, fill in checklist of environmental inspection during construction and keep document archived. ② Put forward rectification plan for items not in compliance with ECOP and supervise its implementation.	

1.1.3 Construction preparation and environmental supervision

PMO shall provide all the EIA documents of each project component, including EAR, ECOP, future EMP, and copies of approvals of local EPB, to contractors after contract award but before construction. Contractors are required to carry out environment survey on construction site to verify the description of construction site in EIA documents and identify the environmental restrictive factors in project area. Environmental mitigation measures shall be put forward regarding the newly found sensitive receptors in environmental survey. Construction cannot be carried out until such measures are approved by environmental supervisor. See Appendix 1 for environmental supervision & management.

During construction, environmental supervisor is obliged to check whether the environmental protection and mitigation measures meet the requirements put forward in ECOP. He shall inspect construction site at least 1 time per week, fill in checklist for environmental protection inspection during construction phase (Appendix 2) and keep document archived, issue rectification notice (Appendix 3) to contractors regarding the environmental issues in construction, supervise contractors implementing relevant rectification measures, and submit report to the environmental manager of execution institutions and the experts of the World Bank. Upon the completion of construction, it is proposed to conduct an environmental inspection at construction site before acceptance of environment, fill in the checklist before acceptance of environmental protection (Appendix 4) and keep document archived.

See figure 1.1-2 for workflow of environmental supervision during construction.

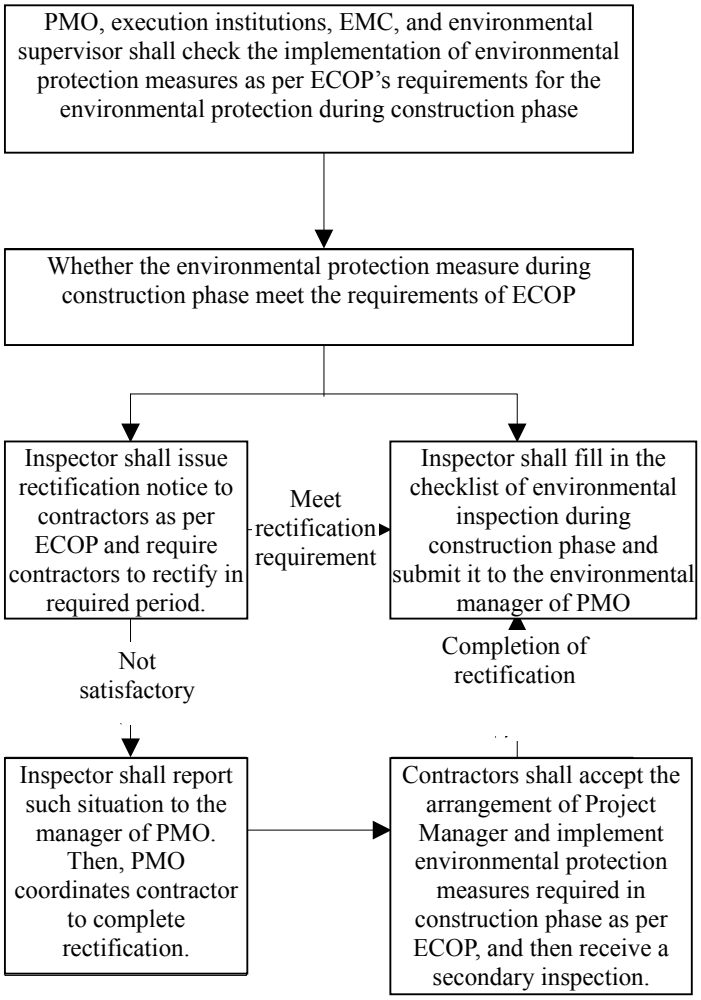

Figure 1.1-2 Workflow of Environmental Supervision

1.1.4 Document management

During implementation of ECOP, relevant documents shall be managed by PMO, execution institutions, EMC, EA Consultant, engineering supervisor and contractors shall manage. See table 1.1-3 for details.

Table 1.1-3 Requirements for Document Management

Name of institutions	Document management
PMO	① Prepare ECOP and domestic EAR documents and supervise their implementation and archiving. ② Record the briefing of PLG and submit report to the World Bank; Keep documents archived. ③ Coordinate with other departments to solve major environmental problems and make record of the measure implemented, as well as keep documents archived.
Various execution institutions	① Prepare and implement environmental rules and regulations for the project components and keep documents archived. ② Prepare and implement environmental management & training plan and keep documents archived. ③ Organize special study or research; keep documents related to seminar and research archived. ④ Keep a good record of complaints during construction and operation and keep them archived. ⑤ Keep a record of the briefing of engineering supervisor on quarterly basis, keep

Name of institutions	Document management
	them archived; submit report to PMO. ⑥ Place signature on checklist submitted by contractors and engineering supervisor; verify environmental sensitive receptors; and keep such documents archived. ⑦ Administer the rectification notices submitted and keep them archived.
EMC	① Submit an interim report to the World Bank and environmental management implementing institutions prior to June 30 in each year and keep the document archived. ② Submit an annual report to the World Bank and PIA prior to December 31 in each year and keep the document archived. ③ Submit a comprehensive evaluation report of environmental management half year after the completion of all environmental management works and keep the document archived.
Contractor	① Keep a weekly record of detailed construction and keep them archived; submit them to engineering supervisor. ② Complete checklist at construction site together with engineering supervisor, keep the checklist archived and submit it to execution institution. ③ Keep a record of detailed construction in case of emergency situations, keep the records archived and submit them to engineering supervisor. ④ Complete rectification within 3 working days after receipt of rectification notice (for items requiring coordination of management institution, rectification period can extend to 10 working days); Keep documents archived.
Engineering supervisor	① Keep a weekly record of the briefing of contractors, and keep the record archived and submit it to PMO. ② Complete checklist at construction site together with contractor, keep the checklist archived and submit it to execution institution. ③ Keep a record of detailed construction in case of emergency situations, keep the records archived and submit them to local management institutions. ④ Put forward rectification plan for environmental problems encountered in construction by contractor and supervise the implementation of such plan, including issuing rectification notice and checklist, review the documents and keep them archived.
Institutions with Class A qualification for EIA	① Prepare ECOP and domestic EAR documents and keep draft, draft for approval and approved draft archived.
The World Bank	① Keep a record of the briefing of PIA every half year and keep the record archived.

1.2 ECOP of construction site and site construction

1.2.1 ECOP of construction site

Construction site includes construction camps, concrete mixing stations, asphalt mixing stations, etc. In terms of function, construction camps fall into three categories, i.e. life camps, production camps, life & production camps. Life camps can only accommodate the living of construction personnel; production camps accommodate building material storage, concrete mixing station, asphalt mixing station, etc; life & production camps accommodate both the living and production of construction personnel. Asphalt mixing station is mainly used for mixing asphalt applied in pavement.

See table 1.2-1 for the ECOP of construction site.

Table 1.2-1 ECOP of Construction Site

Environmental elements	Protection measures	Responsible institution
Water environment	Existing public toilets within project area shall be employed as far as possible. Domestic sewage (construction personnel discharged in toilet) shall be treated by existing municipal facilities. Production sewage shall be recycled after sedimentation without discharge.	Contractor

Environmental elements	Protection measures	Responsible institution
Ambient air	Electricity or other clean energy will be employed for daily life and heating.	Contractor
Acoustic environment	Low-noise equipment shall be selected to control sound source.	Contractor
Solid waste	Domestic garbage collection spot or garbage can shall be provided. Building waste in construction camp shall be recycled as far as possible. Those that cannot be recycled shall be transported to designated spot regularly. A temporary solid waste storage & disposal or recycle spot shall be established.	Contractor
Social environment	Construction personnel shall follow local rules and civil laws, carry out works in a civilized manner and establish good relationship with local residents. Contractor shall provide sufficient and clean drinking water, soaps, toilet papers, and separate male and female bathrooms. In addition, contractor shall ensure that site offices, warehouses and workshops are in locations which are proper in the opinion of environment engineer or supervisor of PMO. 2m high or higher safety fence of proper material shall be established around camps.	Contractor
Ecological environment	Barren slope, brush land, poor land, road with small traffic volume in scenic area shall be preferred for production camp construction. No building noumenon under CH protection shall be occupied. In case it is necessary to occupy farmland for production camp construction, no basic farmland shall be occupied. In addition, before construction, cultivatable surface soil on the farmland shall be removed and stored at a leveled area in the site temporarily and fenced with bagged soil. The area shall be provided with temporary drainage ditch and grit sedimentation and covered with dust-proof screen. Upon completion of construction, the surface soil will be employed for restoring cultivation or landscaping.	Contractor
Environmental management	Only resident employees, staff in construction camp and personnel visiting construction site for business reasons shall have access to the construction site. Visits to construction camp shall be approved by construction camp manager as required. Sufficient lighting at day and night shall be provided at construction site. A strict code of conduct in construction phase shall be formulated to restrain the behavior of construction personnel.	Contractor

1.2.2 ECOP of site construction

See table 1.2-2 for ECOP of site construction.

Table 1.2-2 ECOP of Site Construction

Environmental elements	Protection measures	Organization in charge
Water environment	A review conclusion of preliminary drainage design of construction site. – A detailed implementation plan of proposed drainage system. -- As a part of the drainage system of the site, surface runoff at construction site shall be drained to avoid soil carry-away. Water shall be subject to the treatment of sediment trap before discharge. – Domestic sewage from toilets at site offices shall be collected by licensed waste collector or treated by relevant facilities. Wastewater after treatment shall not be discharged until it meet the requirements of national law. - Wastewater treatment facilities and sedimentation tank shall be provided near each construction area that may produce wastewater. In addition, sedimentation tanks shall be capable of processing excess suspended solids (SS) before they are discharged. Wastewater from washing concrete, cofferdam and vehicles shall not be discharged. - Retaining wall and bagged sand shall be provided near drilling and piling machine to prevent expansive soil and wastewater from flowing into piling area. Collected expansive soil or wastewater shall be released after treatment. – Prior to wet season's arrival, all exposed surface shall be properly covered or provided with landscaping to reduce sand in runoff.	Contractor
Ambient air	In any case, the dust and granular material produced should be minimized, to avoid the impact on the surrounding communities, especially on vulnerable groups (Children, the old); - Prevent the soil from being exposed to wind by large area due to seasonal vegetation loss. - Build dustproof enclosure around the construction site, to reduce the diffusion of dust as far as possible, especially avoid impact on the surrounding communities; - Carry on watering if necessary on muddy roads or passages and in soil or filling material storage area. On dry and windy days, watering should be carried on for twice every day at least (forenoon and afternoon). The frequency of watering near the surrounding communities shall be added	Contractor

Environmental elements	Protection measures	Organization in charge
	properly depending on demands; - In tunnels, the supporting ventilating system and other facilities should be equipped, to control the concentration of air pollution; - The vehicles and roads used for transporting the materials of the project should be designed properly. For example, the roads can be paved with concrete/pitch or stones. There may be large amount of construction materials to be transported before the construction of large earth works; - Ensure the maintenance and repair of all vehicles, prohibit the vehicles that are not properly maintained and may cause server pollution to enter the construction site; - In transportation of chemical products or materials such as cement, yellow sand, and lime, clean and impermeable material shall be used for covering them completely, to avoid leakage or overflow in the transportation; -The exhaust gas of construction vehicles and machines are unavoidable, but the engines of them shall be examined and adjusted when necessary, to reduce the pollution to air.	
Acoustic environment	Limit travel speed at accesses of all roads related to the project; -All the vehicles entering the field should be with speed less than 30 kilometers per hour, except specially specified;. -Keep the noise when all the machines and equipments are in operation less than 90 db if possible; -In sensitive areas (including residential area, etc.), noise reduction measures should be taken more strictly to prevent the noise from disturbing residents; - Proper measures should be taken to avoid the vibration or noise caused by construction activities; - Formulate a construction material transportation plan, to reduce the adverse impact on the life of surrounding residents and the traffic outside the construction site; the vehicles must slow down and be prohibited to whistle when go across the sensitive areas. In rush hours, the transportation should be reduced as far as possible. Contractor must provide transportation routes to Project Manager in advance; -The construction equipments should keep the optimum operation condition and the lowest level of noise. - Use temporary noise barrier, to reduce the noise produced by construction equipments as far as possible; - Hearing protection must be provided for the workers who operate the equipments with high noise, such as piling, exploding, mixing and stirring, etc, and the noise shall be controlled; - In the area used for storing fuel or lubricant, fences shall be installed, and compacted/impermeable ground or other surfaces should be paved, to prevent unexpected leakage or overflow of fuel and/or lubricant. The drainage of the surface water within the enclosure should be through oil skimmer or other devices, to eliminate the discharge of hydrocarbon. Empty buckets of fuel /lubricant shall not be placed in the field, but be labeled with MSDS, and treatment method of them should be trained for workers; - Project supervision team should be equipped with portable noise detecting instruments, to exam the noise level in sensitive areas; -The time for construction materials to be transported away from the field should be during non-peak period, so as to control the increase of traffic volume and noise. - Use properly designed silencer, sound insulation board or protective cover, etc. All the noise control equipments should be repaired regularly, and replaced when dysfunctional. - Use electrical equipment to replace diesel-powered equipments or gas-powered equipments; -In case that an equipment with high level of noise send out noise in one direction, it should be far away from the sensitive receptor nearby as far as possible. -The construction machine and equipments shall be used intermittently, and be closed or slowed down to the minimum speed in downtime. Noise mitigation at night: In case of construction near local communities at night, which will cause heavy impact on local residents and other sensitive receptors, the following special measures should be taken: -Notify the residents of the affected area in advance, with content including the specific time of construction at night and the lasting time, the necessity of construction at night, and the mitigation measures the project will provide, so as to obtain their understanding. The affected residents can put forward their ideas, difficulties, and suggestions, which should be taken into account before construction at night. - Concrete mixer, generator, and other fixed equipments with high noise should be as far from the residential areas as possible. In construction at night, use the municipal power supply the replace diesel generator, to mitigate the impact of the noise.	Contractor
Solid waste	Establish and execute compulsorily daily clearing procedure, including repair and maintenance of construction waste disposal facilities;	Contracto

Environmental elements	Protection measures	Organization in charge
	- The remains produced by demolition of structures should be reused as far as possible (For example, use as filling material in other projects of Jingzhou). The disposal of the remains must be conducted after the identification of the disposal site, and upon approval of supervision engineer of the project. Contractor shall ensure that the disposal sites meet the following conditions: (1) it can't be located in forest area (2) without impact on natural drainage (3) without impact on threatened/ rare plant. In any case, Contractor shall not dispose the materials in environmental sensitive areas; -In case that fragments or sludge are deposited in the adjacent area of the construction site, Contractor shall clear them away immediately, and recover the affected area to the original state upon confirmation of the supervision engineer; - All the traffic arrangement of supply, maintenance, demolition, remain clearance, etc. during construction period, will be regarded as part the work of Contractor, and be defaulted to have been approved to be planned and implemented by Contractor, and arranged by supervision engineer; - For design and construction of all waste soil yard, the most safe and stable technical terms must be applied; - Conduct risk assessment to potential impact caused by permeation of waste material to surface water; -Ensure that the location selection of waste soil yard won't have impact on surface drainage through proper analysis; -Build safe and stable waste soil yard according to requirements of landscape and vegetation recovery plan, avoiding erosion.	r
Social environment	The construction at important traffic nodes should avoid rush hours (07:00~08:30 and 17:00~18:30); set vehicle in and out signboards, and the drivers shall drive in a civilized way, ensuring the safety of transportation; Formulate comprehensive health management plan for construction staffs, including disease control, vaccination, pest management, food safety, etc. - Set safe sight distance in construction site and construction camp; -Set up signs around the construction area, to provide convenience for traffic operation, guidance for all works, as well as suggestion and warnings of safety. – All the signs should use Chinese, and made as per specification of China; -Upon the consent of environmental officer of the project, use selected routes to go to the field of the project. The vehicles shall be of dimension that is suitable to the level of roads in the area, and control the load strictly to prevent to damage the local roads and bridges. For damages to the local roads and bridges due to overload transportation, Contractor shall bear all the responsibility and be requires to repair the damaged; -Appropriate traffic control should be kept during the whole contract period; -Be careful to mark the safe passage for pedestrians; - If there are Children from schools nearby, it's necessary for traffic security officer to direct the traffic at the time when school is over.- Ensure to supply traffic signs (including paint, easels, materials for signs, etc.), road marking, guardrail, to maintain the safety of passengers during construction period.	Contractor
Ecological environment	All the earthworks shall be controlled appropriately, especially in rainy season; - Contractor shall keep the stability of the earthworks in the whole process of excavation, and disturb the area outside the project area as rarely as possible. -It's better for Contractor to operate continuously in excavation and filling of the last section, avoiding local construction of earthworks, especially in rainy season; - To avoid erosion to soil slope caused by excavation and filling, cut-off curtain and toe drainage equipment should be installed and grass or other vegetations should be planted at the top and bottom of the earthworks. The cut-off curtain should be installed at higher place, to reduce surface run off and slope erosion. - The excavation of earthworks and unstable materials, should be conducted in specified disposal area upon approval of the supervision engineer of the project; - The disposal area shall not be arranged in the areas with the possibility of landslide, or may affect the farm land or land of other use, or areas which may cause surface run off with impact on water source. Canal may need to be excavated within and around waste landfill yard, of which the specific construction form will be decided by supervision engineer.	Contractor
Environment and safety management	Reserve, specify and limit a storage and disposal area for construction waste, and/or install a safety mobile run of waste moving from higher place to lower place; -Proper protective and fixing measures need to be taken in the process of sawing, cutting, grinding, polishing, fragmentation or excavation (if applicable); -Achieve clean transportation, avoiding vehicles and other equipments from dropping waste in the process of transportation;	Contractor

Environmental elements	Protection measures	Organization in charge
	- Set temporary protective facilities for falling in the periphery of scaffolds and operation zones high above the ground, such as hand rail, skirt board, etc. to prevent construction materials and staffs from falling.; - Provide safety glasses, side protective cover, mask, safety helmet, safety boots or shoes to all relevant workers.	

Annex II ECOP of Dredging

In this project, dredging of the moat and lakes within the historic town involves the following content: Wet dredging, sediment transportation, construction of mud pipe, booster station for sediment transportation, sediment dewatering and consolidation station, temporary sediment storage yard, construction road, etc. The related ECOP of dredging is as shown in table 2.1-1.

Table 2.1-1 ECOP of Dredging

Environmental elements	Protective measures	Organization in charge
Water environment	When all the operation of pumping in dredging are completed, the pipes need to be washed by pumping water, until the water comes out of the outlet at the end of the pipe is clean. The residual water produced in the process of dewatering in the storage yard shall be discharged outside after treated to meet the grade-A standard of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002)*. In this project, flocculant will be used to improve the impact of the residual water of storage yard on the moat as far as possible. To protect the surrounding environment better and avoid secondary pollution, simple anti-seepage treatment shall be conducted for the temporary storage yard. The method is as following: pave a subcrust with a thickness of 0.35m at the bottom of temporary storage yard. The subcrust consists of four layers, including original soil rammed, 1.5mm HDPE anti-seepage film, a layer of macadam with a thickness of 0.15m, and a layer of coarse sand with a thickness of 0.2m from the bottom up. Set several blind ditches in the yard to discharge the water seepage of sediment and rainwater. As the two storage yards are located beside the moat banks, to prevent damage to the river levee caused by excessive storage of sediment, and ensure that the sediment won't enter the moat again with rainwater, retaining wall shall be built around the storage yard; set intercepting drain made of mortar rubble outside the retaining wall and at the slope line to discharge rainwater. The dimension of the fracture surface of the drain is as following: the bottom is 0.6m wide, the top is 0.8m wide, the depth is 0.6 m. The water of intercepting drain will be discharged into moat finally.	Contractor
Ambient air	The construction of dredging shall be in winter as far as possible, to reduce the impact of stench in the process of dredging. Through watering dust-controlling, reduce the pollution of raise dust caused by bareness of the earth's surface. The sludge storage yard shall be stored by layer, to control the raise dust, and improve the stability of storage. As No.2 storage yard is near from the residential area of Fanrong Street, a protective distance of 30m shall be set according to the EAR, so No.2 storage yard shall not use the area in the scope within 30m away from the residential area as sediment storage yard. Meanwhile, a separating wall shall be set to mitigate the impact of dredging sediment on sensitive points.	Contractor
Acoustic environment	The booster station shall use the equipments with international advanced level of environment protection to reduce the impact of noise of the station at source.	Contractor
Solid waste	Collect the waste oil produced by reamer and equipments of the pump station timely; Conduct mechanical dewatering to the sludge of dredging by dewatering-solidification integrated equipment; the sediment after dewatering shall be delivered to the sludge storage yards for temporary storage. The mud dredged by dredging machine shall be delivered to solidification station by booster station. The mud shall be filtered through vibrating screen to remove oversize rubbish or sundries; then they will enter settling pond for three-level filtration and sedimentation to gain higher concentration of mud and improve the treatment efficiency. The removed rubbish can be directly loaded through belt conveyor. If there is no way to use the sludge, it can be investigated that whether there is specified field for digesting them; if there is, they shall be delivered to the specified field after handling formalities for residue and soil delivering.	Contractor
Social environment	The mud pipe shall be laid along the sidewalk with clear signs; so as to remind the vehicles crossing by to take care and slow down, avoiding pressing the mud pipe, and hindering the construction.	Contractor
Ecological	Wet dredging shall be used; all areas are prohibited to use dry dredging. As for the	Contractor

environment	reamer, negative pressure environmentally friendly reamer shall be used. To prevent water and soil loss, intercepting and drainage ditch shall be set in the slag yard, avoiding that the mud and sand discharge directly into surface water with the runoff of drainage ditch, and affect the water quality. The storage yard can only be used temporarily, which is not permitted to occupy permanently, or use in other ways. After the dredging is completed, the temporarily occupied land of the storage yard shall be recovered for the original usage timely.	
Environment management	The mud pipe shall be repaired and maintained regularly, to prevent the leakage of sludge, which will have impact on the surrounding environment. The equipments shall be examined carefully after installation to confirm that all parts function properly before being put into operation.	Contractor

Annex III ECOP of Preservation of CH

3.1 ECOP of protection of the Historic Town wall

The project focuses on repair of sensitive receptors, especially repair of the damaged brick city wall，construction of retaining wall for the soil city all to prevent water and soil loss; removal of parasitic plants which are threatening original vegetation. It has no negative impact on the historic city wall and its vegetation. Contractor shall compile detailed construction regulations under guidance of this ECOP, and submit it to CH experts and supervision engineer for approval before construction.

Table 3.1-1 Protective measures in the process of city wall repair

Name	Status	Restoration measures	ECOP	Organization in charge
Brick city wall	Been repaired	Maintenance and repair	Implement under guidance of CH experts	Contractor
	Partial loose	Crack pouring and repair	Hire supervision company with a professional background to supervise	
	Severe damage	Reinforce and repair	Hire supervision company with a professional background to supervise	
	Partial holes, gaps, mismatches, bulges	Demolition and rebuilding	Differentiate strictly the protective targets from the demolition targets, DI shall guide in the site during construction phase.	
Brickwork wall	Been repaired	Maintenance and repair	Implement under guidance of CH experts	Contractor
	Partial loose	Crack pouring and repair	Hire supervision company with a professional background to supervise	
	Severe damage	Reinforce and repair	Hire supervision company with a professional background to supervise	
	Partial holes, gaps, mismatches, bulges	Demolition and rebuilding	Differentiate strictly the protective targets from the demolition targets, DI shall guide in the site during construction phase.	
The road on top of the city wall	Been repaired	Clearing and unchoking	Hire supervision company with a professional background to supervise	Contractor
	Partial loose	Crack pouring and repair	Hire supervision company with a professional background to supervise	
	Severe sinking and damage of brick paving	bed mortar and brick paving	Hire supervision company with a professional background to supervise	
	Sinking and damage of basement layer of brick paving	Backfill with loess	Hire supervision company with a professional background to supervise	
Earth city wall	Slight damage	Maintenance and repair	Hire supervision company with a professional background to supervise	Contractor
	Moderate damage	Partial backfill tamping along the terrain	Hire supervision company with a professional background to supervise	

3.2 ECOP of Xiongjiazhong Phase II project

Xiongjiazhong Phase II project is based on Phase I. The Phase II project have minor impact on Xiongjiazhong, because on one hand, as the land expropriation and house demolition, building and greening projects are mostly completed in Phase I, Phase II is not involved in land expropriation, and the construction roads can be built based on the existing roads. On the other hand, the construction of Phase II focuses on improving the service level of supporting facilities. The ECOP

of Xiongjiazhong Phase II project is as shown in table 3.2-1.

Table 3.2-1 Protective measures of Xiongjiazhong Phase II project

Project name	Project component	Protective measures	Organization in charge
Landscape and infrastructure work	(1) Chu Yulin Landscape Work (2) Farmland Clear-up Work (3) Phase II Parking Lot Construction Work (4) Parking Lot and Main Ring Road Asphalt Pavement Work (5) Academic Exchange Center Rebuilding Work (6) Outdoor Greening Spray System Construction Work (7) Visitors Service Facility Construction Work	Set construction roads based on the existing roads in the park, reduce temporary land occupation except for roads as far as possible; If civil work is involved, archaeological excavation shall be conducted firstly, and construction can only be carried on after confirmation of that there is no cultural relic buried.	Contractor
Relics Noumenon Exhibition Work	(8) Horse & Chariot Pit Relics Preservation Exhibition Hall (9) Work of Junshi Grave Sacrificial Pit Preservation Exhibition	Collect the liquid waste specially generated in the process of trial trench, and entrust Jingzhou Museum to treat them. If civil work is involved, archaeological excavation shall be conducted firstly, and construction can only be carried on after confirmation of that there is no cultural relic buried.	Contractor
Work of Unearthed Cultural Relics Exhibition Hall	(10) Exhibition Hall construction work (11) Exhibition Hall and Surrounding Landscape Work (12) Indoor Exhibition Work (13) Multifunctional Hall Equipment Procurement	If civil work is involved, archaeological excavation shall be conducted firstly, and construction can only be carried on after confirmation of that there is no cultural relic buried.	Contractor
Work of Park Area Identification and Guide- to-Visitors System	(14) Logo System Work (15) Guide-to-Visitors System Work (16) On-line Museum Construction	——	Contractor
Park Area Management System Work	(17) Public Management System Construction (18) Security and Protection Management System Construction	——	Contractor

3.3 ECOP of Jingzhou Museum

Jingzhou Museum itself does not belong to CH, but relics on display are sensitive receptor, so during construction of the Treasure Hall, as long as the relics on display are well kept, this project has no impact on CH protection agencies of Jingzhou Museum. ECOP of upgrade project of Jingzhou Museum is shown in table 3.3-1.

Table 3.3-1 Protective measures of Jingzhou Museum Project

Project name	Project content	ECOP	Organization in charge
Comprehensive transformation of Treasure Hall	Removal of part of the building	Jingzhou government has agreed not to demolish the building	Contractor
	Built part of the building	Proper arrangements for temporary storage of CH which meets the standard, and invite professionals to check and transport artifacts	
	Seismic retrofitting (including interior wall transformation)	During the building construction, temporary shelter is needed for the pool to prevent construction waste from entering the pool	
	Insulation and energy-saving reconstruction(including	During the building construction, temporary shelter is needed for the pool to prevent construction waste	

Project name	Project content	ECOP	Organization in charge
	moisture proof reconstruction)	from entering the pool	
	Facade transformation(including update for doors and windows)	Use original building materials as much as possible	
	Reconstruction for roof waterproof layer and downspouts	Use original building materials as much as possible	
Project of exhibition displays for Treasure Hall	Interior furnishing works	Proper arrangements for temporary storage of CH which meets the standard, and invite professionals to check and transport artifacts	Contractor
	Making of reproductions, handicrafts and props		
	Professional showcase and lighting		
	Project of exhibition displays for official documents and letters		
	Multimedia equipment and software engineering works		
Equipment installation works for Treasure Hall	Modification of monitoring system	____	Contractor
	Modification of fire alarm and sprinkler system (supplementary gaseous fire suppression)	____	
	Central air conditioning system	____	
	Elevator	____	

3.4 ECOP of upgrading work of Kaiyuan Taoist Temple

Construction objects of reconstruction project of Kaiyuan Taoist Temple are mainly roads and enclosing walls. Besides, protection work has been done to stone carvings, gravestones and other relics. Project itself does not involve the construction on CH in Kaiyuan Taoist Temple. Therefore, this project has little impact on CH in Kaiyuan Taoist Temple. ECOP of upgrading of Kaiyuan Taoist Temple is shown in table 3.4-1.

Table 3.4-1 Protective measures of reconstruction project of Kaiyuan Taoist Temple

Project name	Project content	ECOP	Contractor
Reconstruction project of Kaiyuan Taoist Temple	Construction for road and enclosing wall	Follow the principle of conservation of heritage buildings. No damage shall be done to heritage buildings. Historical building and surrounding landscape will be protected.	Contractor
	Preservation of CH for carved stones and stone monuments.	Make full use of existing resources. Use existing buildings, landscape pieces and plants for environmental constructions. Strictly protect carved stones and stone monument. Demolition of enclosing walls should be done by professional construction team having experience of preservation of CH.	

3.5 ECOP of historic blocks

During the repairing process of historic blocks, envelope works will be done to historic buildings. The construction materials will be temporarily stored on the road of Dongdi Street and Southgate Street. The road will be occupied, thus affecting the outing of neighborhood residents. As the project belongs to the restoration project, no negative impact on the historic building itself will be seen.

ECOP of historic blocks is shown in table 3.5-1.

Table 3.5-1 Protective measure of reconstruction project of Kaiyuan Taoist Temple

Project name	Project content	ECOP	Contractor
ECOP of historic blocks	Envelope works for historic buildings	The storage site of construction materials should be specified, and its storage time cannot exceed half a day. The storage should not exceed its usage. Avoid road occupation for construction materials as far as possible in building rehabilitation of Dongdi Street blocks. The proportion of temporarily occupied roads and normal traffic road is around 1:2. Construction time should avoid break time of surrounding residents. Construction during the nighttime (22:00~06:00) is prohibited.	Contractor

3.6 General ECOP of CH protection

During the construction period, if any CH is found, the Contractor shall immediately preserve the site and report to the local Cultural Relics Bureau according to Cultural Relic Protection Law of People's Republic of China (2007.12.29). Construction can only be resumed after treatment of Cultural Relics Bureau. Reporting procedures for cultural heritage are shown below. Notification table for CH point is shown in Appendix 5.

If any CH is found during the construction, builders should:

(1) Immediately cease the construction, and strengthen the protection of the site;

(2) The contractor should report to the police and competent authorities of CH for identification in a timely manner;

(3) Once it is defined by the expert as CH, delimit immediately the scope of protection;

(4) If construction period is pressing or there is danger of nature destruction, excavation of CH needs to be undertaken;

(5) The excavation of CH must be carried out by professionals using specialized equipment and no unauthorized excavation shall be taken by the contractor;

(6) Once it is defined as significant cultural heritage discovery, that project shall undertake demonstration as to whether or not it should be built in another place.

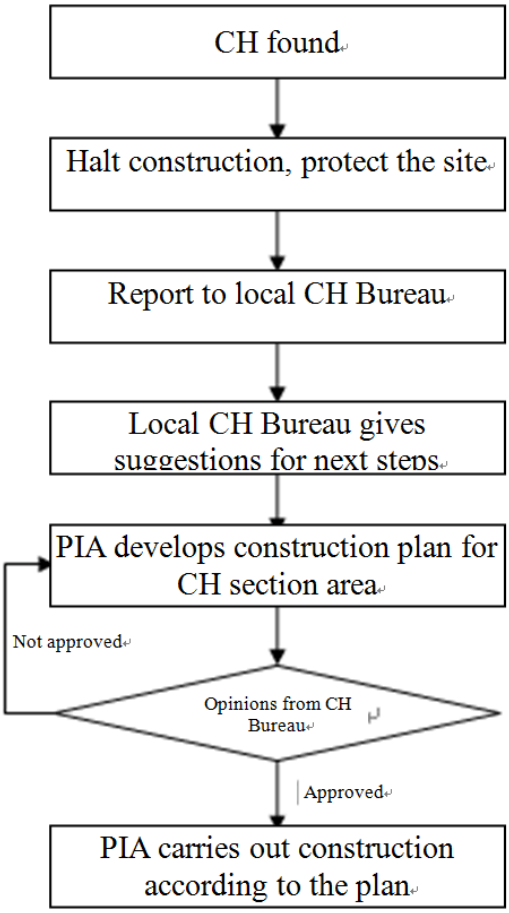

Figure 3.6-1 Flow chart for discovered CH during construction

Annex IV ECOP of Schools

During the construction phase, there is construction at night, so it has little impact on residents. Therefore, only schools are chosen as sensitive target for analysis. Site survey shows: sensitive points around the project site are Simon Middle School in Jingzhou, located in the east of the West Wall, with 43 classes and nearly 2500 students. ECOP during the construction phrase and operation phrase is shown in table 4.1-1.

Table 4.1-1 ECOP of Dredging

Sensitive receptor	Time interval	Protective measures	Contractor
Jingzhou Simon Middle School	Construction phrase	Build dustproof enclosing fences around construction sites to minimize the proliferation of dust. In particular, attention need be taken to the area around the school; sprinkle regularly the roads around schools to prevent dust; Noise of all the machinery and equipment should be less than 90 DB; Transportation vehicles in the sensitive region must slow down and trumpet is banned, and more strict measures to prevent noise must be taken to avoid interference with student learning; use temporary noise barriers, so as to minimize noise generated by construction equipment; guarantee the supply of traffic signs (including paints, easels, sign materials, etc), road marking, fencing wire, in order to maintain pedestrian safety during construction. Clearly mark the pedestrian's safe passage; appropriate traffic management needs to be taken during construction phrase; Construction site should set up visible billboard, explaining the project content, project timetable, completion time, contactors and complaint hotline, and its appeal to the public for understanding of inconvenience to transportation due to construction.	Contractor
		Construction near the school should avoid the school time(07:00~08:30 and 17:00~18:30); provide signs of vehicle access, car drivers should be civilized to ensure safe transportation; transport security personnel should be assigned when the school is over to direct traffic.	Government departments
	Operating period	Control the vehicle speed in the school area, and honking is prohibited; strengthen traffic control after the school is over and strengthen traffic dispersion work; Prohibit vehicles with excessive exhaust emissions and noise emissions; Strengthen the security management around schools to avoid social security problems caused by growth of tourist population.	

Appendix 1 Summary of Environmental Supervision and Management

No.	Content	Mitigation measures	Implementing agency	Supervision agency
Design phase				
1	Soil and water loss	Design scientific construction processes and methods. Rationally select materials and location of stockyard and dump area to prevent soil erosion;	DI Evaluation agency	Implementing agencies and project supervision agencies
2	Greening	Green design for areas surrounding the building;		
3	Land expropriation	Compensation for acquired land shall be complemented in accordance with the relevant provisions, and the compensation funds shall be distributed to each family;		
4	Air pollution	Stockyard and mixing stations should be at least 20m away from sensitive areas;		
5	Water environment	Reuse construction waste as far as possible,and rely on existing sewage treatment facilities for treatment of sanitary sewage.		
Construction phrase				
1	Countermeasures for impact of ecological environment	(1) In the pre-construction, Contractor must map out protection wires, clarifying protected target and the scope of protection; coordinate issues related with construction sites, and minimize the occupation and destruction of the riverside land or other vegetations. (2) Contractor should rationally design general layout of the construction in the construction organization plan, and make full use of the existing street road of the historic town, and minimize the area of temporarily occupied land. (3) For temporarily occupied land that has to be taken, after the construction is finished, waste in that area should be cleared in a timely manner and vegetation should be restored. For permanently occupied land of the project, except for permanent buildings and water surface, vegetation in that area should be restored in a timely manner as far as possible.	Contractor	Implementing agency, environmental supervision agency, and external environmental supervision agency
2	Soil and water loss	(1) To prevent soil erosion caused by interception pipeline, according to related requirements of Report of Soil and Water Conservation Plan, intercepting drain and drainage ditch shall be build, to prevent runoff from entering into moat; build hoards and sedimentation tank to reduce soil loss and runoff; during the rainfall and gale period, construction and material processing shall be limited; stabilize the full-cut slope, dike, and other work areas susceptible to erosion; temporary storage yard for sludge shall be covered with clean waterproof tarps, and shall be spayed with water in dry weather; all water spray; all interference area of earth-work should be stabilized; after construction is completed, immediately restore the landscape in the temporarily occupied land. (2) Residue prevention and slope protection works for provisional storage yard should be determined in accordance with the position of waste soil, its properties, its expected height and other factors. (3) Drainage systems of dump yard should be set on the basis of topography, geological and hydrological conditions, combining the condition of ditches, agricultural irrigation and other facilities, so as to avoid water erosion of farmlands and sloping fields.When there is convergence around the dump area, interception and drainage measures can be taken to distribute water; In addition, after the project is finished, the plant for revegetation in the main protection area, protection area of pioneer road, protection area of concrete mixing station, and provisional dump (residue) area shall use native species and avoid exotic species.	Contractor	Implementing agency, environmental supervision agency, and external environmental supervision agency
3	Surface water pollution	(1) In the construction site, the waste for vehicle cleaning, concrete curing, aggregate washing should be collected through the gutter channel. After the waste water is mixed and diluted, it will run into provisional sedimentation tank for treatment. The size of sedimentation tank should be set so that the residence time of waste water in this tank could be 12h above. Waste water after its treatment will be used for cleaning of construction site , building materials, concrete curing, and aggregate washing; (2) Rely on existing facilities for treatment of domestic wastewater as far as possilbe;	Contractor	Implementing agency, environmental supervision agency, and external environme

No.	Content	Mitigation measures	Implementing agency	Supervision agency
		(3) Strengthen construction management, and strictly control the running, emitting, dripping, and leaking of oils in construction machinery ; build provisional drainage system and take water conservation measures, so as to prevent water environment impact caused by soil and water loss of the dump area; (4) All Contractors must implement measures for treatment of waste water of construction and domestic sewage to ensure proper handling and disposal of waste water; (5) Enhance the education on environmental protection of construction, and enhance the environmental awareness of construction workers; construction workers must not litter, or dump waste and sewage improperly.		ntal supervision agency
4	Noise	(1) Site arrangement: Arrange the construction site properly: Do not place several power or machinery devices at one place to avoid too much noise at the place. Machinery devices fixed to a position should be operated inside an operation shed if any. (2) Use low-noise equipments and technology, so as to reduce noise at the source. By using transport vehicles with low noise, the noise in driving can be 10~15dB (A) less than that of other vehicles of the same level; the difference of noise level can be up to 5dB (A) between different types of excavators and blenders. Reduce operation vibration noise through strengthening inspection and maintenance of mechanical equipments, maintaining regular lubrication, and tightening all components. The whole equipment shall be firmly installed, keeping full contact with the ground. Shockproof base shall be used if possible, so as to reduce noise. (3) Arrange construction time properly, avoid construction operation with noise pollution during 22:00 p.m.~6:00a.m. as well as lunch break as far as possible; if urgent construction at nighttime is unavoidable, it should be reported to local environmental protection administration, and construction can only be conducted at specified day upon approval. Reduce noise of construction transportation: as the transportation during construction period has great impact on environment, the amount of transportation at night shall be reduced as far as possible, and the speed of heavy-duty trucks shall be limited, especially when entering residential area. Regular maintenance of transport vehicles shall be done, whistling shall be reduced or banned, and transport route shall be arranged in a reasonable manner. (4) The PIA shall instruct construction contractor to post and publish complaints hotline at construction site. When receives complaints, PIA shall contact with local environmental protection administration immediately，so as to handle all disputes timely. In case that there are sensitive sites (Newly-built houses or houses haven't been demolished) within 50m from construction site, temporary noise barrier or baffle plates shall be erected. Strengthen management, advocate civilized construction, enhance consciousness of all construction personnel to avoid noise disturbing surrounding residents，so as to control human noise as far as possible. Meanwhile, in the process of project construction, continuous communication with existing and planned communities surrounding the project area is required, so as to obtain understanding and support from surrounding residents.	Contractor	Execution organization, Environmental supervisor, EMC
5	Air pollution	Main sources of fugitive dust are earthwork excavation, mixing of ash and earth during construction of visitors' center, wetland, river-way revetment work, demolition of buildings within the boundary of land expropriation, temporary storage, transportation and other processes of powder materials,. To mitigate the impact of fugitive dust on the environment, following measures shall be taken: (1) Maintain a certain humidity at construction site, watering and cleaning system musts be established for storage area of powder materials, dedicated person shall be arranged for the work, and the frequency shall be adjusted according to the degree of drying of the	Contractor	Execution institution, Environmental supervisor, EMC

No.	Content	Mitigation measures	Implementing agency	Supervision agency
		weather. (2) Effective and clean construction enclosure shall be set around construction site. (3) Construction material shall be stored indoors as far as possible; in case of storing outdoors, they shall be covered with tarpaulin; powder materials like cement and lime shall be transported as bulk materials by tank car; storage site of powder material shall be kept as far from residential community as possible. (4) Materials such as earth, gravel and the like shall be covered with tarpaulin during transportation; overloaded transport is prohibited for fear of secondary pollution as a result of spillage, leakage and overflow along the way. (5) Wheel cleaning equipment shall be installed at the exit of construction site; dedicated cleaner shall be assigned for cleaning wheels and sweeping entry/exit at site; vehicles with mud-carrying wheels are banned for travelling. (6) Under weather condition of strong wind, construction operation producing dust is banned within 200m from sensitive sites such as residential area, school, kindergarten, hospital and the like. (7)For protecting operator's health, dustproof respirator shall be provided. (8) Standard fuel shall be used for transport vehicles and fuel-fired construction machinery, low-grade fuel is prohibited for use; in addition, driving route of transport vehicles shall be arranged reasonably to ensure driving at a safe speed and reduce idle time, so as to reduce emission of exhaust gas by motor vehicle. (9) Strengthen maintenance of fuel-fired mechanical equipment, and maintain equipment operation under normal and good condition; furthermore, fuel-fired machinery shall be installed with exhaust gas emission purifier to ensure emission of standard exhaust gas.		
6	Safety and health during construction	Select capable workers in annual recruitment Implement a comprehensive vaccination program in accordance with the local regulations; Prevent malaria in existing conditions in the camp, and build facilities for early diagnosis and treatment of patients; Reserve sufficient drugs to treat malaria; Collect and assay saliva of persons who are possible to have tuberculosis (TB) infection; Reserve antibiotics to treat respiratory tract infection; Reserve drugs and infusions to treat food poisoning and diarrhea; Provide solutions against mass outbreaks of food poisoning; Monitor the shared kitchen in the camp regularly; Reserve and provide insect repellent to the workers; Take measures for disease control and pest control when building the construction camp; Provide condoms to the workers in the camp for free.	Contractor	Execution institution, Environmental supervisor, EMC

Appendix 2 Checklist for Environmental Protection Inspection during Construction Phase

Inspection element	Implementation status		N/A	Remark
	Implemented	Not implemented		Suggested rectification and preventive measures for the problems and incompliance found in the inspection
1. Control of air pollution				
1.1 Watering the construction site to reduce dusts produced in the construction				
1.2 Powdery materials storage yard is covered or watered to reduce dusts.				
1.3 Vehicles carrying powdery materials are covered or watered before leaving.				
1.4 Spray water to control dusts in the demolition works				
1.5 Construction wastes are transported in enclosed containers.				
1.6 Road-block fence is used in the environmentally sensitive receptors (areas) where road construction is being carried out				
1.7 Earth in the construction site is stacked together and covered.				
1.8 The dirt on the surface of the lorries is cleaned before they leave the construction site				
1.9 The storage yard for materials and large formwork at the construction site is leveled and hardened				
1.10 In consideration of the prevailing wind direction and the surrounding sensitive receptors, the main dust source the storage yard for particle and granular materials is set 30m away from the surrounding sensitive receptors down the wind.				
1.11 Dusty roads are hardened, paved with sand particles and are watered regularly				
1.12 Speed is limited at construction road and speed limitation signs are provided.				
1.13 Fuel consuming construction machines and vehicles are used in good condition and no black smoke is produced when running				
1.14 Any waste is incinerated.				
1.15 Other (Please specify)				
2. Water pollution control				
2.1 Waste water treatment system (such as the temporary settling pond) at the construction site is used and maintained properly				
2.2 Waste water from construction is disposed of and utilized effectively				
2.3 Waste water from construction is drained to the stormwater channel.				
2.4 Facilities collecting waste water from construction into the settling pond (such as earth ditch or U-shape groove) are provided.				
2.5 Mud in the U-shape groove is cleaned off				
2.6 Mud in the settling pond is cleaned off				
2.7 Vehicles and equipment are cleaned before going in or out of the construction site.				
2.8 Washing facilities are maintained properly, sediment is prevented from overflowing.				
2.9 Mud at the washing facilities is settled down and discharged regularly				
2.10The public roads/places surrounding the construction site, entrance to the site and the temporary fence are kept clean and away from mud				
2.11 Sanitary sewage is disposed of properly				
2.12Existing living facilities are relied on				
2.13 Storage of construction materials such as pitch, oil, and chemicals are forbidden around waters				
2.14 Other (Please specify)				
3. Noise control				

3.1 Construction noise permit is obtained for construction in noise control period.				
3.2 Construction noise permit is posted at the entrance of construction site.				
3.3 Idle equipment in construction site is shut down or in a state of throttling and vibration reduction.				
3.4 Effective noise reduction measures (vibration reduction, noise reduction, sound barrier, etc.) are taken.				
3.5 Low-noise equipment is selected.				
3.6 Construction time is reasonably arranged.				
3.7 Machineries producing high noise are set at location away from residential area.				
3.8 Machinery equipments are regularly serviced.				
3.9 Construction intensity, machinery & vehicle operator and COP are managed in a strict manner.				
3.10 Other (Please specify)				
4. Solid waste pollution control				
4.1 Construction site is clean and tidy.				
4.2 Some building waste is employed in small civil works carried out at the same time.				
4.3 Remaining building waste are stacked at designated place in construction site in a centralized manner and transported to landfill for disposal.				
4.4 Mellow soil in spoil is employed for reclamation and forestation on barren land in project area.				
4.5 Water is sprayed before transportation of building waste.				
4.6 Domestic garbage is collected via trash bag and transported to incineration plant for disposal.				
4.7 No toxic or hazardous substance is burned at construction site.				
4.8 No oil is leaked. Contaminated soil is immediately cleaned.				
5. Protection of animals, plants and cultural relics				
5.1 Disturbance to terrestrial plants is minimized. Plants are protected.				
5.2 Rare animal is found				
5.3 Cultural heritage is found in construction. Protection measures are taken if found.				
5.4 Other (Please specify)				
6. Resource conservation				
6.1 Precautions for water pipe break-down and water waste are made.				
6.2 Diesel-powered equipments are shut-down in case of standby to reduce oil consumption.				
6.3 Energy saving measures are taken.				
6.4 Metal or other materials are employed to reduce wood consumption.				
6.5 Materials are well stored to prevent degradation or waste.				
6.6 Other (Please specify)				
7. Construction safety and emergency response				
7.1 The integrity of buildings in construction site is guaranteed.				
7.2 First-aid tools are provided at construction site.				
7.3 Signs are hung at dangerous areas and apparatus, hazardous materials, places provided with safety measures, emergency exits, etc.				
7.4 Personal protective devices are provided to construction personnel by contractor				
7.5 Contractor establishes procedures and system for report and record of occupational accident and diseases, and dangerous accidents.				
7.6 Health education is provided to construction personnel.				
7.7 Accidents are reported and investigated. Rectification and prevention measures are put forward and recorded.				
7.8 Other (Please specify)				
……				
Construction stage for inspection:_____ Inspection date:_____ Inspection time: _____ Weather:_____				

Signature of site inspector:_____ Signature of environmental supervisor_____

Note: ① Problems observed, description of non-conforming items, rectification and prevention measures can be stated in “Remarks” column.

② In case of discovery of non-conforming measures or items requiring rectification, environmental supervisor immediately issues Rectification Notice of Environmental Protection or not. In “Remarks” column, the number of “Rectification Notice of Environmental Protection” shall be stated. Detailed rectification actions of contractor shall be recorded separately.

③ This table is a general environmental checklist of proposed project. Proper adjustment to the table can be made according to specific project component and environmental problems as well as local environmental conditions and construction items. Proper environmental protection measure can be taken.

Appendix 3 Notice on Rectification of Environmental Protection issued by Environmental Supervisor to Contractor

Project name:		Name of the construction site	
Contract No. and location of subproject:		Current construction phrase:	
Problems found in on-site inspection:			
The Contractor makes an analysis and propose improvement measures:			
Rectification opinions of EPB (if necessary):			
Environmental supervision: Date of prescribed period rectification order: Complete within Days Recipient:			MM DD YY MM DD YY
Conclusion for Recheck: Re-checker: Year Month Day			

Appendix 4 Checklist before Acceptance of Environmental Protection

Project name:		Weather on check day:	
Name of the construction site		Environmental inspector:	
Current construction phrase:		Contract No. and location of project:	
Inspection date of Environmental protection:		Specific time:	

Inspection items	Implementation		Not applicable	Note
	Implemented	Not been implemented		Put forward recommendations for rectification and prevention measures for problems and irregularities having been detected
1 Whether construction waste in construction site has been cleaned up to local dump area				
2 Whether measures has been taken to sensitive receptors of acoustic environment along the road				
3 Whether acoustic environment of the sensitive receptors along the road meet requirements of relevant standards				
4 Whether temporary dump (slag) area has taken recovery measures				
5 Whether road condition in existing road turns bad and whether traffic is smooth				
6 Whether ossified concrete mixer has been demolished				
7 Whether provisionally occupied land for concrete mixing has taken the measure to land consolidation, recultivation or greening				
8 Whether provisional sedimentation tanks and grit chambers have been removed				
9 Whether provisionally occupied land for sedimentation tanks and grit chambers has taken the measure to land consolidation, recultivation or greening				
10 Whether water retaining barrier, torrent gutter, and drain ditch have been removed and ecological restoration measures have been taken				
11 Whether mature soil on the surface having been stripped have been used for ecological restoration				
12 Whether trees are planted on both sides of the road				
13 Whether tree species belong to the region				
14 Whether roadbed slope has undergone greening				
15 Whether drainage system of road is adequate				
16 Whether there is visual				

pollution along the road				
17 Whether related training and education in municipalities and counties have been carried out				
18 Whether local residents are satisfied with the construction of road project				
Note for table filling: This table is a general checklist for environmental inspections in the construction phrase specified for subprojects, local condition of the environment and related environmental protection measures, so if necessary, it may be added or adjusted. * When any record of "not been implemented" is found, this suggests that there may be irregularities or situation in need of improvement. At this time, the environmental supervision shall promptly issue a rectification notice of "environmental protection" to the contractor and record in the remarks column the serial number of "rectification notice on environmental protection ". Detailed information of rectification actions by the Contractor should be recorded separately.				
Signature of site inspector:			Time:	
Signature of environmental supervision:			Time:	

Appendix 5 Notification Form of Possible CH Sites

Part 1 - Site confirmation	
Confirmed date of the site	
Description of site location (including the name of construction area)	
Site type	
General description of the site	
Site confirmer	
Time and date of ceasing operation	
- Time and date for informing the construction contractors and environmental coordinators	
Time and date for informing environmental management agency and environmental supervisor	
Completed by	
Verified by	
Part 2: Guidance from environmental management agency	
Receive date of requirement from environmental management agency	
Summary of requirements from environmental management agency (refer to appendix if necessary)	
Date of worker training	
Verification for implementation of requests from environmental management agency (signature and date)	