Initial Environmental Examination

April 2014

PRC: Jilin Urban Development Project

Prepared by the Jilin Provincial Government for the Asian Development Bank.

CURRENCY EQUIVALENTS

(Inter-bank average exchange rate as of March 2014)

Currency Unit	-	Yuan (CNY)
CNY 1.00	=	US$ 0.1613
US$ 1.00	=	CNY 6.2

ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	Affected person
BCMG	-	Baicheng Municipal Government
BEDZ	-	Baicheng Economic Development Zone
CIEE	-	Consolidate Initial Environmental Examination
CNY	-	Chinese Yuan
BOH	-	Bureau of Health
BSMG	-	Baishan Municipal Government
CSC	-	Construction supervision company
DFR	-	Draft Final Report
DMF	-	Design and monitoring framework
EA	-	Executing Agency
EHS	-	Environmental, health and safety
EIA	-	Environment Impact Assessment
EIRR	-	Economic Internal Rate of Return
EMP	-	Environmental Management Plan
EMS	-	Environmental monitoring station
EMU	-	Environment management unit
EPB	-	Environmental Protection Bureau
EPD	-	Environmental protection department
FGD	-	Focus group discussion
FIRR	-	Financial Internal Rate of Return
FSR	-	Feasibility Study Report
FYP	-	Five year plan
GAP	-	Gender action plan
GDP	-	Gross Domestic Product
GHG	-	Greenhouse Gas
GRM	-	Grievance redress mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
ISWM	-	Integrated solid waste management

ITS	-	Intelligent transportation system
JPDRC	-	Jilin Provincial Development and Reform Commission
JPEPD	-	Jilin Provincial Environmental Protection Department
JPFD	-	Jilin Provincial Financial Department
JPG	-	Jilin Provincial Government
JPSLR	-	Jilin Provincial State Land and Recourse Bureau
LAR	-	Land Acquisition and Resettlement
LIC	-	Loan implementation consultant
LIEC	-	Loan Implementation Environmental Consultant
MEP	-	Ministry of Environmental Protection
MOF	-	Ministry of Finance
MSW	-	Municipal Solid Waste
Mu	-	Chinese Land Measuring Unit (1 hector = 15 mu)
NDRC	-	National Development and Reform Commission
NRW	-	Non-revenue water
O&M	-	Operation and Maintenance
OPF	-	Operators of project facility
PCGs	-	Project city governments
PCU	-	Passenger Car Unit
PIC	-	Project Implementation Consultant
PMO	-	Project Management Office
PPCU	-	Project Public Complaint Unit
PPMS	-	Project Performance Management System
PPTA	-	Project Preparatory Technical Assistance
PRC	-	People’s Republic of China
PSA	-	Poverty and Social Assessment
RP	-	Resettlement Plan
SAP	-	Social action plan
SCADA	-	Supervisory Control and Data Acquisition
SPS	-	Safeguard Policy Statement
TBD	-	To be determined
TOR	-	Terms of Reference
WRD	-	Water Resources Department
WSP	-	Water Supply Plant
WWTP	-	Wastewater treatment plant

NOTE

In this report, "$" refers to US dollars.

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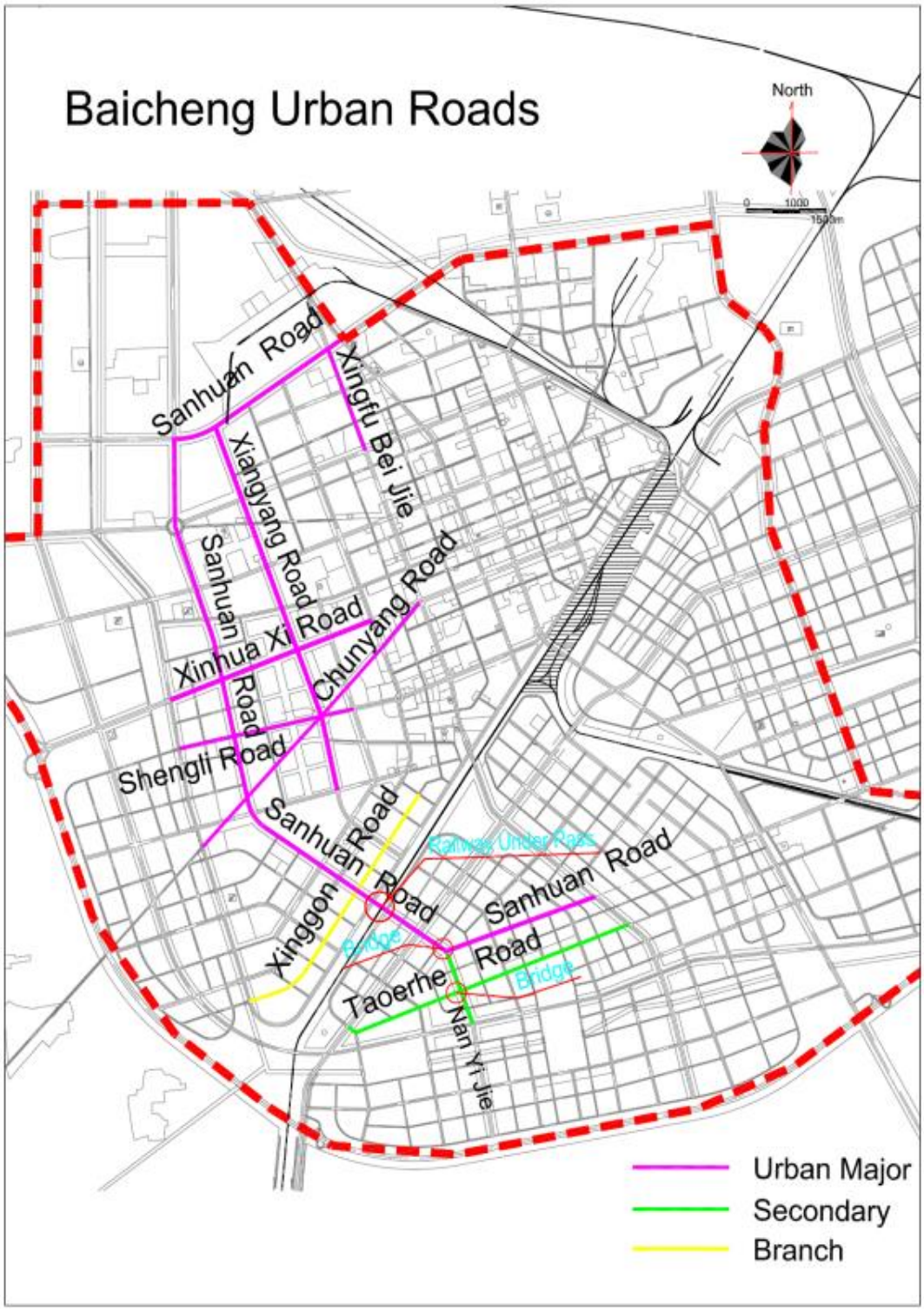
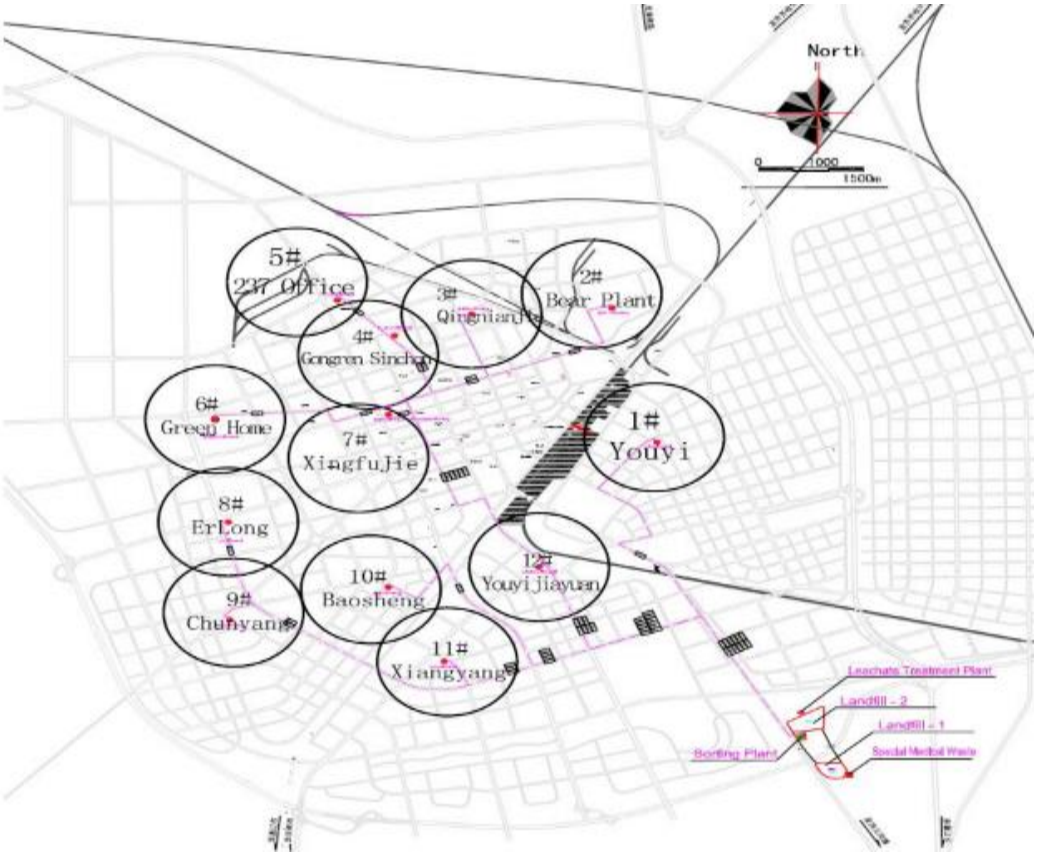


Map A: Location of Roads and Bridges in Baicheng (Component I)



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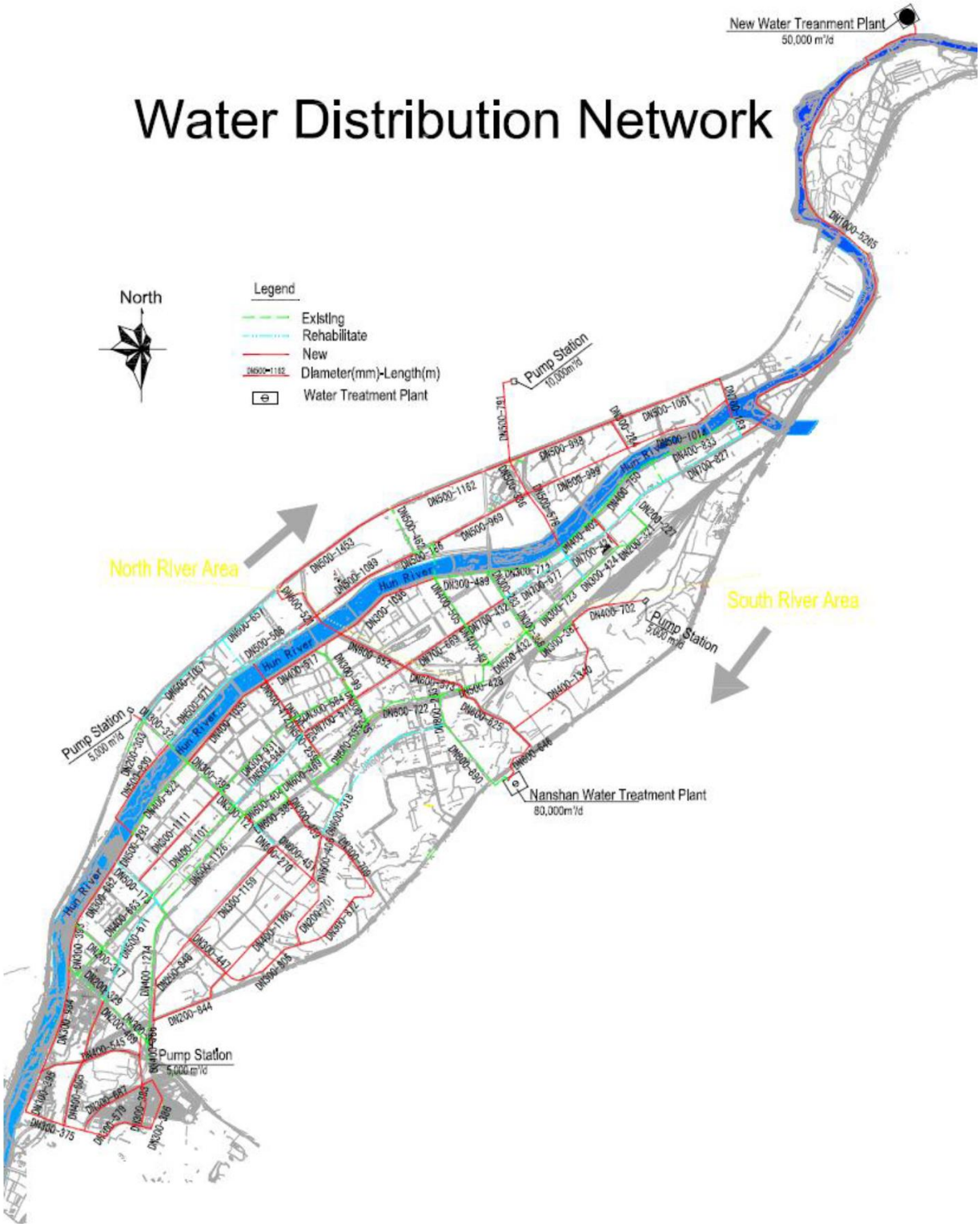

Map D: Water Distribution Network in Baishan (Component IV)

I. EXECUTIVE SUMMARY

A. Background

1. This Initial Environmental Examination (IEE) was prepared for the proposed Jilin Urban Development Project (the project) in the cities of Baicheng and Baishan in Jilin Province, the People's Republic of China (PRC). The IEE has been prepared in accordance with the requirements of the Asian Development Bank's (ADB's) Safeguard Policy Statement (SPS, 2009) on the basis of (i) three domestic environmental impact assessment (EIA) reports prepared by two domestic EIA Institutes, (ii) three project Feasibility Study Reports (FSRs), (iii) a Planning EIA for Baicheng Economic Development Zone (BEDZ); (iv) social and economic assessments conducted under the Project Preparatory Technical Assistance (PPTA), (v) two project cities' urban development master plans; and (vi) discussions between the ADB missions, PPTA consultants, Jilin Provincial Government (GPG) and two project city governments (PCGs).

2. Baishan and Baicheng are two prefecture capitals located in remote and poor regions of Jilin Province, which are the main urban centers[1] of their regions. In Baicheng City, due to lack of road infrastructure the city center is disconnected from the BEDZ; new residential areas were developed without proper connection with other parts of the city; residents who have settled into newly developed residential communities within BEDZ lack of proper municipal services including water supply, sewer and stormwater drainage. Currently it is estimated that about 100,000 residents (almost one third of the total urban population) are not yet connected to the municipal sewer network and wastewater treatment plants (WWTPs) leading to a sewer collection rate of about 30% only.

3. The current daily water supply capacity of Baishan City is 80,000 m^3, which cannot guarantee 24 hours water supply to some residential communities. The water supply capacity will increase to serve the 305,000 population in 2020 according to the city's master plan. Moreover, high rate ($\geq$65%) of non-revenue water (NRW) occurs due to poor management and aged and low standard pipeline, which has also resulted in energy loss, high water tariff, and low service coverage. The current water supply capacity is far from meeting the city's water demand.

4. The daily generation of municipal solid wastes (MSW) in the cities of Baicheng and Baishan is 480 tons and 350 tons, respectively. Currently, there are no any sorting, recycling, reducing or reusing facilities/measures for the MSW management, and open containers and facilities are mostly used for the MSW collection and transportation, which result serious environmental and sanitation concerns. Also, lack of collection system in the cities leads to the presence of many illegal MSW dump sites within the urban areas resulting serous environmental and sanitation problems.

B. Project Components

5. The proposed Project consists of five components. Each component includes several subcomponents, which are summarized below.

6. **Component I - Improved Urban Infrastructure in Baicheng:** The component will improve the

[1] Their direct influence area is estimated to over 1 million and 2 million populations respectively (i.e., urban population of municipalities, 2015 projections)

urban infrastructures and municipal services in the south and west urban areas in the city. The component includes: (i) construction of nine urban roads with a total length of 32.4 km including two 20 m span bridges and one twin cell railway underpass; (ii) 36.9 km water supply piping network; (iii) 63.2 km sewer pipeline, including a pump station; (iv) 59.9 km stormwater pipeline with two pump stations; (v) 33 km 10 kV power line; (vi) 33 km communication line; (vii) 1,582 street lights, traffic control and traffic management system; and (viii) landscaping.

7. **Component II - Integrated Municipal Solid Waste (MSW) Management in Baicheng:** The Baicheng MSW Component includes: (i) a 20 ton/d composting facility, including a 30 ton/d MSW sorting facility; (ii) construction of 12 new MSW transfer stations; (iii) upgrading of MSW management equipment including 12 self-loading trucks, 30 movable MSW compaction containers, 12 MSW compaction trucks, 4 kitchen garbage collection trucks, 50 MSW carts, and one construction material recycling machine; (iv) upgrading city cleaning and maintenance vehicles and equipment including 36 street cleaning and sweeping vehicles, 20 snow cleaning trucks, 10 water spray trucks, 10 sewer suction trucks and 5 sewer cleaning trucks, 10 construction waste trucks, MSW carts, trash and recycling bins.

8. **Component III - Integrated Municipal Solid Waste (MSW) Management in Baishan:** The Baishan MSW Component will improve and upgrade the existing MSW management systems by introducing the 3R concept of reducing, reusing and recycling. The component includes: (i) construction of a new MSW sanitary landfill with a daily capacity of 330 ton/day; (ii) establishment of a 20 ton/d composting site including 30 ton/d MSW sorting facility; (iii) rehabilitation of 15 MSW transfer stations; (iv) upgrading MSW handling equipment park including 15 self-loading trucks, 30 MSW compaction containers, 2 MSW compaction trucks, 4 kitchen garbage collection trucks, 15 MSW carts, and a construction waste recycling machine; (v) procurement of city cleaning vehicles and equipment including 4 sewer suction trucks, 15 street sweeping vehicles, 18 snow cleaning trucks, two moveable toilets, sewer pipe cleaning pipe, trash collection carts and tricycles, trash and recycle bins.

9. **Component IV – Improved Water Supply Management in Baishan:** The component will improve the water supply system in Baishan with safe and reliable drinking water supply and reduce non-revenue water (NRW). The component includes: (i) a 6.8 km water transmission line from Xibeicha Reservoir to Jiangyuan District; (ii) a 21.1 km water transmission line to the new WTP in Hunjiang District; (iii) a new 50,000 m^3/d WTP; (iv) upgrade 11.1 km of existing water supply piping network and construction of 44.2 km water distribution pipeline; (v) water leakage detection and repair equipment; and (vi) apacity building in operation and maintenance of the existing water supply system to reduce NRW loss and provide better service, including demand management (public education).

10. **Component V - Improved Capacity and Institutional Arrangements:** The component will provide support for project implementation on project management, institutional strengthening, environmental management, capacity development and training.

C. Major benefits and project features

11. The project will bring **significant benefits** to about 1.12 million residents in the project cities including 0.60 million people in Baishan and 0.52 million people in Baicheng by improving water supply system, solid wastes disposal and urban transport network: (i) In Baishan, the project will help reduce non-revenue water (NRW) in Baishan from 65% to 35% and implement water supply monitoring and control system (SCADA) to improve energy efficiency, resulting in annual water savings of 6.4 million m3 and energy savings of 7.3 million kWh; (ii) In Baicheng, the wastewater collection rate will be increased

by 9,000 m3 per day, significantly reducing annual pollution load to the environment. The project will promote low-carbon transport modes by dedicating separate bus priority and non-motorized lanes. Curbside stormwater collection and infiltration will be piloted along three project roads to mitigate the risk of waterlogging induced by increased urban soil sealing; (iii) The solid waste management components will significantly improve waste management practices by promoting source-segregation and recycling of domestic waste (kitchen waste, recyclates such as glass, metal, clothes) and composting of kitchen waste. As a result, approximately 14,000 tons of kitchen waste will be converted to valuable compost. Of the total direct beneficiary population, approximately 0.55 million (47.83%) are women including 0.29 million in Baishan and 0.26 million in Baicheng, 9.74% in Baicheng and 12.94% in Baishan are poor living under the urban poverty line of less than CNY200 and CNY209 per capita per month[2], respectively.

12. **Climate change mitigation, adaptation to current and future climate variations.** The project will promote resilience to current climate variations and reduce carbon emissions. The GHG emission reduction benefits of the project are derived primarily from the following major interventions: (i) construction of energy-efficient water supply system, resulting in annual power saving and GHG emission reduction by 7.3 million kWh electricity and 5,685 tons of CO_2, respectively; (ii) reduction the NRW from 65% to 30%, which will save 6.3875 million m^3 clean water annually. Increased resilience to anticipated increased frequency of extreme weather events such as rainstorms or droughts were considered, including water balance analysis for the water source of the Baishan water treatment plant[3], the design for high-capacity stormwater-drainage with local infiltration and storage in Baicheng, which strengthen resilience to current climate variations, as well as future climate change. In Baishan, the water supply system will be supplied by the new Xibeicha Reservoir. However, the Dayangcha River will be kept as secondary water source to cover emergency situations, including extreme dry years. This redundancy in water sources will increase the cities' resilience to decreased water safety that may result from global climate change. The Baicheng infrastructure component with improved road connectivity will be beneficial in coping with any increase in the incidence of natural disasters and extreme weather events that might result from future climate change. They will provide efficient and alternative routes for both emergency vehicles and escape.

13. **MSW sorting and composting facilities.** The proposed project applies a 3R concept for the improvement of current MSW management systems in both cities. MSW sorting and composting facilities with a capacity of 30t/d will be built in each project city. MSW received at the facility will be separated into recyclates, organic waste for composting, and the remaining portion for disposal in the landfill. The organic waste will be composted to produce organic fertilizer to be used for landscaping.

14. **Capacity development for reducing non-revenue water (NRW).** NRW in Baishan reaches 65%. The high NRW is contributed by leakage from the aged water supply pipes, unbilled usage, inaccurate metering, etc. The project will develop a capacity development program including institutional strengthening, staff training, advanced technology for leakage detection and repairing, water supply metering, and public awareness for water conservation to reduce the NRW from 65% to 30%.

15. **Stormwater management and reuse.** The Baicheng infrastructure component will introduce stormwater infiltration, collection and reuse to improve the stormwater management. A stormwater collection, storage and infiltration system located under the road landscaping strip will be introduced and installed as a demonstration feature along two roads. The system will reduce the direct discharge of

[2] In 2012 price.
[3] The water balance was based on historical data and only climate variability has been considered.

polluted runoff to surface water and reduce risks of water logging as a result of increased surface sealing.

16. **ITS traffic management and control, bus priority lanes, traffic safety.** In order to improve urban traffic safety and traffic congestion condition, the project will implement an ITS traffic management system in Baicheng, which will include a traffic monitoring system, red light and speeding violation monitoring system, and real time traffic condition displays. In addition, public bus priority lanes will be built along selected project roads. The bus priority lanes will illustrate the effectiveness of the public bus system and help the municipal government to implement more public bus priority lanes and other public transport facilities. The subcomponent will be supplemented by a comprehensive traffic safety improvement component, to be planned and implemented under the coordination of international and national transport planning and traffic safety specialists, engaged under the Project's capacity building component. The specialist will, amongst others, conduct an urban traffic safety audit to assess the existing situation (with special focus on pedestrian and bicycle safety, and public transportation system); review and update the urban traffic safety plans of the municipality; and develop and implement a detailed work plan for improving urban traffic safety, addressing the 3E urban traffic safety program (Engineering, Education and Enforcement.

D. Potential environmental impacts and mitigation measures

17. Anticipated **impacts during construction** of all project facilities will include short episodes of increased noise and dust pollution during a few concentrated activities, such as the soil excavation for roads, water transmission lines, landfill, road base construction, and asphalt works. Other impacts during construction include earthwork (640,000m^3 of cumulative cut and fill in Baishan, 930,000m^3 in Baicheng) and related soil erosion; temporary interruption of municipal services and traffic disturbance; and potential health and safety risks. Surface water contamination during the excavation works (mainly in relation to the laying of water transmission lines in Baishan) is not considered significant, provided that measures defined in the EMP are applied. No environmentally sensitive or culturally significant areas will be disturbed. There are no ecologically sensitive areas within 25 km of any of the project facilities. All construction-related impacts are of a temporary nature and are covered by stringent site management and procedural provisions in the environment management plan (EMP). Environmental clauses will be included in contracts for project works to ensure that Contractors are aware of and committed to implementing environmental requirements associated with the works.

18. Potential impacts during **operation of the Baicheng infrastructure component** include traffic noise and air pollution at some sensitive areas along the roads including schools, hospitals, and residential areas. However, noise and air quality predictions indicate that the impact will not be significant, even in the long term. Other impacts and risks during operation include traffic safety caused by over-speed, and potential accidental spills caused by hazardous goods transportation.

19. Major environmental impacts resulting from the **operation of MSW facilities** include odorous gases (H_2S and NH_3), which will affect nearby residents, leachate from the landfill expansion site in Baishan, wastewater and noise from the proposed MSW collection and transfer stations and garbage sorting and composting sites, and traffic noise from collection vehicles. Buffer zones (5 m-wide) and greening belts (2 m-wide) will be installed around all MSW facilities. Predicted noise and odor levels at site boundary of solid waste transfer stations, composting and disposal facilities are within legislated limits. Still, nearby residents will be consulted regularly on odor and noise nuisance, and corrective actions will be defined if necessary.

20. The **water supply system** has few environmental, health and safety risks, and will be subject to strict operational standards. Impacts of the water extraction on local and regional water resources have been assessed through water balance analysis. The water supply plant will have no significant impact on regional water resources. The annual water demand for the water supply component is 26.78 million m^3/a, which (including reservoir seepage and evaporation) amounts to 1.51% of the total annual flow of 2.11 billion m^3 of Hunjiang River (Baishan section). The proposed WTP will have acceptable impacts to the areas downstream of the water intake point. A comprehensive discussion of the components impact on local and regional water resources in included in Chapter V of the IEE. Risks to water supply safety (water quality) were assessed through a multi-stakeholder water safety risk assessment that followed in principle an internationally accepted methodology. [4] Identified risks are mitigated through a series of key management measures, including (i) delineating and maintaining drinking water source protection zones for the Xibeicha Reservoir (the water source for the water supply); (ii) strengthening water quality monitoring capacity of the water supply company; and (iii) establishing an emergency preparedness and response mechanism, including and online water source monitoring system, emergency warning procedures, and alternative water supply sourcing (i.e., increasing the redundancy of the water supply system and thus its resilience to identified risks, including climate variability). Other water source protection measures and minimum water release requirements are specified in the reservoir operation specifications and draft water safety plan developed for the project.

21. Mitigation measures and a monitoring program were defined for all identified impacts, and are included in the **environment management plan (EMP)** of the IEE. The EMP sets out the procedures and plans to carry out mitigation measures and monitoring during sequential stages of the project including pre-construction, construction and operation. It consists of two major plans, one for implementing mitigation measures and the other for conduct environmental monitoring. For each impact, appropriate mitigation measures are described. Internal, external and compliance monitoring and supervision will be undertaken to ensure that environmental impacts will be minimized to acceptable levels.

22. The implementation of this IEE and EMP will be supported through training and through ongoing guidance from the project implementation consultants. Training will help improve the environmental capacity of the LPMOs, PIUs and contractors and help ensure that the environmental impacts during the construction are minimized and opportunities for environmental benefits are maximized. The capacity building and training component will focus on water supply safety, MSW management promoting 3R principles, EMP implementation and supervision, and urban transport safety and public transportation.

E. Public consultation, information disclosure, and grievance redress mechanism (GRM).

23. Information disclosure and public consultation for the project components was conducted in accordance with the PRC Guideline on Public Consultation in EIA (2006) and ADB's SPS requirements. Two rounds of public consultation were conducted, through questionnaire survey and public hearings with community representatives, and local village committees in the two project cities (June 2013 to December 2013). A total of 298 people and 21 organizations were consulted in Baicheng and Baishan, respectively. Consulted persons and organizations supported the project and believed it will benefit community health, local economy, living standards, local environmental and sanitation conditions, and effectively protect local water resources and improve the drinking water safety. Suggestions from

[4] Bartram J, Corrales L, Davison A, Deere D, Drury D, Gordon B, Howard G, Rinehold A, Stevens M. *Water safety plan manual: step-by-step risk management for drinking-water suppliers.* Geneva, World Health Organization, 2009.

stakeholders were received, including drinking water source protection, odor control measures for the MSW facilities, good planning to avoid repeated excavation of underground pipelines, and no night-time construction to minimize noise impact to residents. A GRM has been developed in each of the project cities to receive, document, and resolve community concerns and to assist the project to maximize environmental and social benefits. The GRM was discussed during public consultations. Most consulted people believe the project GRM is an improvement compared with current practices.

F. Conclusion

24. The project supports the PRC's Sustainable Urban Development Strategy[5] and both cities' Development Master Plans. Potential environmental impacts during project construction and operation were analyzed and mitigation measures were proposed in the domestic EIAs and this IEE, including the EMP. The IEE concludes that the potential adverse environmental impacts and risks associated with all the project components can be prevented, eliminated, or minimized to meet the relevant national standards and Jilin provincial regulations if the project EMP is fully implemented, particularly: (i) all mitigation measures and monitoring requirements are implemented; and (ii) the environmental management and institutional capacities of JPPMO, the PIUs and IAs are strengthened through implementation of the training and capacity building program.

[5]"China's Sustainable Development Strategy", The Chinese Academy of Social Sciences & Policy research Institute of the PRC state council, 2012.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Overview

25. The PRC has a wide range of laws, regulations, technical guidelines and standards that govern the way in which environmental protection and environmental impact assessment for construction projects must be implemented, including for pollution prevention and control on air, noise, water, ecology and solid waste, and technical guidelines on assessing atmospheric, noise, water and ecological impacts. The domestic EIA Reports upon which this IEE is based were prepared in accordance with the PRC Law on Environmental Impact Assessment (2003), the PRC Management Guideline on EIA Categories of Construction Projects (2008), and the Technical Guidelines for Environmental Impact Assessment (HJ/T2-93).

B. The PRC's Environmental Laws, Regulations, Guidelines, and Standards

26. The primary national laws and regulations that govern the EIA study of the project are provided in Table II-1 and Table II-2, respectively. Table II-3 shows the relevant local laws and regulations.

Table II-1: Relevant National Laws

No.	Law	Year issued	Relevance to project
1	Environmental Protection Law	1989	
2	Urban and Rural Planning Law	2008	The project relates the project cities' master plans
3	Solid Waste Pollution Prevention and Control Law	2005	The project involves solid wastes disposal
4	Environmental Impact Assessment Law	2003	
5	Water Law	2002	The project includes water source protection and drinking water safety
6	Cleaner Production Promotion Law	2002	The project involves low carbon WTP issue
7	Air Pollution Prevention and Control Law	2000	
8	Noise Pollution Prevention and Control Law	1999	
9	Land Administration Law	1999	
10	Forest Law	1998	The project includes landscaping on roadsides (green belt) and within the WTP.
11	Water and Soil Conservation Law	1991	The project involves soil erosion control
12	Water Pollution Prevention and Control Law	2008	

Table II-2: National Administrative Regulations

No.	Regulation	Year of effectiveness	*Relevance to project*
1	Regulation on Pollution Control for Protection Zone of Drinking Water Source	1989	
2	Regulation on EIA of Plans and Programs	2009	
3	Regulation on Environmental Protection Management for Construction Projects	2003	
4	Directive on Strengthening Wetland Protection and Management	2004	*The project involves a reservoir*[6]
5	Environmental Protection Supervision Rules for Construction Projects	1998	
6	Regulation on Protection of Wild Flora	1997	*The associated Xibeicha Reservoir is located in Changbai Mountain where there are many wild flora*

6 Reservoir is a kind of wetlands.

No.	Regulation	Year of effectiveness	*Relevance to project*
7	Requirements for the EIA Summary of Construction Project	2010	
8	Regulation on Classification of Construction Project Environmental Protection Management (MEP)	2001	
9	National Biodiversity Strategy and Action Plan (2011-2030)	2010	*See No. 6*
10	Requirement for Social Risk Assessment of Large Investment Projects	2012	
11	The National Biodiversity Strategy and Action Plan (2011-2030)	2010	*See No. 6*
12	National regulation for public disclosure of EIAs (NDRC)	2012	

Table II-3: Local Laws and Regulations

No.	Law and Regulation	Year issued
1	Drinking Water Source Protection Regulation of Jilin Province	2012
2	Environmental Protection Regulations of Jilin Province (revised edition)	2001
3	Construction Project Quality Management Regulation of Jilin Province	2011
4	Forest Management Regulations of Jilin Province,	2002
5	Regulation on Prime Farmland Protection in Jilin Province (revised edition)	1997
6	Regulations on Agricultural Environmental Protection in Jilin Province	2001
7	Temporary Regulations on Terrestrial Wild Animals Protection of Jilin Province,	1985
8	Surface Water Function Zoning in Jilin Province (DB22/388-2004),	2001
9	Urban Environmental Noise Functional Zoning in Jilin Province	2004
10	Regulations on Water and Soil Conservation Law of the PRC in Jilin Province,	1992
11	Urban Environmental Noise Functional Zoning in Jilin Province	1992

27. The implementation of environmental laws and regulations is supported by a series of associated management and technical guidelines, and those applicable to the proposed project are summarized in **Table II-4**.

Table II-4: Applicable Environmental Guidelines

No.	Guideline	Year/Code
1	Technical Guideline on EIA: Drinking Water Source Protection	2006
2	List of Construction Projects Subject to Environmental Protection Supervision	2008
3	Guideline on EIA Classification of Construction Projects	2008
4	Guideline on Jurisdictional Division of Review and Approval of EIAs for Construction Projects	2009
5	Interim Guideline on Public Consultation for EIA	2006
6	Circular on Strengthening EIA Management to Prevent Environmental Risks	2005
7	Technical Guideline on EIA: Surface Water Environment	HJ/T 2.3-1993
8	Technical Guideline on Environmental Risk Assessment for Construction Project	HJ/T169-2004
9	Technical Guideline on EIA: Acoustic Environment	HJ 2.4-2009
10	Technical Guideline on EIA: Atmospheric Environment	HJ 2.2-2008
11	Technical Guideline on EIA: Ecological Assessment	HJ 19-2011

28. The national environmental quality standard system that supports/evaluates the implementation of the environmental protection laws and regulations in the PRC is classified into two categories by function, i.e. pollutant emission/discharge standards and ambient environmental standards. The relevant main standards applicable to the proposed project are shown in **Table II-5**.

Table II-5: Applicable Environmental Standards

No.	Standard	Code
1	Standard for Flood Control	GB50210-94
2	Urban Ambient Acoustic Quality Standard	GB3096-2008
3	Noise Limit of Industrial Enterprises	GB12348-2008
4	Noise Limit for Social Activities	GB22337-2008
5	Domestic Drinking Water Quality Standard	GB5749-2006
6	Surface Water Quality Standard	GB3838-2002
7	Standard on Pollutant Discharges from Municipal Wastewater Treatment Plants	GB18018-2002
8	Ambient Air Quality Standard	GB3095-1996
9	Integrated Emission Standard of Air Pollutants	GB16297-1996
10	Integrated Wastewater Discharge Standard	GB8978-1996
11	Soil Quality Standard	GB15618-1995
12	Groundwater Quality Standard	GB/T14848-1993
13	Noise Limit for Construction Sites	GB12523-1990
14	Control Standards for Pollutants in Sludge for Agricultural Use	GB4284-1984
15	Pollution Control Standard for MSW Landfills	GB16889-2008
16	PRC specification of Domestic MSW Sanitation Landfill	CJJ17-2004

C. International Agreements

29. The PRC is signatory to a number of international agreements, including all major international agreements dealing with biodiversity and wetland protection, Climate Change etc. Those with direct and indirect implications for the project are listed in **Table II-6**.

Table II-6: Applicable International Agreements

No.	Agreement	Year	Purpose (relevance to project)
1	Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat	1975	*Preventing the progressive encroachment on and loss of wetlands for now and the future*
2	Convention on Biological Diversity	1993	*Conservation and sustainable use of biodiversity (the project includes reforestation)*
3	United Nations Framework Convention on Climate Change	1994	*Achieving stabilization of greenhouse gas concentrations in the atmosphere (the project involves low carbon WSPs for energy saving and GHG emission reduction)*
4	Kyoto Protocol to the United Nations Framework Convention on Climate Change	2005	*Further reduction of greenhouse gas emissions (same as above)*
5	Montreal Protocol on Substances That Deplete the Ozone Layer	1989	*Protection of the ozone layer (same as above)*

D. Applicable ADB Policies and World Bank's EHS

30. ADB's Safeguard Policy Statement (SPS, 2009) provides the basis for the project EIA. All projects funded by ADB must comply with the SPS. The purpose of the SPS is to establish an environmental review process to ensure that projects undertaken as part of programs funded under ADB loans are environmentally sound, are designed to operate in line with applicable regulatory requirements, and are not likely to cause significant environment, health, or safety hazards.

31. The PRC domestic EIAs are prepared initially for the PRC approval processes, which are required to adopt PRC standards for the quality of water, air, and noise, etc. ADB's SPS promotes good international practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety (EHS) Guidelines[7]. The principles and standards of the EHS Guidelines are adopted by the ADB's SPS. The general guidelines, in company with the sector guidelines, will provide the context of international best practice, and contribute to establishing appropriate targets for the environmental performance. EHS guidelines of relevance to the project include guidelines on waste management, energy conservation, water conservation, hazardous materials/wastes management, noise control and sanitation; and guidelines on community and occupational health and safety.

32. Compared with PRC EIA requirements, the SPS requires a number of additional considerations, including (i) project level GRM including documentation in the EMP; (ii) definition of the project area of influence; (iii) assessment of direct, indirect, induced and cumulative impacts; (iv) due diligence of project associated facilities; (v) protection of physical cultural resources; (vi) climate variability and climate change mitigation and adaptation; (vii) occupational and community health and safety requirements (including emergency preparedness and response); (viii) impacts on livelihoods through environmental media; (ix) biodiversity conservation; and (x) ensuring that the EMP includes an implementation schedule and (measurable) performance indicators. These requirements, which are usually weak in PRC EIAs, have been included in the domestic EIA reports to the EIA institute's best knowledge and capacity. This project IEE generally complies with SPS requirements.

E. Assessment Standards for Proposed Project Components

a. Drinking Water Quality Standard

33. The project includes a water supply plant (WTP) in Baishan City. Operation of the WTP and quality of the treated water to be supplied to residents will require compliance with the PRC Drinking Water Quality Standard (GB5749-2006), in which 106 parameters must be met (**Table II-7**).

Table II-7: Drinking Water Quality Standards (GB5749-2006)

No.	Parameter	Standard
	Routine Parameter of Drinking Water Quality	
	Microbiological parameter[8]	
1	Total coliform (MPN/100ml or CFU/100ml)	LD
2	Thermotoletant coliform (MPN/100ml or CFU/100ml)	LD
3	Escherichia Coli (MPN/100ml or CFU/100ml)	
4	Total plant count (CFU/ml)	100
	Toxicological parameter	

7 "World Bank Group Environmental, Health, and Safety Guidelines", April 30, 2007, Washington, USA. http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

8 MPN= Most Probable Number; CFU: Colony forming unit.

No.	Parameter	Standard
5	Arsenic (As, mg/L)	0.01
6	Cadmium (Cd, mg/L)	0.005
7	Chromium Hexavalent (Cr 6+, mg/L)	0.05
8	Lead (Pb, mg/L)	0.01
9	Mercury (Hg, mg/L)	0.001
10	Selenium (Se, mg/L)	0.01
11	Cyanide (CN-, mg/L)	0.05
12	Fluoride (mg/L)	1.0
13	Nitrate (mg/L)	10
14	Trichloromethane (mg/L)	0.06
15	Carbon tetrachloride (mg/L)	0.002
16	Bromate (when O3 is applied) (mg/L)	0.01
17	Formaldehyde (when O3 is applied) (mg/L)	0.9
18	Chlorite (when ClO2 is applied) (mg/L)	0.7
19	Chlorate (when compound chlorine dioxide is applied) (mg/L)	0.7
	Sensory Properties and General Chemical Parameter	
20	Chromaticity (Unit of platinum cobalt color)	15
21	Turbidity (diffusing turbidity unit) NTU	1
22	Odor and Taste	No odor, no taste
23	Appearance	None
24	pH	6.5≤X<8.5
25	Aluminum (Al, mg/L)	0.2
26	Iron (Fe, mg/L)	0.3
27	Manganese (Mn, mg/L)	0.1
28	Copper (Cu, mg/L)	1.0
29	Zinc (Zn, mg/L)	1.0
30	Chloride (Cl-, mg/L)	250
31	Sulfate (SO4-mg/L)	250
32	TDS (mg/L)	1000
33	Total Hardness (CaCO3) (mg/L)	450
34	CODMn (mg/L)	3
35	Volatile phenols (phenol) (mg/L)	0.002
36	LAS (mg/L)	0.3
	Radioactivity Parameter9	
37	Total α radioactivity (Bq/L)	0.5
38	Total β radioactivity (Bq/L)	1
	Non-Routine Parameter	
	Microbial indicators	
39	Giardia cysts (count/10L)	<1
40	Cryptosporidium oocysts (count/10L)	<1
	Toxicological parameter (mg/L)	
41	Antimonium (Sb, mg/L)	0.005
42	Barium (Ba, mg/L	0.7
43	Beryllium (Be, mg/L)	0.002
44	Boron (B, mg/L)	0.5
45	Molybdenum (Mo, mg/L)	0.07
46	Nickel (Ni, mg/L)	0.02

9 Radionuclide phase analysis is conducted if radioactivity value exceeds limits, to determine if the water is drinkable.

No.	Parameter	Standard
47	Silver (Ag, mg/L)	0.05
48	Thallium (Ti, mg/L)	0.0001
49	Cyan chloride (CN- mg/L)	0.07
50	Chlorodibromomethane (mg/L)	0.1
51	Bromodichloromethane (mg/L)	0.06
52	Dichloroacetic acid (mg/L)	0.05
53	1,2-dichloroethane (mg/L)	0.03
54	Dichloromethane (mg/L)	0.02
55	THMs	1
56	1,1,1 - trichloroethane (mg/L)	2
57	Trichloroacetic acid (mg/L)	0.1
58	Trichloroaldehyde (mg/L)	0.01
59	2,4,6- trichlorophenol (mg/L)	0.2
60	Bromoform (mg/L)	0.1
61	Heptachlor (mg/L)	0.0004
62	Malathion (mg/L)	0.25
63	PCP (mg/L)	0.009
64	HCH (total amount, mg/L)	0.005
65	Hexachlorobenzene (mg/L)	0.001
66	Dimethoate (mg/L)	0.08
67	Parathion (mg/L)	0.003
68	Bentazone (mg/L)	0.3
69	Parathion-methyl (mg/L)	0.02
70	Chlorothalonil (mg/L)	0.01
71	Carbofuran (mg/L)	0.007
72	Lindane (mg/L)	0.002
73	Chlopyrifos (mg/L)	0.03
74	Glyphosate (mg/L)	0.7
75	DDVP (mg/L)	0.001
76	Arazine (mg/L)	0.002
77	Deltamethrin (mg/L)	0.02
78	2, 4 - dichlorobenzene oxygen ethanoic acid (mg/L)	0.03
79	Dichloro-diphenyl-dichlorothane (mg/L)	0.001
80	Ethylbenzene (mg/L)	0.3
81	Dimethylbenzene (mg/L)	0.5
82	1,1- dichloroethylene(mg/L)	0.03
83	1,2- dichloroethylene(mg/L)	0.05
84	1,2- dichlorobenzene(mg/L)	1
85	1,4- dichlorobenzene(mg/L)	0.3
86	Trichloroethylene(mg/L)	0.07
87	Trichlorobenzene(mg/L)	0.02
88	Hexachlorobutadiene(mg/L)	0.0006
89	Acrylamide (mg/L)	0.0005
90	Tetrachloroethylene (mg/L)	0.04
91	Toluene (mg/L)	0.7
92	DEHP (mg/L)	0.008
93	ECH (mg/L)	0.0004

No.	Parameter	Standard
94	Benzene (mg/L)	0.01
95	Styrene (mg/L)	0.02
96	Benzopyrene (mg/L)	0.00001
97	Chloroethylene(mg/L)	0.005
98	Chlorobenzene(mg/L)	0.3
99	Microcystin-LR(mg/L)	0.001
	Physical Properties and General Chemical parameters (mg/L)	
100	Ammonia Nitrogen(NH3-N, mg/L)	0.5
101	Sulfide (S, mg/L)	0.02
102	Sodium (Na, mg/L)	200

Table II-8: General Parameters and Requirements for Drinking Water Disinfectant

No.	Disinfectant	Exposure duration with Water	Limit in water supplied (mg/L)	Residue in water supplied (mg/L)	Residues in network end (mg/L)
103	Chlorine and free chlorine (mg/L)	≥30 min	4	≥0.3	≥0.05
104	Monochloramine (total chlorine, mg/L)	≥120 min	3	≥0.5	≥0.05
105	Ozone (O3, mg/L)	≥12 min	0.3	-	0.02/ ≥0.05 if chlorine is added
106	Chlorine Dioxide (ClO2, mg/L)	≥30 min	0.8	≥0.1	≥0.02

b. Ambient Air Quality Standards

34. Assessment of ambient air quality was in accordance with "Ambient Air Quality Standard" (GB3095-1996) Grad II standards. However, the World Bank EHS guidelines[10] (see below) are based on best international practice. Both the PRC standards and EHS guidelines are used in assessment of this project, of which the specific standard values are shown in **Table II-9**.

Table II-9: Ambient Air Quality Grade II Standard

Pollutant	Time	Standard (mg/m3)11	EHS (mg/m3)
SO_2	Annual average	0.06	n/a
	Daily average	0.15	0.125-0.05 (0.02 guideline)
	Hourly average	0.50	n/a
PM_{10}	Annual average	0.10	0.07-0.03 (0.02 guideline)
	Daily average	0.15	0.075-0.15 (0.05 guideline)
NO_2	Annual average	0.08	0.04 guideline
	Daily average	0.12	n/a
	Hourly average	0.24	0.20 guideline
CO	Daily average	4.0	n/a
	Hourly average	10.0	n/a

10 World Bank Group, 2007, Environmental, Health and Safety Guidelines General EHS Guidelines, World Bank, Washington.
11 A new standard has been issued in 2012 (GB 3095-2012), which will only become effective on 1 Jan 2016. Until then, GB3095-1996 remains valid.

c. Acoustic Environment Quality Standards

35. In accordance with the PRC "Acoustic Environmental Quality Standard" (GB3096-2008), constructed new roads are classified as Class 4a or Class II. Sensitive areas such as schools, hospitals, nursing homes and other noise sensitive spots are evaluated in accordance with "Acoustic Environmental Quality Standard" (GB3096-2008) Grade II standards according to the environmental function zoning identified by the local EPBs. The applicable environmental noise standard values and the applicable areas are shown in **Table II-10**.

Table II-10: Acoustic Quality Standards (dB (A))

Standard Category	Applicable Area	PRC		EHS[12]	
		Day	Night	Day	Night
I	Suburb area along the water transmission pipeline and water intake point	55	45	n/a	n/a
II	Outdoor of schools, hospitals (nursing homes, homes for the elderly) , and areas beyond 50 m distance from edge of roads	60	50	55	45
4a	Area within 50 m distance from edge of roads (including pipelines under the roads)	70	55	n/a	n/a

d. Noise Limits for Construction Sites

36. Construction activities must be in accordance with "Noise Limits for Construction Site" standard (GB12523-90), see **Table II-11**.

Table II-11: Noise Limits for Construction Sites Standard (dB(A))

Noise limits	
Daytime	Night
70	55

e. Surface Water Quality Standards

37. Assessment of surface water quality focused mainly on the WTP component in Baishan City and the bridge constructions in the infrastructure development component in Baicheng City and was in accordance with Grade II standard values of "Surface Water Environment Quality Standard" (GB3838-2002) for Xibeicha Reservoir, grade III for Baishan Section of Hunjiang River, and Grade IV standard values for other components, which is shown in **Table II-12**.

Table II-12: Surface Water Quality Standards (mg/L, pH excluded)

Parameter	pH	COD_{Mn}	BOD_5	COD_{cr}	TP	TN	NH_3-N	Petroleum
Grade II Standard	6~9	≤4	≤3	≤15	≤0.1	≤0.5	≤0.5	≤0.05
Grade III Standard	6~9	≤6	≤4	≤20	≤0.2	≤1.0	≤1.0	≤0.05
Grade IV Standard	6~9	≤10	≤6	≤30	≤0.3	≤1.5	≤1.5	≤0.5

Key: BOD5= 5 days biochemical oxygen demand, CODcr = chemical oxygen demand, CODMn = permanganate index, NH3-N=ammonia nitrogen; TN = total nitrogen; TP = Total Phosphorus

12 World Bank Group 2007

f. Wastewater Discharge Standards

38. The local EPBs confirmed that the wastewater discharged from construction sites should be in accordance with "Integrated Wastewater Discharge Standard" (GB8978-1996). Specific standard values are shown in **Table II-13**.

Table II-13: Integrated Wastewater Discharge Standards (mg/L, pH excluded)

Parameter	pH	CODCr	BOD5	SS	NH_3-N	Petroleum
Grade II Standard	6–9	150	30	150	25	10

g. Emission Standard of Air Pollutants

39. Asphalt smoke during road constructions in Baicheng and pipeline work in Baishan will be in accordance with the Grade II standard of "Integrated Emission Standard of Air Pollutants" (GB16297-1996). The standard values are shown in **Table II-14**.

Table II-14: Integrated Emission Standard for Air Pollutants (mg/Nm^3)

Pollutant	Maximum allowable Emission concentration	Fugitive emission concentration limits for monitoring points
Particles	——	1.0
Asphalt Smoke	40-75 mg/Nm^3	No fugitive emission

h. Standard for Urban Area Environmental Vibration

40. Construction activities will cause vibration impact, and should comply with the "Standard for Urban Area Environmental Vibration (GB10070—88)". The details are shown in Table 2-15. The bridge and road works of the project are located near both sides of traffic trunk line, so the project shall comply with the fifth standard listed in **Table II-15**.

Table II-15: Vertical (Z) Vibration Standard Value for Various Urban Areas (Unit: dB)

Scope of applicable area	Day	Night
Special residential area	65	65
Residential, cultural and educational area	70	67
Mixed area and commercial center	75	72
Industrial centralized area	75	72
Both sides of traffic trunk line	75	72
Both sides of railway main line	80	80

The PRC Policies for Reduction of Vehicle Emissions, Source: Subproject EIA Reports

41. The Government of the PRC has a comprehensive program for the control and reduction of vehicle emissions. The current program[13] includes the following main focus areas connected with vehicle emissions: (i) Improvement and stricter enforcement of national emission standards for new vehicles; (ii) Improvement of conventional fuels to make them cleaner with less GHG emissions; (iii) Use of alternatives or cleaner fuels; (iv) Improved maintenance and inspection of vehicles; and (v) Encouragement for the scrapping of older high emission vehicles.

13 The PRC's "Air Pollution Control Action Plan (2013)", issued by Ministry of Environment Protection.

F. The PRC's Environmental Management Institutional Framework and the EIA Approval Process

42. The PRC's Guideline of Environmental Protection Categories of Construction Projects (2008) provides detailed classifications of the EIA study, including 23 general categories and 198 subcategories based on the project's nature, scale and environmental sensitivity. In accordance with the guideline, this project was classified into the categories of (i) urban transportation (roads and bridges); and ii) Urban infrastructure (water supply and solid waste disposal facilities).

43. Article Sixteen (16) of the PRC EIA Law (2003) stipulates that an Environmental Impact Statement (EIS)[14] is required for any capital construction project producing significant environmental impacts, so as to provide a comprehensive assessment of these potential environmental impacts. On 2 September 2008, the MEP released the Guideline on EIA Classification for Construction Projects, which came into effect on 1 October 2008. According to this guideline, a project is classified into one of the following three categories:

i) Category A: Projects with significant adverse environmental impact, a comprehensive environment impact assessments (EIA) is required.

ii) Category B: Projects with adverse environmental impacts which are of lesser degree and/or significance than those of Category A; a tabular (simplified) EIA Report is required.

iii) Category C: Projects unlikely to have adverse environmental impact; an Environmental Impact Registration Form is required.

iv) The full EIA under PRC EIA regulations are similar to the EIA or IEE for ADB financed projects under the ADB SPS. All project components were classified as category A.

44. MEP's Guideline on Jurisdictional Division of Review and Approval of EIAs for Construction Projects (2003) provides two prescribed lists of projects for which EIAs must be reviewed and approved. The guideline was amended in 2009 to include a list of construction projects for which EIAs require MEP's review and approval, and a list of projects for which EIAs will be delegated to the provincial EPD. Jilin Provincial EPD was authorized by the MEP to review and approve the EIAs for all projects financed by International Financial Organizations according to the current regulation. The institutional framework for the EIA approval process in Jilin Province is summarized in **Table II-16**.

Table II-16: Institutional Frameworks for the EIAs Approval

Responsible Division	Scope of work
Jilin Provincial EPD	(i) Organizes experts for EIA evaluation, including compliance with appropriate laws, regulations and standards; and (ii) Final EIAs approval.
Baishan and Baicheng cities' EPBs	Environmental management and supervision during project implementation, including the management and supervision of the implementation and fulfillment of the environmental mitigation measures and environmental monitoring.

Source: EIA Institutes

45. In the PRC, the enforcement of environmental laws and regulations rests with the environmental protection authorities within each level of government. At the national level, the Ministry of Environmental Protection (MEP) is the regulatory, enforcement and supervision authority. Each province has an environmental protection department (EPD). The environmental management authorities at the sub-provincial level or city level are the environmental protection bureaus (EPB). These authorities are supported by their environmental monitoring stations and environmental protection research institutes.

14 Full environmental impact assessment report.

46. There is an environmental monitoring station (EMS) in each of the two project cities, which are responsible for regular monitoring of ambient environmental quality and the compliance monitoring of pollution sources in the project areas. The EMSs conduct compliance monitoring for the project cities quarterly.

47. The three EIA reports for the project components were prepared by two EIA institutes[15] holding a national Grade A and B certificates in accordance with the Management Guideline on Qualification of EIA Institutes (MEP Ministerial Order No. 26, 2005). The final domestic EIAs are expected to be approved by mid February 2014. The PPTA consultants are assisting the finalization of the domestic EIAs.

Table II-17: Expected Date for EIA Completion and Approval

No.	Component	Date of Final EIA Completion	EIA Approval Date
1	Baishan Water Supply Plant and Pipeline	17 February 2014	31 March 2014
2	Baishan Municipal Solid Wastes Disposal Facilities		
3	Baicheng Infrastructure and Solid Wastes Disposal Facilities		

Source: EIA Institutes

15 China Northeast Municipal Engineering Design and Research Institute (Grade A EIA Institute) prepared the two EIAs for Baishan components while Jilin Xinghuan Environmental protection Company prepared the Baicheng one.

III. DESCRIPTION OF THE PROJECT

A. Need for the Project

48. **National and provincial policies.** The PRC state government is accelerating the efforts to support sustainable urbanization and social-economic development. This aims to address the problems of medium sized cities'[16] fast population growth over the last decade which was not followed by adequate infrastructure investments. The current situation doesn't allow these cities to adequately absorb the flow of rural surplus labors, slow down their social-economic development, restrict them to fully deploy their urban functions, and increase negative impact on the environment, resource and residents' living condition. The PRC's 12th Five-year Plan (FYP) defines clear targets and measures to encourage the balanced development at all levels of the urban hierarchies[17], reduce the current gap in municipal infrastructure and improvement of urban public services. The objectives of this strategy is to support a more inclusive and sustainable urban and rural development, balance the spatial development within each province, help to build a middle class, reinforce the vital link between city and countryside and decrease the congestion of major urban areas in most big cities.

49. Jilin Province is located in the middle of northeastern PRC. Based on the PRC's 12th FYP, among the sixteen national development strategies outlined, sustainable urbanization and environmentally friendly socio-economic development are top priorities. The Jilin provincial government has created sustainable economic and social development strategies toward stable economic development, environmental protection and improvements in residents living condition.

50. The northeastern part of the PRC including Jilin, Liaoning and Heilongjiang provinces used to be the heavy industrial base, especially during the 1950s to 1980s before the PRC economic reform. Almost all enterprises are large state owned companies/factories with outdated technologies and poor management. The productivity was low and the products could not meet the economic development needs in both quality and quantities. After the economic reform, many of these enterprises went bankrupt. The area suffered big economic losses at the end of the last century. In order to improve the severe condition, the PRC state council initiated the "Strategy of Revitalization of Northeastern Old Industrial Base" to promote regional economic development. The strategy identified nine aspects including economic structure adjustment, new technology application, agricultural development, infrastructure development, economic transformation, green development, social development, Regional Corporation, and continuing economic reform. In the strategy, Baishan, one of the two project cities, was identified as the demonstration city for economic transformation for resource exhausted cities, while Baicheng was identified as an important transport and logistical center in the northeast PRC as well as the Europe-Asia continent.

51. The cities of Baishan and Baicheng are two prefecture capitals located in remote and poor regions of Jilin Province. They are the main urban center of their respective region. Their development is key to balance the development of the province, provide jobs and a good livelihood to their growing population, and prevent migrant to move to provincial major cities - Changchun and Jilin - already overcrowded and reaching a critical level of congestion.

[16] The cities where the population is comprised between 0.5 and 1 million people.

[17] Such as the recent release of guidelines from the China's State Council for "registered permanent residence" reform, that ostensibly makes it easier for migrants to obtain permanent urban residence in small and medium-sized cities.

52. **Need for improved transport infrastructure and municipal services in Baicheng.** Due to the lack of transport infrastructure and linked services such as water supply and wastewater collection, the urban center is disconnected from the Baicheng Economic Development Zone (BEDZ). New residential areas have been developed without proper connection with other parts of the city. Currently it is estimated that about 100,000 residents (about one third of the city's total population) are not yet connected to the existing municipal wastewater treatment plant (WWTP), resulting in wastewater collection rate of 30% only. The construction of new transport infrastructure and associated facilities including pipelines for water supply, sewer, stormwater, communication, will create a rational link between the city areas. Moreover it will open well planned urban areas, providing new residential and mixed-function areas to accommodate future residents and economic activities and organize adequately the future urban growth. The project component will improve traffic management; promote public transportation such as bus priority lane and non-motorized traffic. The project will work with Baicheng city on urban planning improvement including urban plan and zoning, and provide advice on the development and management of BEDZ and promote a green, inclusive and competitive urban development.

53. **Baishan** City is identified as the urban development center in southeastern Jilin for processing industry and tourist development by the provincial government. The city is located in foothills of Changbai Mountain, the city used to be a resource-dependent city with major industries of timber production and mining. Due to over-mining and implementation of government's policy for prohibition of tree cutting, the city becomes a resource-exhausted city, and has suffered big economic loss due to the significant reduction of industrial revenues. The city is facing the challenges of the economic transformation from the forest and mining industries to and processing industry and tourism. The proposed project components will contribute the economic transformation and promote the city's competitiveness and make the city more attractive for outside investment.

54. **Water/energy savings and adaptation to climatic variations for the water supply component.** The northern PRC, including Jilin Province is vulnerable to climate change, and more droughts in the future will require greater efficiency of water use.[18] Due to previous low technical standards, aging of pipeline networks, and current poor efficiency of water supply dispatching, current NRW loss in Baishan is as high as 65%, resulting in inefficient water use, high water tariffs and excess energy consumption. Through the construction and upgrade of water supply distribution pipelines, installation of water meters, procurement of water pipeline leakage detection and repairing equipment, the development of water supply monitoring centers, promotion of public awareness for water conservation, and adoption of improved pump systems, the project will achieve significant water savings (an estimated 35% reduction in NRW loss) and energy savings, and reduce greenhouse gas (GHG) emissions as well. The water supply component will greatly impact on the overall financial sustainability of the water scheme.

55. **Water supply safety.** Recent concerns have been raised regarding the quality of the water in the PRC. Studies have pointed out that nearly 50% of so-called drinkable water is unsafe for consumption. The project will support service providers to supply safe drinking water through water quality monitoring and assurance systems and avoid the limitations associated with relying on end-product testing as a means of water safety control. The project will identify risks and control measures along the water supply system (from water source to point of use), and will help define actions and investments that would be incorporated in the project design to guarantee that the water quality meets the PRC's Drinking Water

[18] Climate model projections agree that seasonal precipitation will increase in the project location. The model predictions do not agree that seasonal precipitation will decrease in the project location, indicating a relatively high degree of uncertainty (AWARE, accessed in April 2014)

Quality Standard (GB5479-2006)[19].

56. **Rationale for integrated MSW management components.** The current daily generations of MSW are 480 wet tons in Baicheng and 350 wet tons in Baishan, respectively. In Baishan, the existing landfill is being rehabilitated to include leachate collection and treatment. However, Baishan's landfilll will reach its capacity in 3-4 years. In Baicheng, the existing landfill has already reached its design capacity and a new landfill with a capacity of 123,000 m^3 is under construction. The lack of collection system in the city leads to the presence of small dump sites everywhere within the urban areas. The cities have no solid waste soirting facilities, and no strategy to promote waste reduction, reuse and recycling (3R). There is a need to construct MSW sorting and composting facilities and extend the Baishan landfill, and improve the MSW collection system in the two cities.

57. Currently, the MSW is collected and hauled to the garbage stations and then to landfill sites by open trucks, which results significant impacts to local environment and sanitation. The subproject component will improve the existing MSW collection and transferring stations, equip the MSW system with enclosed MSW trucks, compressing equipment, and two trash bin system for recycle and non-recycle MSW.

58. The Project will provide institutional capacity-building and public awareness activities in urban infrastructure development and environmental management, as well as public participation and policy reforms to ensure sustainability of the Project in the project cities. The demonstration features with particular resonance for the environment include: (i) strengthening project environmental management and monitoring capacity during the implementation of the project from design to operation; and, (ii) emphasizing environmentally friendly and climate resilient construction and operation of the project infrastructures.

59. The proposed project aims to promote balanced and environmentally sustainable urbanization and social-economic development in the two project cities. The project will support sustainable urban transportation, urban municipal service facilities, safe drinking water supply and integrated MSW management with "3R" principals.

60. The project complies with the two main development agendas of environmentally sustainable growth and inclusive economic growth promoted in ADB's long-term strategic framework 2020. It is also in line with and supports the PRC country partnership strategy (2011-2015), which will support the PRC's over-arching strategic goal of building a "comparatively well-off" society by helping foster inclusive growth and promote environmental sustainability.

61. The project is in line with the Jilin Provincial Twelfth FYP and the project cities 2020 Master Plans. The provincial Twelfth FYP calls for economic development, environmental protection, and building environmentally and ecologically friendly urban areas and town settlements.

[19] The standard of GB5749-2006 includes 106 water quality parameters.

B. Project Impact, Outcome and Outputs

62. There are five project outputs (components) as shown in **Table III-1**, and described below:

63. **Component I - Improved Urban Infrastructure in Baicheng:** The component will improve the urban infrastructure and municipal services in the south and west urban areas in the city. The component includes: (i) construction of nine urban roads with a total length of 32.4 km including two 20 m span bridges and one twin cell railway underpass; (ii) 36.9 km water supply piping network; (iii) 63.2 km sewer pipeline, including a pump station; (iv) 59.9 km stormwater pipeline with two pump stations; (v) 33 km 10 kV power line; (vi) 33 km communication line; (vii) 1,582 street lights, traffic control and traffic management system; and (viii) landscaping.

64. **Component II - Integrated Municipal Solid Waste (MSW) Management in Baicheng:** The Baicheng MSW Component includes: (i) a 20 ton/d composting facility, including a 30 ton/d MSW sorting facility; (ii) construction of 12 new MSW transfer stations; (iii) upgrading of MSW management equipment including 12 self-loading trucks, 30 movable MSW compaction containers, 12 MSW compaction trucks, 4 kitchen garbage collection trucks, 50 MSW carts, and one construction material recycling machine; (iv) upgrading city cleaning and maintenance vehicles and equipment including 36 street cleaning and sweeping vehicles, 20 snow cleaning trucks, 10 water spray trucks, 10 sewer suction trucks and 5 sewer cleaning trucks, 10 construction waste trucks, MSW carts, trash and recycling bins.

65. **Component III - Integrated Municipal Solid Waste (MSW) Management in Baishan:** The Baishan MSW Component will improve and upgrade the existing MSW management systems by introducing the 3R concept of reducing, reusing and recycling. The component includes: (i) construction of a new MSW sanitary landfill with a daily capacity of 330 ton/day; (ii) establishment of a 20 ton/d composting site including 30 ton/d MSW sorting facility; (iii) rehabilitation of 15 MSW transfer stations; (iv) upgrading MSW handling equipment park including 15 self-loading trucks, 30 MSW compaction containers, 2 MSW compaction trucks, 4 kitchen garbage collection trucks, 15 MSW carts, and a construction waste recycling machine; (v) procurement of city cleaning vehicles and equipment including 4 sewer suction trucks, 15 street sweeping vehicles, 18 snow cleaning trucks, two moveable toilets, sewer pipe cleaning pipe, trash collection carts and tricycles, trash and recycle bins.

66. **Component IV – Improved Water Supply Management in Baishan:** The component will improve the water supply system in Baishan with safe and reliable drinking water supply and reduce non-revenue water (NRW). The component includes: (i) a 6.8 km water transmission line from Xibeicha Reservoir to Jiangyuan District; (ii) a 21.1 km water transmission line to the new WTP in Hunjiang District; (iii) a new 50,000 m^3/d WTP; (iv) upgrade 11.1 km of existing water supply piping network and construction of 44.2 km water distribution pipeline; (v) water leakage detection and repair equipment; and (vi) capacity building in operation and maintenance of the existing water supply system to reduce NRW loss and provide better service.

67. **Component V - Improved Capacity and Institutional Arrangements:** The component will provide support for project implementation on project management, institutional strengthening, environmental management, capacity development and training.

Table III-1: Overview of Project Components and Subcomponents

No		Description	Type/ Category	Unit	Length/ Capacity
1	**Improved Urban Infrastructure in Baicheng**				
	A	***Urban Roads and Bridges***			
	1	Third Ring Road	Urban Major	m	11,304
		20 m RC Void Slab Bridge (W = 24 m twin bridge)			
		Railroad Underpass			
	2	Xiangyang Street (w/bus priority lanes)	Urban Major	m	4,505
	3	Xinhua Xi Road (w/bus priority lanes)	Urban Major	m	2,724
	4	Shengli Road	Urban Major	m	2,068
	5	Xingfu Bei Street	Urban Major	m	1,330
	6	Nanyi Street	Secondary	m	1,024
	7	Taoerhe Road	Secondary	m	2,657
		20 m RC Void Slab Bridge (W = 30 m)			
	8	Chunyang Road	Branch	m	3,881
	9	Xinggong Road	Branch	m	2,927
		subtotal =			32,420
	B	***Municipal Service Facilities***			
		Water Supply		m	36,932
		Sanitary Sewer		m	63,229
		Stormwater		m	59,890
		No. 1 Stormwater Pump Station (Xinggong Road/G302, Capacity = 10,479 L/s)			
		No. 2 Stormwater Pump Station (at existing pump station site, Capacity = 11,000 L/s)			
		Power Supply	10 KV	km	33
		Communication		km	33
		Street Lighting		each	1,582
		Traffic Control and Traffic Management		set	1
2	**Integrated Municipal Solid Waste Management in Baicheng**				
		a. Municipal Solid Waste Sorting and Composting Center		ton/day	30
		b. Municipal Solid Waste Transfer Station	28 ton/day	each	12
		c. Urban Cleaning Equipment, MSW Container & Trash Bin		set	1
		d. Urban Infrastructure Maintenance Equipment			Misc.
3	**Integrated Solid Waste Management in Baishan**				
		a. Municipal Solid Waste Sanitary Landfill		t/d	330
		b. Municipal Solid Waste Sorting and Composting Center		t/d	30
		c. Municipal Solid Waste Collection Station		ea	15
		d. Urban Cleaning Equipment, MSW Container & Trash Bin			Misc.
4	**Improved Water Supply Management in Baishan**				
		a. Water Transmission Lines to Hunjiang and Jiangyuan			
		Jiangyuan Water Transmission Line	30,000 m^3/d	m	6,800
		Hunjiang Water Transmission Line	50,000 m^3/d	m	21,140
		b. Water Treatment Plant for Hunjiang	50,000 m^3/d		
		c. Water Distribution Network in Hunjiang			

No		Description	Type/ Category	Unit	Length/ Capacity
		Upgrading existing water piping network		m	11,138
		New water piping network		m	44,240
5	**Improved Capacity & Institutional Arrangement**				
	A	***Project implementation support***			
	B	***Institutional Capacity Development including environmental management***			

Source: Draft Project Administration Manual (February 2014)

68. The project has the following **special features:**

- **MSW sorting and composting facilities.** The proposed project applies a 3R concept for the improvement of current MSW management systems in both cities. MSW sorting and composting facilities with a capacity of 30t/d will be built in each project city. MSW received at the facility will be separated into recyclates, organic waste for composting, and the remaining portion for disposal in the landfill. The organic waste will be composted to produce organic fertilizer to be used for landscaping.

- **Non-revenue water (NRW) management.** NRW in Baishan reaches 65%. The high NRW is contributed by leakage from the aged water supply pipes, unbilled usage, inaccurate metering, etc. The project will develop a capacity development program including institutional strengthening, staff training, advanced technology for leakage detection and repairing, water supply metering, and public awareness for water conservation to reduce the NRW from 65% to 30%.

- **Stormwater management and reuse.** The Baicheng infrastructure component will introduce stormwater infiltration, collection and reuse to improve the stormwater management. A stormwater collection, storage and infiltration system located under the road landscaping strip will be introduced and installed as a demonstration feature along two roads. The system will reduce the direct discharge of polluted runoff to surface water and reduce risks of water logging as a result of increased surface sealing.

- **ITS traffic management and control, bus priority lanes, traffic safety.** In order to improve urban traffic safety and traffic congestion condition, the project will implement an ITS traffic management system in Baicheng, which will include a traffic monitoring system, red light and speeding violation monitoring system, and real time traffic condition displays. In addition, public bus priority lanes will be built along selected project roads. The bus priority lanes will illustrate the effectiveness of the public bus system and help the municipal government to implement more public bus priority lanes and other public transport facilities. All major roads will have separate lanes for non-motorized traffic. Pedestrian-priority traffic lights, safety islands, crosswalks (zebra lines), and boarding bays/islands will be established at all intersections. The subcomponent will be supplemented by a comprehensive traffic safety improvement component, to be planned and implemented under the coordination of international and national transport planning and traffic safety specialists, engaged under the Project's capacity building component. The specialist will, amongst others, conduct an urban traffic safety audit to assess the existing situation (with special focus on pedestrian and bicycle safety, and public transportation system); review and update the urban traffic safety plans of the municipality; and develop and implement a detailed work plan for improving

urban traffic safety, addressing the 3E urban traffic safety program (Engineering, Education and Enforcement.

C. Detailed Description of the Project Components and Subcomponent

(1) Component I –Improved Urban Infrastructure in Baicheng

a. Urban Roads and Bridges

69. There are nine urban roads and two bridges in the subcomponent as shown in **Map A**. The roads and bridges are located in the southwestern part of the city which is the new urban development area. The area has been developed in the last decade and the part of the road network has already been constructed. The project component will build new urban roads according to the development master plan, and improve the urban traffic management so that the road network can be functional properly. The summary of the proposed roads and bridges including the classification, right-of-way, design speed, design load and the length is shown in **Table III-2**.

Table III-2: Summary of Proposed Roads and Bridges

No	Name	Classification	Width (m)	Design Speed (km/h)	Design Live Load	Length (m)
1	Third Ring Road	Urban Major	55	50	BZZ-100	11,304
	20 m RC Void Slab Bridge (W = 24 m twin bridge)				Urban-A	
	Railroad Underpass	(two twin cell culverts: 8.5+11.5 m)				
2	Xiangyang Street (bus priority lanes)	Urban Major	55	50	BZZ-100	4,505
3	Xinhua Xi Road (bus priority lanes)	Urban Major	55	50	BZZ-100	2,724
4	Shengli Road	Urban Major	45	50	BZZ-100	2,068
5	Xingfu Bei Street	Urban Major	45	50	BZZ-100	1,330
6	Nanyi Street	Secondary	30	40	BZZ-100	1,024
7	Taoerhe Road	Secondary	30	40	BZZ-100	2,657
	20 m RC Void Slab Bridge (W = 30 m)				Urban-A	
8	Chunyang Road	Branch	35			3,881
9	Xinggong Road	Branch	20	30	BZZ-100	2,927
	Total =					32,420

RC= reinforced concrete, Source: PPTA Consultants,

70. There are five urban major roads, two urban secondary roads, two branch roads, two bridges and one railway underpass. The detailed cross sections for each road and the bridges are summarized in **Table III-3.**

Table III-3: Cross Section for Each Road and Bridge (Unit: m)

Road/bridge	SW	NMV	Sep	MV	Med	MV	Sep	NMV	SW	Total
1. Third Ring Road	2.5	6.0	3.5	11.5	8.0	11.5	3.5	6.0	2.5	55.0
20 m RC Void Slab Bridge (W = 24 m twin bridge)	2.5	6.0	3.5	11.5	8.0	11.5	3.5	6.0	2.5	55.0
Railroad Underpass	2.5	6.0	3.5	11.5	8.0	11.5	3.5	6.0	2.5	55.0
2. Xiangyang Street (w/bus priority lanes)	3.0	5.5	3.5	11.5	8.0	11.5	3.5	5.5	3.0	55.0
3. Xinhua Xi Road (w/bus priority lanes)	3.0	5.5	3.5	11.5	8.0	11.5	3.5	5.5	3.0	55.0
4. Shengli Road	3.0	6.0	2.5	11.0	0.0	11.0	2.5	6.0	3.0	45.0
5. Xingfu Bei Street	3.0	6.0	2.5	11.0	0.0	11.0	2.5	6.0	3.0	45.0
6. Nanyi Street	5.0	0.0	2.0	8.0	0.0	8.0	2.0	0.0	5.0	30.0
7. Taoerhe Road	5.0	0.0	2.0	8.0	0.0	8.0	2.0	0.0	5.0	30.0
20 m RC Void Slab Bridge (W = 30 m)	5.0		2.0	8.0		8.0	2.0	0.0	5.0	30.0
8. Chunyang Road	3. 0	4.0	3.0	7.5	0.0	7.5	3.0	4.0	3.0	35.0
9. Xinggong Road	5.5	0.0	0.0	4.5	0.0	4.5	0.0	0.0	5.5	20.0

SW = sidewalk, NMV = non-motor vehicle lane; Sep = separation belt, Med = middle separation belt, source: PPTA Consultant

b. Municipal Service Facilities

71. In conjunction with the roads construction, the associated municipal facilities will be constructed, including pipelines for water supply, sewer, stormwater drainage, cables of power supply and communication, street lighting, traffic management facility and landscaping.

72. **Water supply pipeline.** The new water supply pipeline with the length of 36.9 km will be installed along the proposed roads. Based on the alternative study of piping material, it has been determined that for the pipe with the diameter of 400 mm or smaller, PE (polyethylene) pipe will be used, while for the pipe with larger diameters, the ductile iron pipe will be used. Water flow monitoring meters will be installed at the key control points of the pipelines.

73. **Sewer pipeline.** The new sanitary sewer pipes will be installed along the new and rehabilitated roads. The sewer pipes will be connected to the existing sewer network that is connected to the existing wastewater treatment plant (WWTP). A total of 63.2 km sewer pipe will be installed along the new urban roads (**Table III-5)**. In addition to the pipe network, one pumping station will be built.

74. **Stormwater drainage.** The 59.9 km long stormwater drainage pipes will be laid under the roads. A demonstration section with the stormwater management features for pollutants removal, rainwater infiltration, underground storage and detention will be build. The scheme of the stormwater management system is illustrated in **Figure III-1**. In addition to the pipe network, two stormwater pump stations will be built to lift the stormwater to the drainage channel due to the extreme flat condition in the urban area.

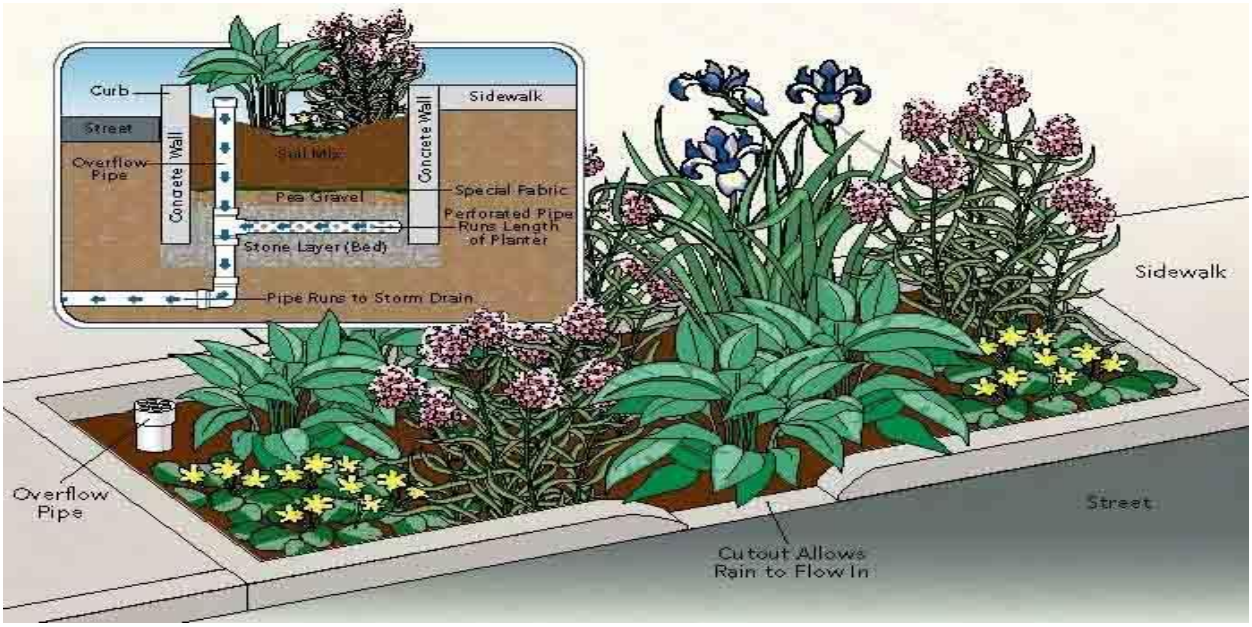

Figure III-1: Curbside Stormwater Management for Infiltration

75. **Cables of power supply and communication.** The 10KV power supply lines with the length of 33 km will be laid under the roads; The 33 km long underground communication cable will be installed along the roads, including underground conduits and 120 manholes.

76. **Traffic control.** The traffic management system will be installed in the urban roads, which

includes 37 traffic signals, a fiber optical network, and a large LED traffic information display screen.

(2) Component II - Baicheng Integrated MSW Management Component

77. The scheme of the MSW management system is shown in **Figure III-2**. At the selected residential communities, a double bin system to separate kitchen and non-kitchen waste is used. In addition, the recycle stations will be setup at the selected communities to collect and recycle paper and cardboard, plastic and glass, clothes, etc. The collected recycle items will be sent to the recycle stations scattered in Baicheng, which are privately operated businesses for profits and it's popular in the PRC. The kitchen waste will be collected, transported to the sorting and composting center, in which he kitchen waste will be separated for composting, the composted fertilizer will be used for urban landscaping. The remaining non-usable waste will be transported to the landfill site for sanitation disposal. Currently in PRC, there is high percentage of construction waste in the municipal solid waste due to rapid urbanization and construction activities. The project will procure construction and demolition waste (C&D waste) recycling machine for each project city and place it at the sorting and composting center for shredding C&D waste[20]. The generated recycling materials can be used for landfill cover soil or the backfill materials for road and other construction.

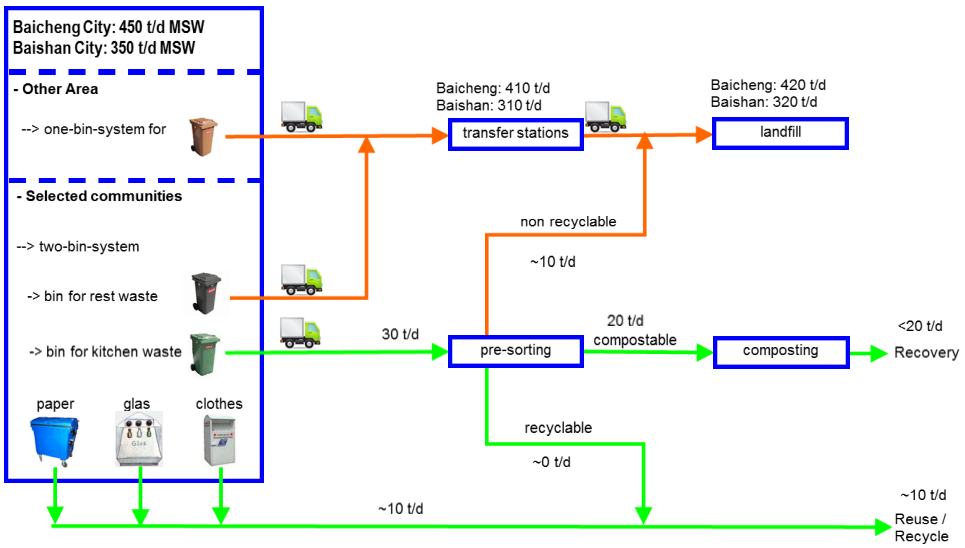

Figure III-2: Scheme of Municipal Solid Waste Management Systems in Baicheng (Top) and Baishan (Bottom)

[20] These are mobile C&D waste low speed, high torque shredding facilities with capacity of 90-190 ton/hr to reduce size of C&D waste (typically including wood, roofing shingles, gypsum, metals and plastics as well as salvaged doors windows and plumbing fixtures) to increase density for transport and also to facilitate down-line separation and recycling.

78. **Sorting and composting plant.** The center part of the component is to build a demonstration organic waste composting facility with pre-sorting capacities to separate compostable, non-recyclable and recyclable waste prior to composting. The key control parameters for the composting plant are summarized in **Table III-4**. The plant's daily treatment capacity is 30 ton/day. The waste received in the plant will be conveyed and sorted through semi-automated techniques to separate paper, cardboard, plastic, metal and other usable parts for recycle and reuse, the organic parts for composting, and the remaining parts for final disposal in the landfill site. The sorting plant will occupy about 1.9 ha of land and the major structures in the plant include sorting workshop, storage, administration building, composting fields, wastewater tank. The major equipment in the sorting plant includes receiving and feeding, sorting and separating, conveying, composting, moving and packing. The detailed equipment list is shown in **Table III-5.** Waste sorting will be done manually, supported by semi-automated techniques (such as solid waste lifter, conveyors, magnetic metal removers, etc).

Table III-4: Design Parameters for Sorting and Composting Facilities - Baicheng

No	Name	Unit	Quantity
1	Daily sorting capacity	ton/d	30
2	Area occupied	ha	1.9
3	Daily composting capacity	ton/d	20
4	Building area	m^2	1,311
5	**Buildings**		
	i) Sorting workshop	m^2	520
	ii) Storage	m^2	691
	iii) Administration building	m^2	100
	iv) Wastewater tank	m^3	150

Source: PPTA Consultant

Table III-5: Sorting and Composting Equipment – Baicheng

No	Name	Type	Unit	Quantity
	Sorting Plant			
1	Receiving hopper	3000x4500	each	1
2	Plate type feeder	B1300x4400	each	1
3	Spreader	B1300xØ800	each	1
4	Loading conveyor	B1200x12200	each	1
5	Sorting platform 1	B4000x4500	each	1
6	Roller sorting machine	Ø2000x6000	each	1
7	Output conveyor 1	B800x6500	each	1
8	Output conveyor 2	B800x6000	each	1
9	Magnetic metal remover	RCDD-08	each	1
10	Output conveyor 3	B1000x12000	each	1
11	Sorting platform 2	B4000x4500	each	1
12	Output conveyor 4	B1000x8000	each	1
13	Lubricant and hydraulic oil	set	each	1
14	Solid waste lifter	QD50-105-B	each	1
15	Work platform & stairs	-	set	1
16	Electronic control system	-	set	1
17	Air fresher system	N = 8.0 kw	each	1

18	Packing machine	HPA-50	each	1
19	Receiving container	HPA-50	each	16
	Composting Plant	-		
20	Loader	3t	each	2
21	Turner	146 kw	each	1
22	Movable roller sieving machine	10 t/h	each	1
23	Packing machine with scale	-	each	1
	Construction Material Recycling			
24	Movable construction waste recycling machine	180 t/h	each	1

Source: PPTA Consultant

79. **MSW transfer stations**. The project will build 12 new MSW transfer stations. The proposed new MSW transfer stations will use advanced technologies and equipment for MSW handling. For each of the transfer station, one lifting truck will be equipped, with a total of 30 fully sealed compaction containers. In addition, 12 enclosed MSW compaction trucks will be purchased to collect and transport the MSW to the landfill site. The upgrade also includes the purchase of 49 small MSW carts and 4 kitchen garbage collection truck. The control parameter and equipment list for the transfer station is shown in **Table III-6**. And the locations of the MSW transfer stations are shown in **Figure III-4**.

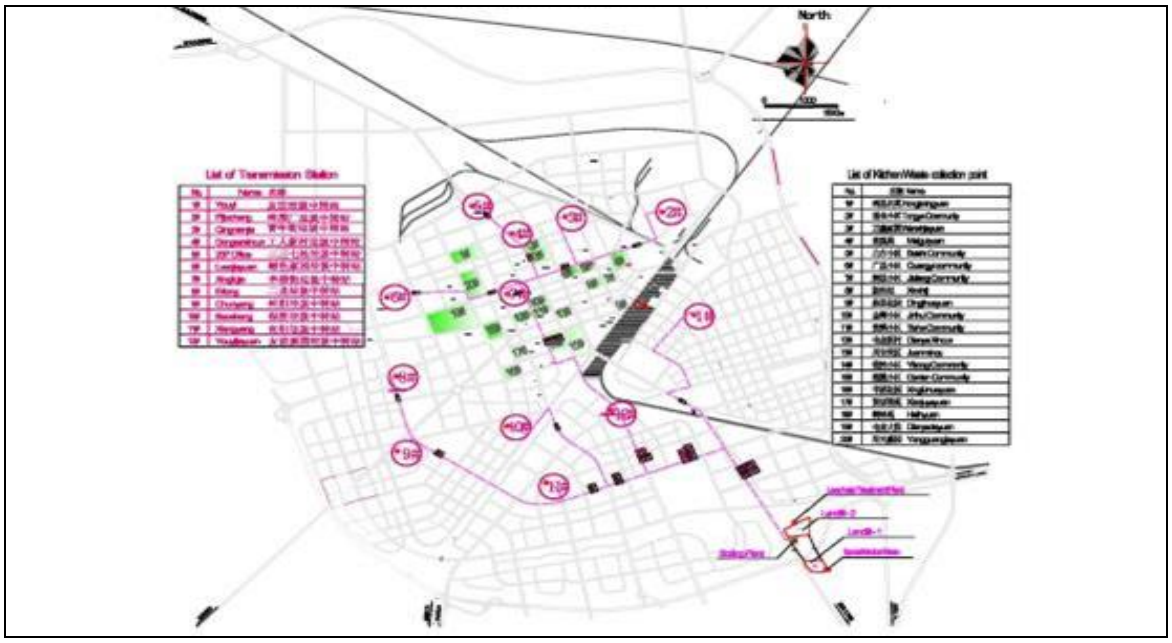

Figure III-3: Location of Baicheng MSW Transfer Stations

Table III-6: Design Parameters and Equipment for MSW Transfer Stations – Baicheng

No	Name	Type	Unit	Quantity
1	New MSW transfer station	enclosed	each	12
	Storage capacity		ton/d	28
	Transfer station area			160
2	Movable MSW compaction container		set	30
3	Self-loading truck	25t	each	12
4	Enclosed MSW compaction truck		each	12
4	Enclosed MSW cart	0.5t	each	50
5	Kitchen garbage collection truck	6 m^3	each	4

Source: PPTA Consultants

(3) Component III - Baishan Integrated MSW Management

80. **Sorting and Composting plant.** Similar to Baicheng MSW Component, the Baicheng MSW Component includes a demonstration MSW sorting and composting plant. The design parameters for the sorting and composting facilities are summarized in **Table III-7**, and the detailed equipment is shown in **Table III-8**.

Table III-7: Design Parameters for Sorting Plant - Baishan

No	Name	Unit	Quantity
1	Daily sorting capacity	ton/day	30
2	Daily composting capacity	ton/day	20
3	Area occupied	ha	2.65
4	Building area	m^2	1,311
5	Buildings		
	i) Sorting workshop	m^2	520
	ii) Storage	m^2	691
	iii) Administration building	m^2	100
	iv) Wastewater tank	m^3	150

Source: PPTA Consultants

Table III-8: Summary of Sorting and Composting Equipment – Baishan

No	Name	Type	Unit	Quantity
	Sorting Plant			
1	Receiving hopper	3000x4500	each	1
2	Plate type feeder	B1300x4400	each	1
3	Spreader	B1300xØ800	each	1
4	Loading conveyor	B1200x12200	each	1
5	Sorting platform 1	B4000x4500	each	1
6	Roller sorting machine	Ø2000x6000	each	1
7	Output conveyor 1	B800x6500	each	1
8	Output conveyor 2	B800x6000	each	1
9	Magnitude metal remover	RCDD-08	each	1
10	Output conveyor 3	B1000x12000	each	1
11	Sorting platform 2	B4000x4500	each	1
12	Output conveyor 4	B1000x8000	each	1

No	Name	Type	Unit	Quantity
13	Lubricant and hydraulic oil	set	each	1
14	Solid waste lifter	QD50-105-B	each	1
15	Work platform & stairs		set	1
16	Electronic control system		set	1
17	Air fresher system	N = 8.0 kw	each	1
18	Packing machine	HPA-50	each	1
19	Receiving container	HPA-50	each	16
	Composting Plant			
20	Loader	3t	each	2
21	Turner	146 kw	each	1
22	Movable roller sieving machine	10 t/h	each	1
23	Packing machine with scale		each	1
	Construction Material Recycling			
24	Movable construction waste recycling machine	180 t/h	each	1

Source: PPTA Consultants

81. **Transfer stations.** The Baishan MSW Component includes construction of 15 MSW transfer stations. Currently, there are 19 existing MSW transfer stations in the urban area, in which 15 stations will be upgraded the other 4 will be eliminated. Most of these transfer stations were built 20 or more years ago with low design standards. The technology will be identical to Baicheng. The control parameters and equipment list for the transfer station are shown in **Table III-9.**

Table III-9: Equipment for MSW Transfer Stations – Baishan

No	Name	Building Area (m^2)	Capacity (t/d)	Distance to Landfill (km)
1	**Upgrade MSW collection stations:**			
	1) Hekou Station	136	18	8.0
	2) Yangguang Station	100	20	7.0
	3) Diantie Road Station	86.4	26	6.0
	4) Huimin Station	129.4	28	5.0
	5) Jiefang Station	-	-	-
	6) Jinhe Station	118.4	28	2,5
	7) Xingtai Station	147.29	26	4.5
	8) Aimin Station	95.58	28	4.5
	9) Tuanjie Station	93.6	-	-
	10) Xiaocheku Station	93.8	20	3.0
	11) Tongjiang Station	88.8	-	-
	12) Gulan Station	91.2	28	3.5
	13) Xinbei Station	128.7	26	5.0
	14) Minhua Station	132	26	6.5
	15) Jianxi Station	85.8	-	-
	16) Xianmingcun Station	129.6	20	9.6
	17) Caizheng Station	127.5	10	9.0
	18) Xiaobanshi Station	100.4	26	10.6
	19) Tonggou Station	137.7	10	3.0
2	**Equipment List:**			
	1) Movable compaction MSW container	17 m^3	each	30
	2) Armed self-loading truck	25t	each	15
	3) Air fresher system		each	15
	4) Enclosed compaction MSW truck	12 m^3	each	2
	5) Enclosed MSW cart	2.2 m^3	each	15

	6) Kitchen garbage collection truck	6 m^3	each	2
	7) Kitchen garbage collection truck	4.8 m^3	each	2

Source: PPTA Consultant

82. **Landfill.** The Baishan MSW Component includes the construction of Phase II of the municipal sanitary landfill. The site is large enough to accommodate the new landfill with a design operation period of 8 years. The design capacity is 530,000 m^3 and the daily treatment capacity will be 330 tons. A leachate treatment facility with a treatment capacity of 150 m^3/d has been completed in 2013, which will be put into operation before the end of March 2014. The capacity of the facility is sufficient for the treatment of leachate generated by the proposed landfill expansion. The treatment process of the facility is filtration + MVC evaporation + deionization (DI). The effluent of the leachate treatment facility will meet the PRC Pollution Control Standard for MSW Landfill (GB16889-2008). The landfill expansion work will comply with PRC design code for sanitary landfills (CJJ17-2004). The major structures of the landfill include exterior and interior dams, water blocking dam, drainage pipe, water proofing, gas collection system. The design parameters of the landfill are summarized in **Table III-10**.

Table III-10: Design Parameters for Landfill Expansion

No	Item	Unit	Quantity
1	Total landfill capacity	m^3	530,000
2	Daily treatment capacity	t/d	330
3	Service year (w/ existing site)	yr	8
4	Landfill:		
	i) Exterior dam (top El 551 m)	m	48
	ii) Interior separation dam (top El 560 m)	m	59
	iii) Water blocking dam (top El 575 m)	m	48
	iv) Drainage pipe	mm	1800
	v) Leachate collection & treatment	set	1
	vi) Gas collection system	set	1
	vii) Leaking proofing - HDPE sheet	set	1

Source: PPTA Consultants

(4) Component IV - Baishan Improved Water Supply

83. The component will build (i) two water transmission pipelines, one for Hunjiang District (to supply new project water treatment plant, WTP), and another for Jiangyuan District (to supply the existing Jiangyuang WTP[21]); (ii) one new WTP in Hunjiang District (to supplement the existing Nashan WTP), with the treatment capacity of 50,000 m^3/d; and (iii) build and upgrade water distribution piping network in Hunjiang District. The water source will be the new Xibeicha Reservoir that is under construction will be completed and put into operation before the end of 2015 according to the plan. The due diligence for the associated reservoir is in the section below. [22]

84. **Water Supply Plant.** Based on the alternative study during the PPTA, the final WTP site is selected at a high ground outside Shangdianzi Village. The site elevation is 520 m ASL, which is about 45 m higher than that of Hunjiang urban area and 60 m lower than that of the water source at Xibeicha Reservoir. The site elevation is ideal for power conservation, where the both raw water and supplied

[21] To replace the current unreliable water source (Dayangcha River) which will be kept as emergency water source for the Jiangyuan WTP.

[22] Nanshan WTP will continue its normal operation, and will be the alternative water source in case of accidental contamination of the Xibeicha water source.

water can mostly by gravity with minimum need for power consumption. The design parameters and structures for the WTP are shown in **Table III-11** and **Table III-12**, respectively.

Table III-11: Design Parameters for the WTP

No	Name	Unit	Quantity	Remark
1	Design capacity	m^3/day	50,000	
2	Plant area	ha	4.5	
3	Source water pre-chlorination	mg/L	2.0	
4	Water turbidity			
	- Water source	NTU	35-70	
	- Water output	NTU	0.5	
5	Dosage of aluminum sulfate	mg/L	30.0	Max – 60.0
6	Percentage of self-water usage		6%	

Source: PPTA Consultants

Table III-12: Major Structures in the WTP

No	Item	Unit	Quantity	Remark
1	Water mixing house (12x38.1 m)			2 story
	a. water mixing (9x12 m)			
	- Water tank 6.2x5.7x9.0 m	each	1	
	b. Coagulation workshop 29.1x12.0 m			
	- aluminum sulfate storage tank (4.4x12x4.5 m)	each	2	
	- aluminum sulfate liquid tank (1.8x1.8x42.7 m)	each	3	
	- sodium carbonate tank (1.8x1.8x2.7 m)	each	1	
	- sodium carbonate liquid tank (1.8x1.8x2.7 m)	each	2	
2	Water treatment house (90x42m)			2 story
	- Mixing and settlement tank (44.25x14.4x6.1m)	each	2	
	- V shape filtration tank (22.8x10x4.8 m)	each	1	
	- Flushing pump station (6x16.5x7 m)	each	1	
	- Compress air station (6x10.5x5.7 m)	each	1	
3	Clean water tank (42x30x4 m)	each	2	
4	Chlorination house (15x12x3.6 m)	each	1	
5	Recycle water tank (15x6x4.9 m)	each	2	
6	Sludge tank (15x6x4.9 m)	each	1	
7	Sludge condense house (36x18x6.6 m)	each	1	
8	Sludge condense tank (9 diameter x 6.2 m)	each	2	
	- Sludge balance tank (4.5x3.6x4.2 m)	each	2	
	- Sludge dewater house (12x10.5x5.7 m)	each	1	
9	Sludge storage shed (12x7.5x5.7 m)	each	1	
10	Administration building	m^2	1,000	
11	Repair workshop & storage (28x13.2 m)	m^2	740	
12	Boiler house	m^2	300	
13	Security guard house	m^2	25	

Source: PPTA Consultants

85. **SCADA System and NRW Reduction.** A conventional water treatment process of coagulation - sedimentation - filtration - disinfection (chlorination) was designed for the WTP in the FSR (**Figure III-4**). In order to improve the operation energy efficiency and NRW reduction, a Supervisory Control and Data Acquisition (SCADA) system will be installed, which are shown in **Table III-12**. More than 10,000 water meters will be installed in the water supply network (the number will be identified in the detailed design). Three residential communities were selected as demonstration District Metering Area by installing water flow meters and monitoring system to check the water leakage situation, in addition, the advanced water

leakage detection and repairing equipment will be procured for the NRW reduction.

Table III-13: Major Components of SCADA System

No	Item	Unit	Quantity
1	RTU	set	20
2	GPRS Terminal	set	20
3	Power measurement box	set	20
4	Measuring box	set	20
5	Power supply system	set	1

Source: PPTA Consultant

Table III-14: Water Leaking Detection and Repairing Equipment

No	Item	Unit	Quantity
1	Leaking sounding instrument	each	4
2	Leaking checking instrument	each	3
3	Correlator	each	2
4	Area leakage monitoring system	set	1
5	Metal pipe locator	set	4
6	Pavement drilling machine	set	1
7	Sounding rod	each	8
8	Measuring wheel	each	2
9	Leaking detection and repairing vehicle	each	2

Source: PPTA Consultant

86. **Water Transmission Pipeline.** The alignments of the water transmission pipelines from Xibeicha Reservoir to the districts of Jiangyuan and Hunjiang have been relocated from the riverbed in the draft FSR to the underground during the PPTA due to operation and maintenance concern. Both the pipelines will start from the Xibeicha Reservoir. The Jiangyuan pipeline will run about 6.8 km to the existing Jiangyuan WTP, while the Hunjiang pipeline will run 21.14 km to the new WTP at Shangdianzi Village (the proposed WTP site). Ductile iron pipes will be used for the pipelines.

87. **Water Distribution Piping Network.** The subcomponent of water distribution network improvement include the upgrade and replacing part of the existing water pipes in the existing urban area and laying new water supply pipes. Based on the alternative study on pipe materials, it is proposed that ductile iron pipe will be used for pipe diameter larger than 300 mm and PE pipe will be used for smaller pipes.

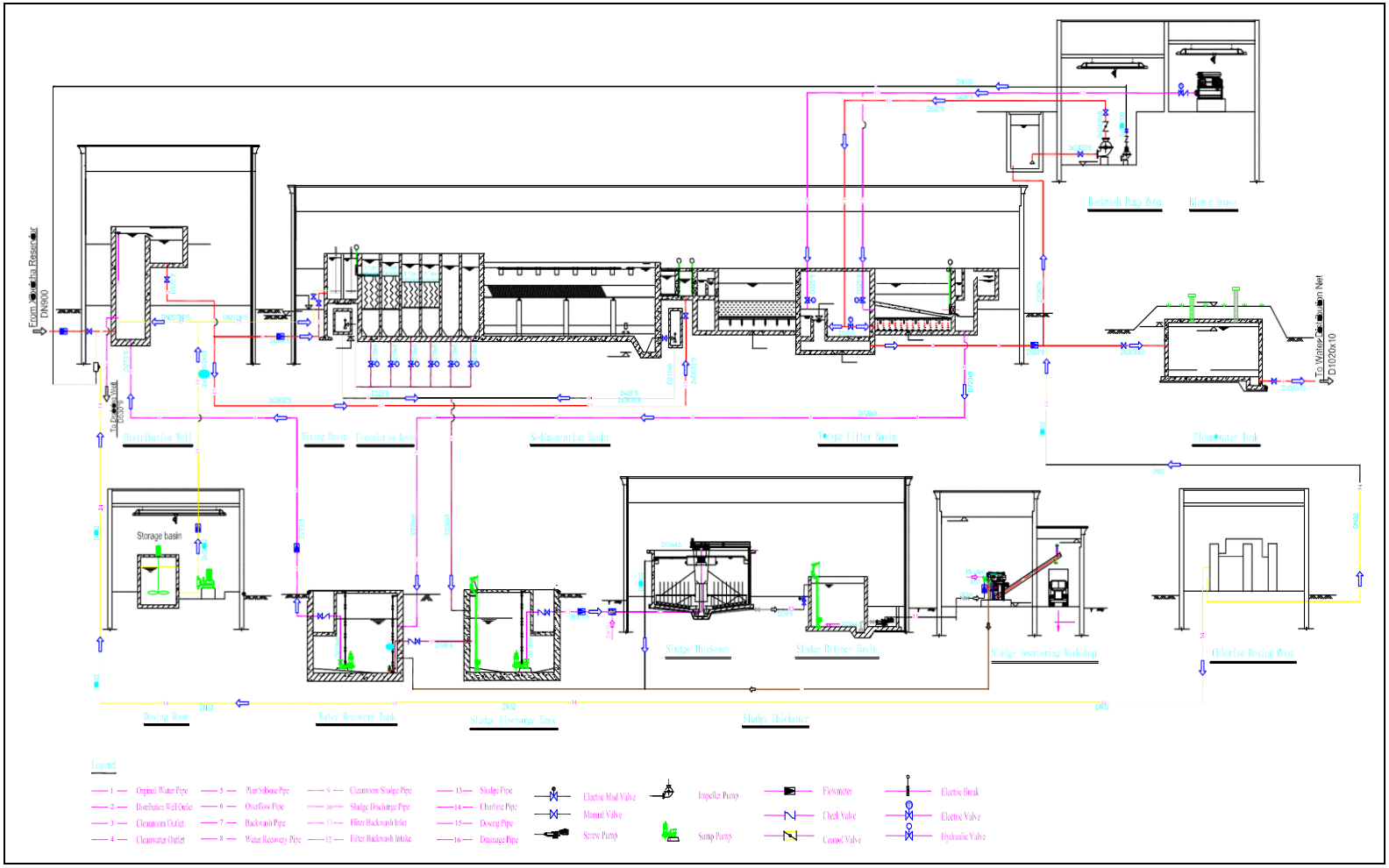

Figure III-4: Treatment Process of the Proposed Baishan WTP (Source: FSR)

(5) Component V - Improved Capacity & Institutional Strengthening

88. The objectives of the component are to improve the EA and IA's management and technical capacities to ensure the smooth implementation of the project. The component will provide technical and managerial support to the EA/IA's on project and contract management, bid and procurement, financial disbursement management, and environmental management. The consultants will introduce and implement new concepts and technologies for 3R MSW management, low carbon water supply, urban development and planning, urban infrastructure management and maintenance, public transportation, etc. The proposed subcomponents include:

i) **Project Implementation Support** – To provide project implementation support on project and contract management, procurement, bidding document preparation, financial and disbursement management, safeguard monitoring and reporting for environmental, resettlement and social issues.

ii) **MSW Management –** To provide training and technical support for the further development and implementation of the proposed integrated MSW system. The program will continue to provide support on development and implementation of the MSW system to ensure the successful implementation of the project.

iii) **Operation and Management of Water Supply System** – To provide training and technical support on the implementation of NRW reduction program and water conservation plan. For NRW reduction program, the consultants will provide the guidance on the installation of flow meters, SCADA system, DMA system, and provide training on leakage detection and institutional strengthening. For the implementation of WTP, the consultant will help to update and refine the WTP; provide technical supports for upgrading the monitoring and water source protection system, and conduct training for the operation and maintenance staffs of the IA.

iv) **Road Safety –** To provide assistance to improve urban road safety. Road safety has becoming a big problem due to the rapid urban development and fast growing number of vehicles. In general, urban road safety can be improved in the three interrelated aspects, sometimes referred as "Three E" system, which are: i) engineering to design the road without safety black spot; ii) education to educate the driver as well as the public to raise safety awareness; and iii) enforcement to enforce the traffic regulation and laws.

v) **Pedestrian and Public Transport Oriented Urban Transport –** To provide technical assistance and training on the implementation of the proposed Baicheng Infrastructures component with special attention to the pedestrian and bicycle facilities, the bus priority lanes, street parking, and ITS application for urban traffic control.

vi) **Environmental Management –** To provide technical and managerial assistance and training on the environmental management during the project implementation including construction sites environmental management, major environmental impacts and mitigation measures, internal and compliance environmental monitoring, low carbon water supply system, power conservation and GHG emission reduction. The detailed training topics are listed in the EMP.

D. Due Diligence for the Associated and/or Linked Facilities

(a) The Xibeicha Reservoir

89. The water source of the proposed Baishan WTP is the Xibeicha Reservoir, which is currently under construction, and will be completed and put into operation in 2016. The following paragraphs describe the reservoir in terms of its planning, engineering design, implementation status, and environmental implications. The reservoir's operational regime and related impacts are discussed in

para. 198-205.

90. **FSR and Design.** The Xibeicha Reservoir is designated for municipal water supply (primary purpose), hydropower and flood control (secondary purposes). The FSR was prepared by the Tonghua Hydropower Design Institute, and approved by Jilin Provincial Water Resource Department (WRD) in 2002, with budget estimate of CNY 296.93 million. The preliminary design was completed jointly by the Yinhe Hydropower Design Co. and Bashan Municipal Hydrology & Hydropower Design Institute in 2009, and approved by the Jilin WRD in 2009 with the approval document No. of Ji-Water-Tech-2009-590.

91. **Engineering and Construction.** The reservoir structure is a rock-fill dam with concrete face, side-bank spillway. The diversion structure (conduit system) is located on the right bank of the river, with a length of 4,469 m. It will connect with the planned hydropower plant and the proposed WTP through the transmission pipeline. The major design parameters are shown in **Table III-15**, and the applicable design specifications are as follows: (i) Flood Control Standard of Water Conservancy & Hydropower Engineering (SL252-2000); (ii) Design Specification of Rock-Filling with Concrete Faced Dams (SL228-98); (iii) Design Specification for Earth-Rock Dams (SL274-2001); (iv) Design Specification for Reservoir Spillways (SL253-2000); (v) Design Specification For Hydraulic Tunnel (SL279-2002); and (iv) Specification for Stone masonry Dam (SL25-2006). The reservoir design has been reviewed by the PPTA team and is considered compliant with PRC design specifications for drinking water reservoirs. A small hydropower plant with a capacity of 3.2 MW is planned to be constructed in Wucha village. The plant will utilize hydro potential to generate GHG emission-free electricity and export it to the regional grid. Four turbines, with an output capacity of 800 kW each, will be installed in two power houses that will be continuously maintained by local personnel. The resulting power will be transported to the next sub-station of the regional power supply system where it is fed into the grid. Through this, the fuel mix will be upgraded with renewable energy and greenhouse gas emissions equivalent to 7,000 tons of CO_2 will be reduced every year. The Consultant has reviewed the reservoir design, and concluded that it was sound and basically compliant with relevant design specifications. The IA and the EIA institute reconfirmed that the design of the reservoir and all its approval documents (including FSR, preliminary design and detail design, as well as the EIA) remain valid. The reservoir is currently under construction, and will be completed and put into operation before end of 2016.

Table III-15: Main Characteristic of The Xibeicha Reservoir

No.	Items	Unit	Quantity
1	Catchment area	km^2	128
2	Average runoff flow	m^3/s	1.62
3	Design flood level	m	715.85
4	Check flood level	m	717.28
5	Normal water level	m	713.40
6	Regulating characteristics of the reservoir	-	Single year regulation
7	Total storage capacity of the reservoir	m^3	16.63 million
8	Maximum discharge volume of the spillway	m^3/s	485
9	Type of the dam	-	Rock-filled dam
10	Crest length	m	305.3
11	Maximum height of the dam	m	62.05
12	Type of the discharge structure	-	Spillway
13	Size of the spillway	m	20
14	Length of the water tunnel	m	4,469
15	Capacity of hydropower plant	kW	3,200 (4x800)
16	Annual power generation	kWh/a	12.85 million
17	Location of hydropower plant	-	126°32' E, 42°06'N (Wucha Village)

92. **EIA for the Reservoir.** An EIA for the reservoir was prepared in 2007/2008, and approved by the Jilin Provincial EPD on 25 November 2008 (document No. of Jilin_En2008-304). The EIA confirms that the reservoir is feasible from an environment point for view, and defines, amongst others, the need to ensure that the Xibeicha River downstream of the Xibeicha Reservoir receives a minimum flow at all times in accordance with the rule on minimum flow provision (0.14 m^3/s)[23], and the establishment of drinking water source protection zone (Chapter V of the IEE). The EIA concludes that the Xibeicha River is a small mountain stream, populated by common carp, loaches and catfishes, and that it is not a habitat for migratory fish. The tailrace of the planned hydropower plant is downstream of the Xibeicha reservoir. Thus the power plant is virtually not making any difference on the environment downstream of the reservoir.

(b) Linked MSW landfills

93. **Baishan landfill and leachate treatment facility.** The existing MSW landfill in Baishan was completed and put into operation in 2007, with a total capacity of 1.05 million tons (daily capacity of 350 tons) and a total area of 7.91 ha. The designed service lift is 8 years (from 2007 to the end of 2014).

94. The volume of landfill leachate in the rainy season (about 100 days) and dry season are 30m^3/d and 10m^3/d, respectively. The annual leachate generation is 4,150 m^3/a, which is expected to double to triple after completion of the new landfill expansion (60-90 m^3/d in rainy season and 20-40 m^3/d in dry season). The leachate treatment facility with treatment capacity of 150m^3/d has been completed in 2013, which will be put into operation before the end of March 2014. The capacity of the facility is adequate for treatment of leachate generated by the proposed landfill expansion. The treatment process of the facility is filtration + MVC evaporation + deionization (DI). The effluent of leachate treatment facility is anticipated to meet the PRC Pollution Control Standard for MSW Landfill of GB16889-2008. This will be confirmed through regular monitoring during the operation phase of the project.

95. **Baicheng landfill and leachate treatment facility.** There are two existing MSW landfills in the city. The Baicheng North Landfill is located nearby Yujia Village, with a total area of 2.0 ha. The landfill was built on natural lowland in 2002 without anti-seepage layer. The landfill was put into operation in 2002 and 370,000 tons of MSW have been disposed since then. The landfill was closed recently. The existing Baicheng South MSW landfill is located 10 km southeast of the urban area, with a total area of 44.4 ha and a total capacity of 3.39 million tons (including Phase I of 1.17 million tons and Phase II of 2.22 million tons). Phase I was put into operation in 2006, and will be closed in 2014. Phase II is ready for operation; the designed service life of the Phase II is 13 years (2014-2027).

96. The current leachate treatment plant, which adopts a combined UASB+H/O process, was completed in 2013, with a treatment capacity of 100 m^3/d, and a current treatment load of 20 m^3/a leachate. The effluent of the treatment facility is used as dust control spray water on the landfill site. Once Phase II of the landfill is put into operation, the leachate generation is expected to increase to 50 m^3/d (mid-term) and 80 m^3/d (long-term). The designed capacity of the leachate treatment facility is adequate.

(c) Linked Wastewater Treatment Plants (WWTPs)

97. The proposed Baicheng sewer pipeline sub-component will discharge 9,000 m^3/d of domestic wastewater to the existing Baicheng WWTP. In Baishan, the project will increase wastewater discharge by approximately 40,000 m^3/d (assuming an 80% water supply-to-wastewater conversion factor).

[23] The minimum flow of 0.14 m^3/s was defined based on (i) dry year flow (P=90%) in Xibeicha River; (ii) assessed need to ensure continuous flow in the downstream river for guaranteeing the river ecology and fishes survival.

Therefore due diligence for the existing WWTPs was conducted by the EIA institutes and the PPTA consultants during the PPTA, which is descripted below.

98. **The existing WWTP in Baicheng**. There is an existing WWTP in Baicheng City with a total designed treatment capacity of 100,000 m^3/d, which adopts an activated sludge treatment process. The effluent of WWTP complies with Class 1-B of the PRC Discharge Standard of Pollutants from Municipal WWTPs (GB18918-2002). The WWTP was put into operation in June 2010 by Singapore Santar Group (a BOT project). Due to lack of sewer collection network, the current operation load of WWTP is less than 50%. The proposed ADB financed sewer pipeline work will increase the sewage collection rate by 18% (or 9,000 m^3/d) according to the domestic EIA report. The existing WWTP has sufficient spare capacities to cope with this increased wastewater volume.

Table III-16: Performance of Baicheng WWTP

Parameter	Quality of Current Influent (average concentration)	Quality of Current Effluent (average concentration)	Class I-B Standard GB18918-2002[24]
COD_{cr}	500 mg/l	≤60 mg/l	60
BOD_5	300 mg/l	≤20 mg/l	20
SS	400 mg/l	≤20 mg/l	20
TN	50 mg/l	≤20 mg/l	20
NH_3-N	35 mg/l	≤8 mg/l	8/15[25]
TP	4 mg/l	≤1 mg/l	1
pH	6-9	---	6-9

Source: the EIA Report

99. **The existing WWTP in Baishan City.** The WWTP in Baishan City adopts the Cyclic Activated Sludge Technology (CAST) process with a treatment capacity of 50,000 m^3/d. The WWTP will be expanded to 100,000 m^3/d in 2015-2016 (before WTP completion date). The WWTP was put in normal operation in October 2010. The effluent of the WWTP complies with the Class I-B standard of GB18918-2002 (**Table III-17**).

Table III-17: Performance of Baishan WWTP

Parameter	Quality of Current Influent (average concentration)	Quality of Current Effluent (average concentration)	Class I-B Standard GB18918-2002
COD_{cr}	450 mg/l	≤60 mg/l	60
BOD_5	300 mg/l	≤20 mg/l	20
SS	300 mg/l	≤20 mg/l	20
TN	---	≤20 mg/l	20
NH_3-N	35 mg/l	≤8 mg/l	8/15
TP	3 mg/l	≤1 mg/l	1
pH	----	----	6-9

Source: the EIA Report

100. According to the FSRs and the domestic EIAs, as well as the due diligence conducted jointly by the EIA institutes and the PPTA Consultant, the existing WWTPs in the two project cities have sufficient treatment capacities to receive the wastewater that will be collected in the proposed sewer pipeline networks (including additional wastewater generated by the proposed WTP in Baishan). The effluent from the WWTPs meets the PRC Standard of GB18918-2002. Overall, the impact of the proposed components on the surface water quality is anticipated to be positive if the WWTPs keep normal

[24] The PRC "Pollutants Discharge Standard for Municipal Wastewater Plants".
[25] 8 mg/l -water temperature >12℃; and 15 mg/l- water temperature ≤12℃

operation, and all mitigation measures are implemented. Internal monitoring of basic parameters (pH, BOD, SS) by facility operators, and regular compliance monitoring by the local EPBs during operation will assess possible unanticipated impacts of the project on water quality, and additional mitigation measures and corrective actions will be defined if necessary.

Figure III-5: The existing WWTPs in the cities of Baishan and Baicheng

(d) Linked Baishan Water Supply Plants (WTP)

101. **The WTP in Hunjiang District.** The only existing WTP in Hunjiang Disctrict, Nanshan WTP, is located in southern Hunjiang District with a current treatment capacity of 80,000 m^3/d. The water source of the WTP is the Qujiaying Reservoir, with a storage capacity of 20.3 million m^3. The treatment process at the WTP is coagulation – sedimentation – filtration and disinfection (chlorination). The current water supply capacity cannot meet the district's water demand of 130,000 m^3/d, and the WTP site has no space for expansion.

102. **The WTP in Jiangyuan District.** The existing Jiangyuan WTP, with a treatment capacity of 30,000 m^3/d, is working far below its treatment capacity, due to high fluctuations of yield of its only water source, the Dayangcha River. The river's water quantity and quality cannot meet the requirements: the quality of the water source fluctuates greatly and partly exceeds the PRC Drinking Water Quality Standard (GB5749-2006), partly caused by upstream pollution through ore and coal mines. The proposed water transmission pipeline will supply the Hiangyuan WTP from the Xibeicha Reservoir; the Dayangcha River will be kept as secondary water source to cover emergency situations, such as in case of interruptions of the main transmission line, or during extreme dry years. This dual water sourcing will increase redundancy and thus resilience of the water supply system for Jiangyuan District, recognized as a key adaptation measure to current and future climatic variability. The treatment process at the WTP is coagulation – sedimentation – filtration and disinfection (chlorination). The WTP is technical sound and does not need major repairs or upgrades. The mode of the Jiangyan WTP's operation will not change, only the source of its water. Overall, the supply of the Jiangyuan WTP will significantly improve, and no current water user will be worse off.

IV. ESCRIPTION OF THE ENVIRONMENT (BASELINE)

103. The description of the environment (biophysical and socio-economic) before the project implementation establishes (i) the environmental settings within which the project components will be implemented, and therefore the needs to be designed to suit, and (ii) the environmental values, which will be changed (either negatively or positively) by the project. The baseline environmental monitoring and survey undertaken by local environmental monitoring stations in Baicheng and Baishan, as well as the two EIA Institutes for each of the project components was determined by the feature of the component and proposed the environmental parameters which were relevant to their impact assessment.

A. Environmental Setting of Jilin Province

104. Jilin Province is located in the middle of the northeast of the PRC with the longitude from 121°38' to 131°19' E and the latitude from 40°52' to 46°18' N. The province borders Liaoning Province in the south, Heilongjiang Province in the north, Inner Mongolia Autonomous Region (IMAR) in the west, Russian Federation in the east, and North Korea in the southeast across the Yalu River. The province covers an area of 187,400 km^2, accounting for 2% of the nation's total. The total population of the province was 27.5 million in 2012, accounting for 2% of the nation's total, with the agricultural population of 12.73 million and non-agricultural population of 14.77 million. The provincial capital is Changchun and there are seven prefecture level cities (Jilin, Siping, Tonghua, Baishan, Liaoyuan, Baicheng, and Songyuan) and one minority autonomous state (Yanbian Korean Autonomous State). The GDP of the province achieved 1,193 billion CNY in 2012. The administrative division of Jilin Province is shown in **Figure IV-1**.

105. Jilin Province is located at the east of Eurasia and has temperate continental monsoon climate with long, cold winters and short, warm summers. The average temperatures in January range from -20^{0}C to -14^{0}C. The average temperature in July is 20^{0}C. The annual average frost-free season range 100 to 160 days. The annual sunshine duration is about 2,259 to 3,016 hours. The average annual precipitation is 400-800 mm, mostly occurring during July to September.

106. The eastern part of Jilin Province is the mountainous area of the Changbai Mountains, with an elevation of more than 1,000 m, and the Jidong Hills, 500 m above sea level or lower. Other mountain ranges include the Jilinhada, Zhangguangcai, and Longgang mountains. Jilin is drained by the Yalu and Tumen rivers in the extreme southwest (which together form the border between the PRC and the Democratic People's Republic of Korea), by tributaries of the Liaohe River along the southern border, and by the Songhua and Nenjiang rivers, both eventually flowing into the Amur. In the western part of the province are the Songhua–Liao Plains, whose low and flat western section is the grain production base of the province. The catchment area of Songhua River is 128,200 km^2, which accounts for 65.1% of the province's area. The area of Liaohe River is 12,900 km^2, Tumen River is 33,200 km^2, Yalu River is 61,900 km^2, and Suifen River is 2,400 km^2.

107. Jilin Province is one of the PRC's six major forested areas. Stretching about 500 km, the Changbaishan Mountains are renowned for their biodiversity and natural beauty. The land used for forestry in the province covers 9.72 million ha, accounting for 51.37% of the province's total and ranking 12th in the country. The province's forest coverage is 42.4%. The highest summit in the province, the White Cloud Peak of the Changbaishan Mountains, is 2,691 m above sea level. The prairies in western Jilin are in the center of the Songhua–Nenjiang Prairies, one of the famous grasslands in the PRC. The prairies are known for their rich forage grasses, most of which are perennial rootstock and bushy grasses. They are also one of the breeding bases of commercial cattle and fine-wool sheep in northern PRC. There are 4.379 million ha of grassland in the province, mainly in its western and eastern parts. Its

western part is the easternmost edge of the Euro-Asian grassland, where there are rich water resources and good-quality grass.

108. Jilin province is a nationally important commodity grain and soybean producer. In the agricultural areas, the main farm crops are corn, soybean, paddy rice, wheat, barley, and sorghum. Other important crops are beans, sugar beet, flax, and tobacco.

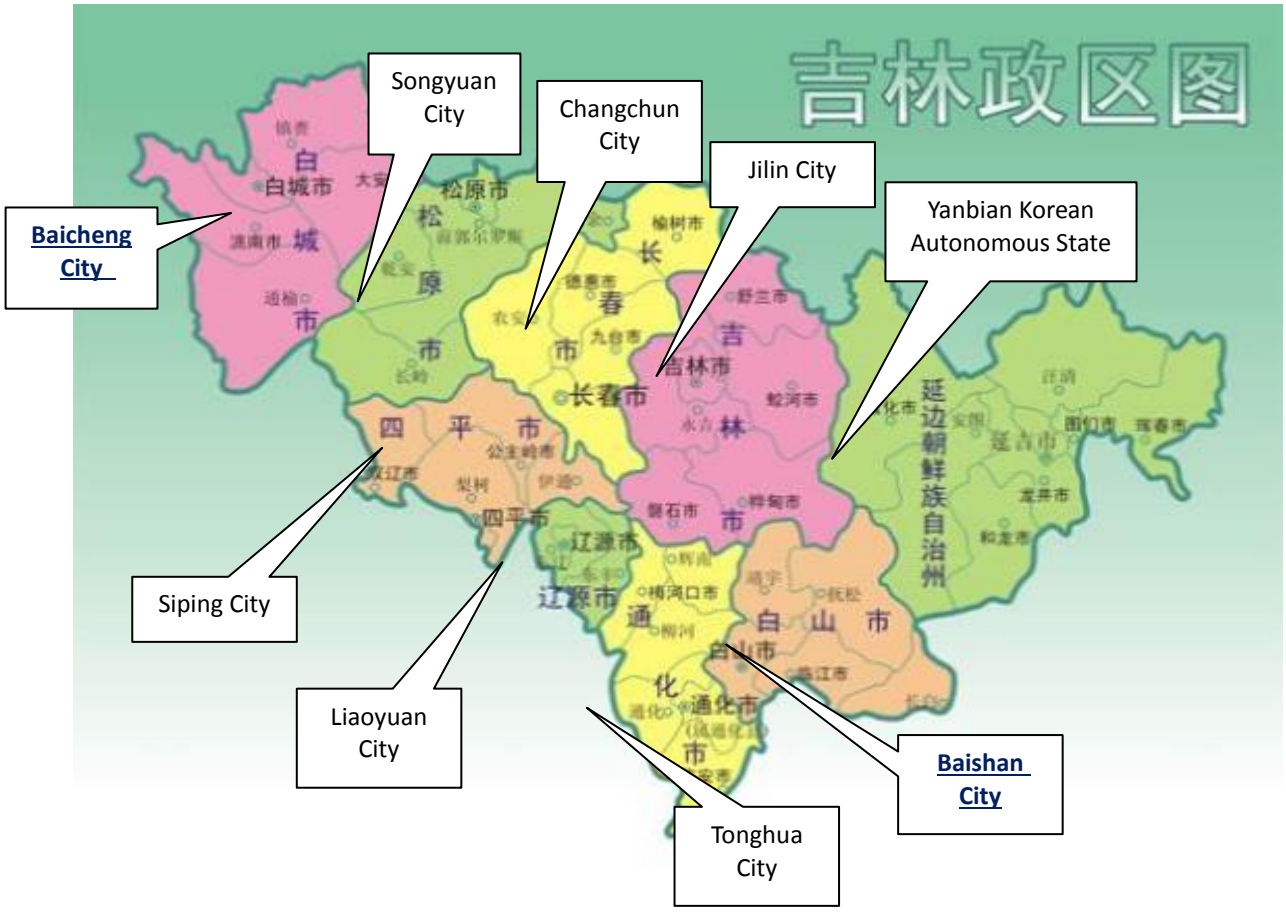

Figure IV-1: Administrative division of Jilin Province

B. Environmental Setting of Baicheng City

(a) Geography, Topography and Geology

109. Baicheng Municipality is located in the northwest of Jilin Province with the longitude from 121°38' to 124°22' E and the latitude from 44°13'57" to 46°18' N. It is bordered with Songyuan City in the south and east, Inner Mongolia in the west, and Heilongjiang Province in the north. The territory of the city is about 230 km in north-south direction and 211 km in the east-west direction with a total area of 25,685 km^2. It is the connection point of Jilin, Inner Mongolia, and Heilongjiang Province. Under its jurisdiction there are one district of Taobei, where the project will be located in, two counties of Tongyu and Zhenlai, and two county-level cities of Taonan and Daan. The total area of Baicheng is 26,000 km^2 with the total population of 2.029 million.

110. The topography of Baicheng from north to southeast are orderly low mountains, hill and plain, and the northwest site is higher. The northwestern part is at the extension of the Large Xingan Mountain

with the elevation at about 300-663 m ASL, the northeastern and southern parts are in hinterland of Songnen Plain with the elevation at about 130-140 m ASL. Baicheng is located on the quaternary alluvial fan by Tao'er River, and the geology is quaternary sediment layer, under which is clay layer, then the gravel bed. The seismic intensity is Grade VII. The main soil type is black earth.

(b) Meteorology and Climate

111. Baicheng has temperate continental monsoon climate with long, cold winters and short, mild summers. The spring is dry and windy, and the autumn is short and cool. The average annual precipitation is 430 mm, mostly occurring during May to September. The characteristic values of local meteorological parameters are shown in **Table IV-1**.

Table IV-1: Main Meteorological Parameters of Baicheng City

Weather elements	Unit	Value
Annual average temperature	°C	5.1
Extremely high temperature	°C	40.6
Extremely low temperature	°C	-42
Average air pressure	100Pa	995.8
Annually average precipitation	mm/a	430
Extremely maximum precipitation	mm/a	726.3
Average wind speed	m/s	3.5
Average evaporation amount	mm/a	1,006
Maximum frozen earth depth	mm	2,430
Dominant wind direction in the entire year		W
Average annual sunlight duration	hour/a	2,919
Average annual frost free season	day	144

Source: EIA report

(c) Hydrological condition and water resources

112. There are nine (9) rivers in Baicheng Municipality, including Nen River, Tao'er River, Huolin River, Jiaoliu River, Najin River, Hu'erda River, Erlongtao River, Emutai River and Wenniugechi River. Within the territory, the Nen River flows from the Shijiazi Village of Dandai Town in Zhenlai County, and out of Baicheng at Sikeshu Village in the Daan, with a total length of 150 km in the territory of Baicheng. The Tao'er River, the first tributary of Nen River, begins at Taobei District, through the Yueliang Lake and flows into Nen River, whose total length in the territory of Baicheng is 285.83 km. There are more than 700 small lakes and ponds in Baicheng with the total area of 270,033 hectares (ha), which is beneficial for aquaculture and irrigation.

113. Baicheng city is located in a semi-arid area with limited surface water resources but rich in groundwater resources. [26] The annual average water resources in Baicheng are 2.272 billion m^3 in total, of which surface water runoff is 189 million m^3 (8.32% of the total) and groundwater is about 2.083 billion m^3 (91.68% of the total). There are eight (8) reservoirs including Yuelingpao, Xianghai, Qunchang, Chuangye, Tuanjie, Xinglong, Shengli and Wujianfang, which are the major water sources in the municipality with a total storage capacity of 1.717 billion m^3.

[26] http://en.cnki.com.cn/Article_en/CJFDTOTAL-GHQJ200403004.htm

114. There is no surface water body within the project area, except an artificial channel to be constructed before 2016 according to the city's master plan. The nearest Tao'er River is 25 km away from the project site.

(d) Ecological resources

115. Baicheng City has 1.17 million ha farmland (45.43% of the city's total area); 405,900 ha of forest land (11.6%); and 377,600 ha of wetland areas. It has two national natural reserves (Xianghai and Momoge) and the Baolawendu provincial natural reserve, which belong to inland wetland and water ecological protection zones. There are 600 vegetation varieties, and 296 breeds of bird, in which the red-crowned crane, white-napped crane, white crane, white-head crane, white stork, white ibis and bustard etc. belong to treasure birds under national protection. The nature reserve areas are the key resting sites for the migration of East Asia migratory birds. **Table IV-2** lists the natural reserves' distance and direction to the Baicheng project site.

Table IV-2: Natural Reserve and Park in Baicheng Municipality

No.	Name of Reserve/park	Location	Distance and direction to Project Site
1	Momoge National Natural Reserve	Zhenpen County	71 km northeast
2	Xianghai National Natural reserve	Tongyu County	62 km southwest
3	Nen River Bay National Wetland Park	Da'an City	102 km east
4	Balawendo Provincial Natural Reserve	Tongyu County	114 km south

Source: the EIA Institute

116. The Baicheng project components will be located in the urban area, where ecological resources are limited due to high population density and activity. Local fauna are mainly made up of grassland and farmland animals. The wild animals include hare, golden weasel, field mouse, magpie, crow and sparrow. The domestic EIA confirmed that there were no legally protected or endangered species within the project's area of direct influence.

(e) Social and economic conditions

117. The total population of Baicheng City was 2.029 million in 2011, in which the agricultural population is 0.689 million and non-agricultural population is 1.34 million. There are 30 ethnic minority groups in Baicheng. The major ethnic groups are Mongol, Man, Hui and Korean. The ethnic minority population accounted for about 6% of the total population in 2011. (see also para. 140)

118. The GDP of Baicheng City reached CNY 61.54 billion in 2012. The ratios of the first, second, and tertiary sectors were 18.2%, 48.8% and 33.0%, respectively. This indicates that industrial production is the main contributor to the local economy and that the tertiary sector is also important for the local economy. The gross agricultural output value was CNY 19.99 billion in 2012, an increase of 11.4% over the previous year. The average income per capita for urban population was CNY30, 571 in 2012, an increase of 11.7% over the previous year.

119. Baicheng has five energy mineral resources, which are petroleum, natural gas, coal, oil shale and oil sand, in which the oil reserve is 195,8 million ton, and natural gas is more than 270 billion m3, and by the end of 2009 the coal reserve is 7.7 million ton. Mining is a pillar industry for the city's economy.

C. Environmental Baselines of the Project Site

(A) Baicheng City

120. Environmental baseline monitoring for Baicheng City was conducted by Baicheng Municipal Environmental Monitoring Station (EMS) during the project preparation. The monitoring results are summarized below.

(a) Surface water quality - Baicheng

121. The baseline monitoring of surface water quality within the project impact area was performed during 24-26 Oct. 2013 along the drainage channel and at Dadongpo Pond (the drainage receiving water body). Three points were selected for the monitoring: point #1 is the domestic sewer drainage channel before the Baicheng WWTP (which will receive and treat wastewater collected in the project sewers); point #2 is after the WWTP treatment; and point #3 is the effluent receiving water body (Dadongpo Pond). The monitoring points are shown in **Table IV-3** and **Figure IV-2**, and the monitoring results are presented in **Table IV-4**.

Table IV-3: Baseline Surface Water Monitoring Locations - Baicheng

No.	Description of Monitoring Location	Purpose of monitoring
#1	The point in the urban drainage channel 1 km prior to the Baicheng industrial park	Influent of the WWTP
#2	The drainage channel	1 km downstream of the WWTP (effluent of the WWTP)
#3	Wastewater discharge receiving area (Dadongpo Pond)	7.5 km downstream of the WWTP

Source: domestic EIA report

Table IV-4: Surface Water Quality in Baicheng City (mg/L, except for pH)

Monitored Parameter	#1	#2	#3	Class III Standard of GB3838-2002	Class II Standard of GB18919-2002
pH	7.46	7.48	7.46	6-9	6-9
COD_{Cr}	248	36	26	20	100
BOD_5	80	17	16	4	30
SS	60	19	17	---	30
NH_3-N	47.4	9.1	8.4	1.0	30

Source: Domestic EIA report.

122. According to **Table IV-4**, the five monitored parameters at the #2 point met the Grade II Standard of Pollutants Discharge from Municipal Wastewater Treatment Plant (18918-2002), which shows that the existing WWTP is operating properly. The four parameters of COD_{Cr}, BOD_5, SS and NH_3-N at the #3 point exceeded the Grade III standard of GB3838-2002, especially for NH_3-N, caused by discharge of untreated domestic wastewater, and non-point source pollution (agriculture).

(b) Groundwater quality - Baicheng

123. Groundwater quality in the project area was monitored by the Taobei District EMS on 28 November 2013. The monitoring locations are shown in **Table IV-5 and Figure IV-2**. The monitoring results are shown in **Table IV-6.** The national Grade III Groundwater Quality Standard of GB14848-93 applies to the project site according to the local environmental functional zoning.

Table IV-5: Description of Baseline Groundwater Monitoring Locations - Baicheng

Sampling Code	Monitoring Location	Well depth (m)
#1	Mafang Road	20
#2	Erlong Village	25
#3	The existing landfill site	30

Source: Domestic EIA report

Table IV-6: Groundwater Quality - Baicheng (mg/L, except for pH and coliform)

Parameter	1#	2#	3#	Grade III Standard of GB14848-93
pH	7.15	7.08	7.24	-
NH_3-N	0.085	0.080	0.076	0.2
COD_{Mn}	0.5L	0.5L	0.68L	3.0
Total coliforms	<3	94	<3	≤3

Source: Domestic EIA report

124. Table IV-6 shows that the three monitored parameters of pH, NH_3-N and COD_{mn} met the Grade III of the National Groundwater Quality Standard, and the total coliform of #2 point exceeded the standard, most likely as a result of contamination by untreated domestic wastewater discharge.

(c) Ambient Air Quality - Baicheng

125. Daily average ambient air quality was monitored by the EMS for seven consecutive days in August 2013. Six samples were taken within the project area, in which the first four sites (#1 to #4) were monitored for the infrastructure component, while the last two sites (#5 and #6) were for the MSW component. The monitoring locations are shown in **Figure IV-2** and **Table IV-7,** and the baseline data are shown in **Table IV-8**. The applicable standard is Grade II of National Ambient Air Quality Standard (GB3095-1996).

Table IV-7: Baseline Air Monitoring Locations - Baicheng

Sampling Code	Monitoring Location	Description
#1	Erlong Village	West (upwind) of the project area
#2	Baicheng Normal college	Middle of the project area
#3	Xiangyang Village	South of the project area
#4	Changqing Village	North of the project area
#5	Mafang Waste transfer station	Air quality at a typical existing MSW transfer station
#6	MSW Sorting/composting Center	Air quality at the location for the MSW Sorting/composting Facility

Source: the EIA Report

Table IV-8: Daily Average Concentrations of the Monitored Pollutants – Baicheng

Monitoring Parameter	Monitoring Location	Concentration Range	Class II Standard of GB3095-1996	*EHS Guideline*	Assessment Result
PM_{10} (mg/m^3)	#1	0.053-0.081	0.15	*0.075-0.15*	Meet
	#2	0.052-0.081			Meet
	#3	0.052-0.080			Meet
	#4	0.053-0.077			Meet
	#5	0.057-0.092			Meet
	#6	0.056-0.085			Meet
TSP (mg/m^3)	#1	0.089-0.129	0.3	-	Meet
	#2	0.086-0.134			Meet

Monitoring Parameter	Monitoring Location	Concentration Range	Class II Standard of GB3095-1996	*EHS Guideline*	Assessment Result
	#3	0.090-0.130			Meet
	#4	0.088-0.140			Meet
	#5	0.095-0.144			Meet
	#6	0.094-0.145			Meet
SO_2 (mg/m^3)	#1	0.016-0.027	0.15	*0.125-0.05*	Meet
	#2	0.018-0.029			Meet
	#3	0.018-0.028			Meet
	#4	0.018-0.028			Meet
	#5	0.019-0.028			Meet
	#6	0.018-0.028			Meet
NO_2 (mg/m^3)	#1	0.019-0.028	0.12	*0.04-0.20*	Meet
	#2	0.018-0.026			Meet
	#3	0.019-0.026			Meet
	#4	0.020-0.027			Meet
	#5	0.020-0.028			Meet
	#6	0.020-0.029			Meet

Source: Domestic EIA Report.

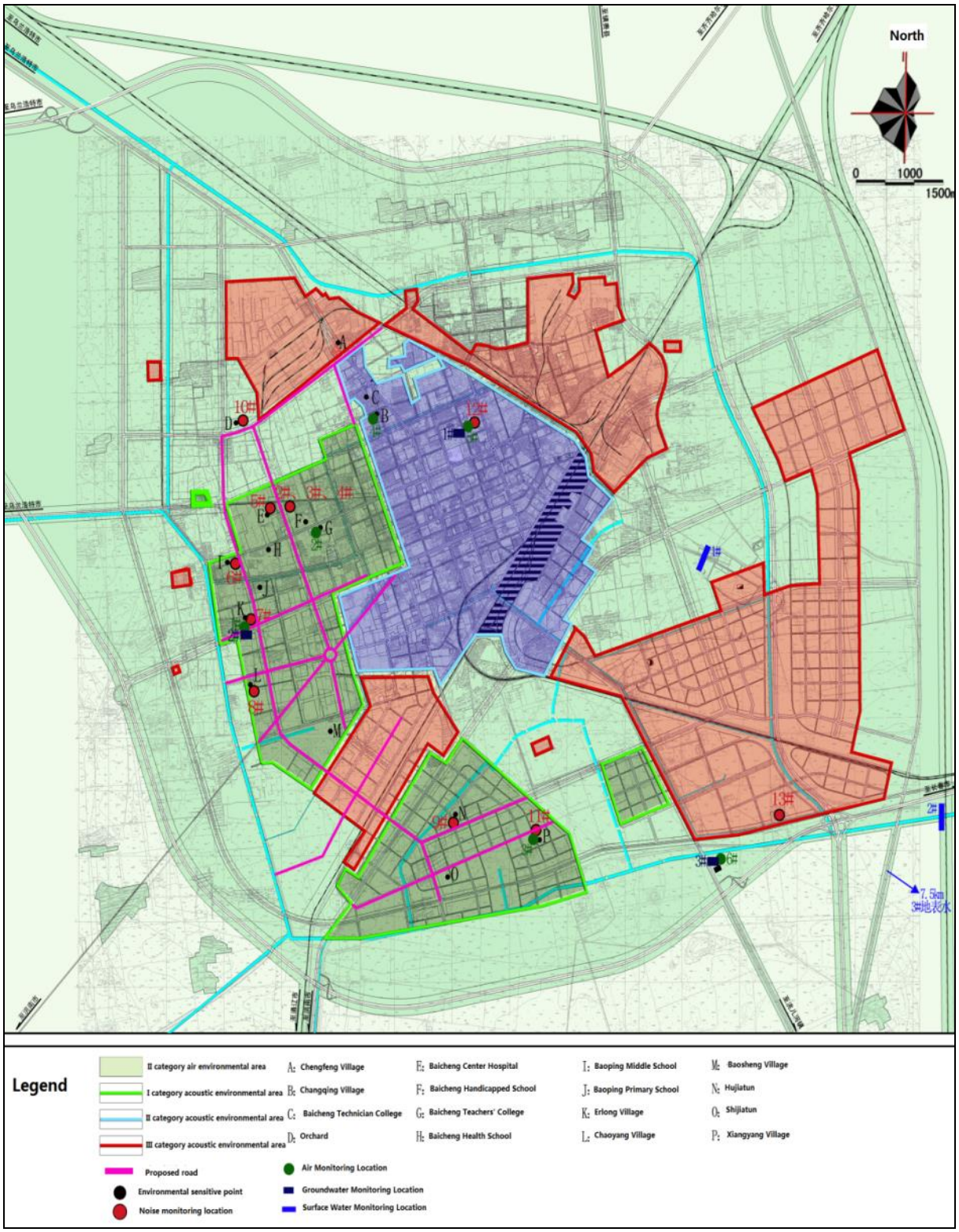

Figure IV-2: Environmental Baseline Monitoring Locations and Environmental Sensitive Receptors for Baicheng Infrastructures and MSW Components *(Source: the EIA Institute)*

126. According to **Table IV-8**, the quality of the monitored ambient air in the project area all met the Grade II of National Ambient Air Quality Standard (GB 3095-1996), as well as the guideline values

recommended in the World Bank Group's EHS Guidelines. Since baseline monitoring was conducted in August only, the baseline might not be fully representative for the year, but (i) this is baseline monitoring conducted in the framework of domestic EIA preparation (in accordance with PRC EIA requirements); (ii) lowest air quality is during winter time, during which no construction is ongoing, and (iii) August is the peak construction period, so the values should be representative enough to assess construction induced air quality problems.

(d) Acoustic environment - Baicheng

127. Noise monitoring within the project area was conducted on 28 October 2013 at or nearby each of the construction sites. Thirteen points were selected in the BEDZ for the monitoring. The monitoring points are shown in **Figure IV-2** and **Table IV-9**, and the monitoring results are listed in **Table IV-10** below.

Table IV-9: Baseline Noise Monitoring Locations for the Project - Baicheng

Sampling Code	Monitoring Location	Sensitive Receptor	Description
#1	Xingfubei Street	Chengfeng Village	60m southeast of the road
#2	Xiangyang Street	Handicapped school	40m west of the road (first floor of the school)
#3	Xiangyang Street	Handicapped school	Second floor of the school
#4	Xiangyang Street	Handicapped school	Third floor of the school
#5	Xiangyang Street	Baicheng Center Hospital	160m west of the road
#6	Sanhuan Road	Baiping Middle School	40m west of the road
#7	Sanhuan Road	Erlong Village	20m west of the road
#8	Sanhuan Road	Chaoyang Village	80m west of the road
#9	Sanhuan Road	Hujiatun	20m north of the road
#10	Sanhuan Road	Orchard	200m north of the road
#11	Tao'erhe Road	Xiangyang Village	60m south of the road
#12	Mafang Waste transfer Station	Residential area	160m west of the project
#13	MSW Sorting/composting Site	Plant	---

Source: domestic EIA report

Table IV-10: Baseline Noise Monitoring Data - Baicheng (dB(A))

No.	Monitoring Result		GB3096-2008	EHS Guideline	Assessment Result
#1	Day	48.1	60 (Grade II)	55	Meet
	Night	43.6	50 (Grade II)	45	Meet
#2	Day	49.2	70 (Grade 4a)	55	Meet
	Night	43.8	55 (Grade 4a)	45	Meet
#3	Day	48.5	60 (Grade II)	55	Meet
	Night	44.2	50 (Grade II)	45	Meet
#4	Day	48.3	60 (Grade II)	55	Meet
	Night	41.6	50 (Grade II)	45	Meet
#5	Day	49.2	60 (Grade II)	55	Meet
	Night	42.3	50 (Grade II)	45	Meet
#6	Day	52.7	70 (Grade 4a)	55	Meet
	Night	41.9	55 (Grade 4a)	45	Meet
#7	Day	53.2	70 (Grade 4a)	55	Meet
	Night	42.1	55 (Grade 4a)	45	Meet
#8	Day	51.3	60 (Grade II)	55	Meet
	Night	40.5	50 (Grade II)	45	Meet

No.	Monitoring Result		GB3096-2008	EHS Guideline	Assessment Result
#9	Day	48.3	70 (Grade 4a)	55	Meet
	Night	41.2	55 (Grade 4a)	45	Meet
#10	Day	43.7	60 (Grade II)	55	Meet
	Night	39.6	50 (Grade II)	45	Meet
#11	Day	51.6	60 (Grade II)	55	Meet
	Night	42.3	50 (Grade II)	45	Meet
#12	Day	53.9	60 (Grade II)	55	Meet
	Night	46.7	50 (Grade II)	45	Meet
#13	Day	51.5	65 (Grad III)	---	Meet
	Night	42.6	55 (Grade III)	---	meet

Source: Domestic EIA Report

128. The monitoring results **(Table IV-10)** show that the sound levels of the proposed MSW sorting and composting site met the Environmental Quality Standard for Noise (GB 3096-2008) – Grade III (65 dB(A) for daytime and 55 dB(A) for nighttime). Other monitoring locations met the applicable standards of Grade 4a (70 dB(A) for daytime and 55 dB(A) for nighttime) and Grade II (60 dB(A) for daytime and 50 dB(A) for nighttime). All points complied with the EHS Guideline value (55 dB(A) for daytime and 45 dB(A) for nighttime).

D. Sensitive Receptors within Project Area of Influence

129. Sensitive receptor for impacts during both construction and operation of the project components have been identified in the domestic EIA Report, these comprise nearby villages, school etc. (**Figure IV-2** above and **Table IV-11**).

Table IV-11: Sensitive Receptors within Project Area of Influence - Baicheng

No.	Project	Sensitive receiver	No. of household	Distance & Direction of Rd
1	Xinhuaxi Road	Erlong Village (K)[27]	100	30m north of the road
2	Chunyang Road	Chaoyang Village (L)	14	80m south of the road
3	Xingfubei Street	Changqing Village (B)	23	50m east of the road
4	Sanhuan Road	Chengfeng Village (A)	20	45m north of the road
		Orchard Village (D)	51	60m west of the road
		Baoping Middle School (I)	200	65m west of the road
		Baoping Primary School(J)	150	80m east of the road
		Erlong Village (K)	100	65m west of the road
		Chaoyang Village (L)	62	90m west of the road
		Baosheng Village (M)	87	85m east of the road
		Xiangyang Village (P)	37	45m on both sites of the road
5	Tao'erhe Road	Xiangyang Village (P)	18	40m on both sites of the road
6	Xiangyang Street	The Center Hospital (E)	200	150m west of the road
		The Special School (F)	230	35m west of the road

[27] Letter on Figure IV-3

No.	Project	Sensitive receiver	No. of household	Distance & Direction of Rd
		The Teachers College (G)	720	40m east of the road
		Baosheng Village (M)	87	80m south of the road
7	Shengli Road	Chaoyang Village (L)	62	60m south of the road
8	Nanyi Street	Xiangyang Village (P)	37	45m east of the road
9	Xinggong Road	-	-	-
10	MSW Sorting and Composting Site		-	

Source: The EIA Report.

E. Environmental Setting of Baishan City

(a) Geography, Topography and Geology

130. Baishan City is located in the southeast of Jilin Province, at about 292 km south of Changchun City (the provincial capital), with the longitude from 126°07' to 128°18' E and the latitude from 41°21' to 42°49' N, in the western side of the Changbai Mountain. The city is surrounded by Yanbian Korean Autonomous Prefecture in the east, Tonghua City in the west, Jilin City in the north, and North Korea in the south across the Yalu River. The city is located in the mountainous area of Changbai Mountain, covered with thick forest. The total area of the city is 17,485 km^2 with the population of 1.308 million (including an urban population of 467,000). The total GDP was CNY53.1 billion in 2012, ranked 8th among all 49 cities/counties in Jilin Province, and the GDP per capita was CNY41,325, ranked 12th in the province. The annual disposable income for the urban resident was CNY18,483, ranked as the second from the last among all nine prefectures and cities.

131. Baishan City is located in the west side of the Changbai Mountain, with the dimension of 180 km from east to west and 163km from north to south. The Changai lava plateau and Jingyu lava plateau cover the most area of the city. There are two mountain ranges of Longgang and Laoling in Baishan City, the elevation of Longgang Mountain range is 800-1200 m ASL with the relative height of 500-700 m, and the elevation of Laoling Mountain range is 1000-1300 m ASL with the relative height of 500-800 m. The seismic intensity in the project area is Grade VI. The main soil types in the project area are brunisolic soil, albic soil, and black earth.

(b) Meteorology and Climate

132. Baishan City has temperate continental monsoon climate with long, cold winters and short, warm summers. The average annual precipitation is 883.4 mm, mostly occurring during May to September. The annual average temperature is 4.6℃. The characteristic values of local meteorological parameters are shown in **Table IV-12**.

Table IV-12: Main Meteorological Parameters of Baishan City

Weather elements	Unit	Value
Average temperature	°C	4.6
Max. temperature	°C	36.5
Min. temperature	°C	-42.2
Annually average precipitation	mm/a	883.4
Average wind speed	m/s	2.35

Weather elements	Unit	Value
Average annual evaporation	mm/a	1,096
Maximum frozen earth depth	mm	1,650
Dominant wind direction		SW
Average annual sunlight	hrs	2,259
Average annual frost free season	days	140

Source: Domestic EIA report

(c) Hydrological condition and water resources

133. There are two river systems (Yalu River and Songhua River) in the area, in which the Yalu River is the main river system. The Yalu River originates from the northwest of the Laoyeling Mountain; the Hunjiang River is the biggest tributary of the Yalu River. In the area, the dry season of a year is from December to March, the spring flood season is from April to June while the summer flood season is from July to August. The City is located on the upstream of the Hunjiang River, with an average flow of 20.9 m^3/s, and a total average annual runoff volume of 420 million m^3. There is one middle-size reservoir (Qujiaying reservoir) and four small-size reservoirs in the city, with the total storage capacity of 34.79 million m^3.

134. The Xibeicha River is a first tributary of Hunjiang River with the total length of 19.25 km, the total catchment area of 157.1 km^2, and the current average flow of 1.62 m^3/s (51.2 million m^3/a). the associated Xibeicha Reservoir is located on the midstream of the Xibeicha River with the total designed capacity of 13.5 million m^3 and dead storage of 0.6073 million m^3. Downstream the reservoir, the Xibeicha River follows 9 km before it merges into the Hunjiang River. The length of Hunjiang River in Baishan Municipality is 67.7 km with the river basin area of 1,734.2 km^2, and the average annual flow of Hunjiang River is 2.11 billion m^3.

135. The groundwater of Baishan City is divided into five types, interstitial water from rock, fissure water from basalt, fissure water from clastic rock, fissure water from carbonate rock and fissure water from bed rock. The chemical component of groundwater is mainly bicarbonate. The groundwater resource amount in Baishan is 252 million m^3 which accounts for 18% of total water resource amount of the city. Groundwater currently supplies for small water treatment plants, including Pearl Gate (Zhenzhumen Gate), Kucanggou, and Jinying, with capacities of 9,000 m^3/d, 5,000 m^3/d, 10,000 m^3/d respectively. Due to groundwater pollution, these WTP are planned to be phased out. There are 130 natural mineral water sources in the city with the total flow rate of 257,100 m^3/d.

(d) Ecological resources

136. Baishan City has 14,761 km^2 forests with afforest coverage of 83%. 60% of the Changbai Mountain Natural Reserve is in Baishan City. The ample forest resources provide the advantageous survival condition for the wild fauna and flora. There are more than 350 breeds of wild fauna in Baishan, in which there are 37 breeds of national protected animals, such as Manchurian tiger, brown bear, lynx, and musk deer. And there are more than 2,300 vegetation varieties, in which more than 900 medicinal plant varieties (ginseng, ganoderma, rhodiola rosea, gastrodia elata), 1,500 economic plant varieties, more than 200 food plant varieties.

137. The Baishan project components will be located on the foot of the Changbai Mountain and close or within the urban area. The domestic EIAs recorded no rare or endangered wildlife species or impact of the proposed works on any protected area or habitat area. Aquatic biodiversity in the Xibeicha River is

reported in the FSR and EIA as uniformly low. Species noted were common carp and loach species. Nature reserves and the protected parks within 100 km from the project site are listed in Table **IV-13** below. These are outside the project's area of influence.

Table IV-13: Natural Reserves in Baishan

No.	Name of Reserve/park	Location	Distance and direction to Project Site
1	Changbai Mountain National Natural Reserve	Fushong County	100 km east
2	Jingyu Provincial Natural reserve	Jingyu County	35 km northeast

Source: the EIA Institute

(e) Socio-economic conditions

138. Baishan was an important timber production center relying on harvesting trees from the Changbai Mountain forest. Since the PRC and Jilin province governments started to limit tree cutting for forest protection in the late 1980's, the city became a resource exhausted city and faced challenges to find new development directions for economic transformation. The city then has shifted the economic development direction to tourism development and natural goods production such as spring water and wild mushrooms. The annual GDP of Baishan City reached CNY 60.06 billion in 2012. The ratios of the first, second, and tertiary sectors are 8.9%, 59.6% and 31.5%, respectively. This indicates that industrial production is the main contributor to the local economy and that the tertiary sector is also important for the local economy. The gross agricultural output value was CNY 5.36 billion in 2012, an increase of 5.4% over the previous year. The average income per capita for urban population was CNY21, 282 in 2012, an increase of 15.1% over the previous year.

139. **Poverty incidence:** The urban poverty incidence of Baishan and Baicheng cities is 12.5% and 10.2%, respectively. Lack of labor, disease, unemployment and disabled are the main causes to make households poor.

140. **Ethnic minorities (Baishan and Baicheng):** About 188,600 ethnic minority people, accounting for 5.75% of total population, live in two project cities, mainly Manchu, Mongolia and Korea people. Most of them live in Changbai Korean Autonomous County and nine ethnic minority townships. The project will not be constructed in the ethnic minority areas. The Poverty and Social Assessment (PSA) and resettlement plans concluded that no centralized ethnic minority communities will be affected by the project. 45 ethnic minority persons from Manchu and Mongolia peoples, accounting for 2.35% of total APs, will be affected by land acquisitions and resettlement of the project; however, most of them are living in the project area in families married with Han nationality people. In addition, all of them understand Chinese language and are living in the same communities with Han people. They have the same economic status and living conditions. Therefore, no specific measures are prepared for ethnic minority peoples for the project.

F. Environmental Baseline of the Project Sites - Baishan

141. The two Baishan project EIAs were prepared by two different EIA teams, consequently, environment baseline monitoring was also conducted separately. The monitoring results are summarized below.

(a) Surface water quality

142. **Baishan water supply component.** The baseline monitoring of surface water quality was performed by the EMS for the Xibeicha River and Hunjiang River on 14 August 2013. The monitoring locations are shown in **Figure IV-3**. The national standard adopted for the water quality assessment is National Surface Water Quality Standard of GB 3838-2002), Grade III standard for the Hunjiang River. The monitoring results are summarized in **Table IV-14**. The Monitoring result shows that the five

monitored parameters of pH, COD_{Cr}, BOD_5, petroleum and NH_3-N all met the Grade III standard of GB3838-2002.

Table IV-14: Surface Water Quality – Baishan Water Supply Component (mg/L, except pH and temperature)

Parameter	1# (Xibeicha River)	2# (No.501 Bridge on Hun River	3# (Hun River at 1 km downstream of effluent discharge point of the WWTP)	Grade III Standard
pH	7.34	8.05	7.59	-
COD_{Cr}	5	10.4	18.0	20
BOD_5	2	2	2	4
Petroleum	0.04	0.04	0.04	0.05
NH_3-N	0.05	0.06	0.2	1.0
SS	4	12	6	-
Cr^{+6}	0.004	0.004	0.004	0.05
Volatile phenol	0.002	0.002	0.002	0.005

Source: The EIA report.

143. The Xibeicha Reservoir will be the water source of the proposed WTP. Since the reservoir has not yet been completed, the water sample was taken at the designed reservoir location in the current Xibeicha River on 14 August 2013 by the EMS. The monitoring result shows that all monitored parameters meet the Grade II standard of GB3838-2002 (**Table IV-15**).

Table IV-15: Water Quality of Xibeicha River[28] – Baishan Water Supply Component (mg/L, except pH and temperature)

Parameter	Value	Grade II Standard	Parameter	Value	Grade II Standard
pH	7.34	-	Hg	0.00001L	0.00005
Sulfate	16.42	250	Cyanide	0.04L	0.05
Chloride	3.62	250	Fe	0.03L	0.3
Nitrate nitrogen	2.06	10	Mn	0.01L	0.1
COD_{Mn}	1.35	4	Cu	0.05L	1.0
CODcr	5L	15	Zn	0.05L	1.0
Pb	0.001L	>6	LAS	0.05L	0.2
BOD_5	2L	3	Se	0.005L	0.01
Fluoride	0.022	1.0	As	0.0005L	0.05
Volatile Phenol	0.002L	0.002	Cd	0.0001L	0.005
Petroleum	0.01L	0.05	Cr^{+6}	0.004L	0.05
NH-N	0.05	0.5			

L = lower than detection limit. Source: Domestic EIA Report.

144. In order to guarantee drinking water safety, the Baishan Municipal EMS conducted supplementary monitoring at three points of the Xibeicha River in November 2013. None of the monitored 17 pesticides (No. 23-40 in Table IV-16) was detected, and all other monitored parameters met the PRC Drinking Water Quality Standard of GB5749-2006 (Table IV-10). The monitoring result shows that the raw water of the WTP is good.

[28] Sampling at the Xibeicha Reservoir location

Table IV-16: Water Quality of Xibeicha Reservoir – Water Supply Component (mg/L, except pH and temperature)

No.	Parameter	Monitored Value	Standard Value	Standard Compliance
1	pH	7.34	6.5-8.5	Meet
2	Odor and Taste	No odor and taste	No odor and taste	Meet
2	Sulfate (mg/L)	16.42	250	Meet
3	Chloride (mg/L)	3.62	250	Meet
4	Nitrate nitrogen (mg/L)	2.06	10	Meet
5	COD_{Mn} (mg/L)	1.35	3	Meet
6	COD (mg/L)	5.0	15	Meet
7	Pb	0.001L	0.01	Meet
8	BOD5	2L	3	Meet
9	Fluoride	0.022	1.0	Meet
10	Volatile Phenol	0.002L	0.002	Meet
11	Petroleum	0.01L	0.05	Meet
12	NH_3-N	0.05	0.5	Meet
13	Cyanide	0.04L	0.05	Meet
14	Fe	0.03L	0.3	Meet
15	Mn	0.01L	0.1	Meet
16	Cu	0.05L	1.0	Meet
17	Zn	0.05L	1.0	Meet
18	LAS	0.05L	0.2	Meet
19	Se	0.005L	0.01	Meet
10	As	0.0005L	0.05	Meet
11	Cd	0.0001L	0.005	Meet
12	Cr+6	0.004L	0.05	Meet
23	Malathion (mg/L)	Not detected	0.25	Meet
24	PCP (mg/L)	Not detected	0.009	Meet
25	HCH (total amount, mg/L)	Not detected	0.005	Meet
26	Hexachlorobenzene (mg/L)	Not detected	0.001	Meet
27	Dimethoate (mg/L)	Not detected	0.08	Meet
28	Parathion (mg/L)	Not detected	0.003	Meet
29	Bentazone (mg/L)	Not detected	0.3	Meet
30	Parathion-methyl (mg/L)	Not detected	0.02	Meet
31	Chlorothalonil (mg/L)	Not detected	0.01	Meet
32	Mercury (Hg, mg/L)	0.00001L	0.001	Meet
33	Carbofuran (mg/L)	Not detected	0.007	Meet
34	Lindane (mg/L)	Not detected	0.002	Meet
35	Chlopyrifos (mg/L)	Not detected	0.03	Meet
36	Glyphosate (mg/L)	Not detected	0.7	Meet
37	DDVP (mg/L)	Not detected	0.001	Meet
38	Arazine (mg/L)	Not detected	0.002	Meet
39	Deltamethrin (mg/L)	Not detected	0.02	Meet
40	DDT（mg/L）	Not detected	0.001	Meet

Source: the domestic EIA Report

145. **Baishan MSW component.** The monitoring of surface water quality was performed by the Baishan Municipal EMS during 11-13 September 2013. The monitoring locations are shown in **Figure IV-3** and **Table IV-17**. The national standard adopted for the water quality assessment is National Surface Water Quality Standard of GB 3838-2002, Grade III standard for the Hunjiang River[29] according to the local environmental functional zoning. The average monitoring results are summarized in **Table IV-18**.

Table IV-17: Baseline Surface Water Monitoring Locations – Baishan MSW Component

Sampling Point	River Section of monitoring
#1	Estuary of Hunjiang River
#2	Qidaohe section of Hunjiang River
#3	Xi Village section of Hunjiang River

Source: The EIA report.

Table IV-18: Surface Water Quality – Baishan MSW Component

Parameter	1#	2#	3#	Grade III Standard
pH	8.21	8.61	8.19	-
COD_{Cr} (mg/L)	11.83	13.83	15.70	20
BOD_5 (mg/L)	2.0L	2L	2L	4
Petroleum (mg/L)	0.01L	0.01L	0.01L	0.05
NH_3-N (mg/L)	0.02L	0.16	0.01L	1.0

Source: The EIA report.

146. According to **Table IV-20**, all monitored parameters meet the Grade III standard of GB3838-2002, which indicate that the water quality of Hunjiang River (Baishan section) is generally good.

(b) Groundwater quality

147. **Baishan Water Supply Component.** The baseline groundwater quality was monitored by the Baishan EMS on 14 August 2013. The three monitoring locations are shown in the **Figure IV-3** and **Table IV-14**. According to the local environment functional zoning, the National Groundwater Quality Standard of GB/T14848-93 – Grade III applies to the project area. The monitoring result is shown in **Table IV-20**, which indicates that the quality of the monitored groundwater met the Grade III of the National Groundwater Quality Standard (GB/T14848-93).

Table IV-19: Ground Water Quality Monitoring Location – Baishan Water Supply Component

Sampling Code	Monitoring Location	Depth from ground (m)
#1	Ailin Village	5
#2	Shangdianzi Village	5
#3	Hunjiang District	20

Source: Domestic EIA Report

Table IV-20: Groundwater Quality – Baishan Water Supply Component

(mg/L, except for pH and coliform)

Parameter	1#	2#	3#	Grade III Standard
pH	6.70	7.19	7.27	-
Total Hardness	74	362	296	450
Sulfate (SO_4)	18.94	87.71	43.46	250

[29] See Map D.

Parameter	1#	2#	3#	Grade III Standard
NH_3-N	0.02	0.02	0.02	0.2
NO_2-N	0.05	0.05	0.05	0.02
COD_{Mn}	1.2	1.4	1.5	3.0
Fluoride (F)	0.18	0.58	0.27	1.0
Cr_6	0.004	0.004	0.004	0.05
Arsenic (As)	0.0005	0.0035	0.0022	0.05
Iron (Fe)	0.03	0.03	0.03	0.3
Zn	0.05	0.05	0.05	1.0
Cu	0.05	0.05	0.05	1.0
Mercury (Hg)	0.00001	0.00001	0.00001	0.001
Lead (Pb)	0.001	0.001	0.001	0.05
Cadmium (Cd)	0.0001	0.0001	0.0001	0.01
Manganese (Mn)	0.01	0.01	0.01	0.1

Source: Domestic EIA report.

148. **Baishan MSW Component.** The National Groundwater Quality Standard (GB/T14848-93) – Grade III is applied for the project area. The baseline monitoring was conducted by the Baishan EMS on 23 September 2013. The monitoring locations are shown in the **Figure IV-3** below. The monitoring results are shown in **Table IV-21.** According to the monitoring results, the NO_3-N at 1# point exceeded the Grade III standard of GB/T14848-93 due to pollution from sewer discharge, while other monitored parameters met the standard.

Table IV-21: Baseline Groundwater Quality – Baishan MSW Component

(mg/L, except for pH and coliform)

Parameter	1# Daqiaogou Area	2# proposed landfill site	3# Jiangbeitun Village	Grade III Standard
pH	7.25	7.49	7.43	6.5-8.5
NH_3-N	0.02L	0.02L	0.02L	0.2
NO_2-N	0.05L	0.05L	0.05L	0.02
Arsenic (As)	0.0005L	0.0005L	0.0005L	0.05
Mercury (Hg)	0.00001L	0.00001L	0.00001L	0.001
Cr^{6+}	0.004L	0.005	0.004L	0.05
Total Hardness ($CaCO_3$)	310	216	232	450
NO_3-N	21.09	1.57	3.03	20
Volatile Phenol	0.002L	0.002L	0.002L	0.002

Source: The EIA report. L – lower than detection limit

(c) Ambient Air Quality

149. **Baishan Water Supply Component.** The baseline of ambient air quality in the project locations was monitored by the EMS for five consecutive days during 9-13 August 2013. Three samples were taken at the sites where the Grade II of Ambient Air Quality Standard (GB 3095-1996) is applicable. The monitoring locations are shown in **Figure IV-9**. **Table IV-13** summaries the monitoring results, which show that all monitored parameters of SO_2, NO_x and TSP satisfy the PRC standard. Daily SO_2 levels exceeded EHS guideline values by a slight margin.

Table IV-22: Daily Average Concentrations of Pollutants – Baishan Water Supply Component

Monitoring Parameter	Monitoring Location	Concentration (mg/m3)	Value of Class II Standard	EHS Guideline Value	Assessment Result
TSP (mg/m^3)	#1	0.049-0.097	0.3	-	Meet
	#2	0.041-0.095	0.3		Meet

Monitoring Parameter	Monitoring Location	Concentration (mg/m3)	Value of Class II Standard	EHS Guideline Value	Assessment Result
	#3	0.047-0.086	0.3		Meet
SO_2 (mg/m^3)	#1	0.063-0.078	0.15	0.125-0.05	Meet
	#2	0.065-0.078	0.15		Meet
	#3	0.069-0.076	0.15		Meet
NO_2 (mg/m^3)	#1	0.025-0.046	0.12	0.04-0.20	Meet
	#2	0.029-0.043	0.12		Meet
	#3	0.032-0.046	0.12		Meet

Source: Domestic EIA Report.

150. **Baishan MSW Component.** The baseline ambient air quality (NO_2, PM_{10}, SO_2) at the project locations was monitored by the EMS for seven consecutive days, from 24 September to 1st October 2013, and the NH_3 and H_2S was monitored by the Sanitation Test Center of Jilin University during the same period. The applicable standard for the parameters of NO_2, PM_{10} and SO_2 is the Grade II of Ambient Air Quality Standard of GB 3095-1996. The Sanitation Design Standard for Industrial Facilities (TJ36-79) – Residential Area is applied for the NH_3 and H_2S. The monitoring locations are shown in **Table IV-23** and **Figure IV-12**. **Table IV-24** summaries the monitoring results.

Table IV-23: Baseline Air Monitoring Locations – Baishan MSW Component

Sampling Code	Monitoring Location	Direction from the Project	Distance to the Project (m)
#1	Guanmenlizi	West	2000 m upwind
#2	Daqiaogou	Southwest	800 m upwind
#3	Proposed Landfill	-	-
#4	Qingshanhu	Northeast	2000 m downwind
#5	Qinggouzi	North	1500 m crosswind
#6	Shirengou	Southeast	1100 m cross-downwind
		Exact sampling point	
#7	Gulan Station	Guotai Road	
#8	Caizheng Station	Caizheng Community	
#9	Diantielu Station	Dongsheng Road	

Source: The EIA Report.

Table IV-24: Daily Average Concentrations of the Pollutants – Baishan MSW Component

Monitoring Parameter	Monitoring Location	Daily Average Concentration	Grade II Standard of GB3095-96	EHS Guideline Value	Assessment Result
PM_{10} (mg/m^3)	#1	0.037-0.059	0.15	0.075-0.15	Meet
	#2	0.035-0.059	0.15		Meet
	#3	0.036-0.054	0.15		Meet
	#4	0.036-0.051	0.15		Meet
	#5	0.034-0.052	0.15		Meet
	#6	0.037-0.059	0.15		Meet

Monitoring Parameter	Monitoring Location	Daily Average Concentration	Grade II Standard of GB3095-96	EHS Guideline Value	Assessment Result
	#7	0.036-0.059	0.15		Meet
	#8	0.035-0.054	0.15		Meet
	#9	0.036-0.052	0.15		Meet
SO_2 (mg/m^3)	#1	0.045-0.075	0.15	0.125-0.05	Meet
	#2	0.047-0.075	0.15		Meet
	#3	0.048-0.072	0.15		Meet
	#4	0.046-0.068	0.15		Meet
	#5	0.047-0.071	0.15		Meet
	#6	0.045-0.076	0.15		Meet
	#7	0.043-0.078	0.15		Meet
	#8	0.050-0.073	0.15		Meet
	#9	0.050-0.073	0.15		Meet
NO_2 (mg/m^3)	#1	0.034-0.049	0.08	0.04-0.20 *(note: no guideline for daily average values*	Meet
	#2	0.031-0.053	0.08		Meet
	#3	0.033-0.048	0.08		Meet
	#4	0.034-0.049	0.08		Meet
	#5	0.031-0.053	0.08		Meet
	#6	0.031-0.048	0.08		Meet
	#7	0.033-0.049	0.08		Meet
	#8	0.034-0.047	0.08		Meet
	#9	0.033-0.057	0.08		Meet
			TJ36-79 (for residential area)		
NH_3 (mg/m^3)	#1	<0.25	0.2	-	Exceed
	#2	0.25-0.31	0.2		Exceed
	#3	0.25-0.43	0.2		Exceed
	#4	0.25-0.29	0.2		Exceed
	#5	<0.25	0.2		Exceed
	#6	<0.25	0.2		Exceed
	#7	<0.25	0.2		Exceed
	#8	<0.25	0.2		Exceed
	#9	<0.25	0.2		Exceed
H_2S (mg/m^3)	#1	<0.005	0.01	-	Exceed
	#2	0.005-0.031	0.01		Exceed
	#3	0.005-0.052	0.01		Exceed
	#4	<0.005	0.01		Meet
	#5	<0.005	0.01		Meet

Monitoring Parameter	Monitoring Location	Daily Average Concentration	Grade II Standard of GB3095-96	EHS Guideline Value	Assessment Result
	#6	<0.005	0.01		Meet
	#7	<0.005	0.01		Meet
	#8	<0.005	0.01		Meet
	#9	<0.005	0.01		Meet

Source: Domestic EIA.

151. According to **Table IV-24** above, NO_2, PM_{10} and SO_2 at all monitoring points met the Grade II Standard of GB 3095-1996; NH_3 at all nine points exceeded the standard of TJ36-79 (for residential area), and the monitored H_2S at three of the nine points (#1 to #3) exceeded the standard of TJ36-79. The cause for excessive odor emissions is the proximity to existing MSW transfer stations, which will be replaced with new transfer stations financed by the project.

(d) Acoustic environment - Baishan

152. **Baishan Water Supply Component.** Baseline noise was monitored on 14 August 2013 by the EMS. Fourteen (14) points were selected in the project area, which are shown in **Figure IV-2**. The monitoring data are listed in **Table IV-25** below. The monitoring data show that the monitored sound levels met the Environmental Quality Standard for Noise (GB 3096-2008) – Grade II (60 dB(A) for daytime and 50 dB(A) for nighttime. The monitored data at villages, schools and hospitals met the EHS Guideline value for residential areas (55 dB(A) for daytime and 45 dB(A) for nighttime).

Table IV-25: Baseline Noise Monitoring Data – Baishan Water Supply Component (dB(A))

No.	Monitoring Location	Monitoring Result		Grade II standard of GB3096-2008	EHS Guideline Value
#1	East boundary of WTP	Day	49.3	60	-
		Night	43.4	50	
#2	South boundary of WTP	Day	57.9	60	
		Night	45.9	50	
#3	West boundary of WTP	Day	48.3	60	
		Night	42.9	50	
#4	North boundary of WTP	Day	49.7	60	
		Night	42.6	50	
#5	Ailin Village	Day	51.8	60	55
		Night	43.4	50	45
#6	Banshan No.27 Middle School	Day	52.1	60	55
		Night	41.2	50	45
#7	Jiangyuan District Hospital	Day	53.3	60	55
		Night	45.0	50	45
#8	Baishan No.3 Middle School	Day	52.8	60	55
		Night	43.6	50	45
#9	Zhazi Village	Day	51.1	60	55
		Night	42.4	50	45
#10	Shangdianzi Village	Day	53.4	60	55
		Night	41.9	50	45
#11	Xinhua Village	Day	51.0	60	55

		Night	44.9	50	45
#12	Chunjiang Garden Community	Day	53.5	60	55
		Night	43.1	50	45
#13	Mining Bureau Hospital	Day	49.4	60	55
		Night	43.6	50	45
#14	Huixin Community	Day	49.1	60	55
		Night	42.5	50	45

Source: Domestic EIA Report

(a) Acoustic environment - Baishan

153. **Baishan MSW Component.** Noise monitoring at the project areas was conducted on 23 September 2013 by the Baishan EMS to identify the acoustic baseline at or nearby each of the project components. Seven (7) points were selected within the project area including three (3) points (#1 to #3) at the proposed landfill site (as shown in **Figure IV-3**), and four (4) points (#4 to #7) for the MSW stations (as shown in **Figure IV-3)**. The monitoring results are listed in **Table IV-26** below. The Environmental Quality Standard for Noise (GB 3096-2008) – Grade I and II are applied for the proposed sites.

Table IV-26: Baseline Noise Monitoring Data – Baishan MSW Component (dB(A))

No.	Monitoring Location	Monitoring Result		Standard of GB3096-2008
#1	North boundary of the landfill	Day	49.2	55 (Grade I)
		Night	36.7	45 (Grade I)
#2	South boundary of the landfill	Day	50.2	55 (Grade I)
		Night	42.0	45 (Grade I)
#3	On the landfill site	Day	46.0	55 (Grade I)
		Night	41.0	45 (Grade I)
#4	Gulan MSW transfer Station	Day	**65.0**	55 (Grade I)
		Night	39.2	45 (Grade I)
#5	Caizheng Station	Day	54.6	55 (Grade I)
		Night	44.7	45 (Grade I)
#6	Diantielu Station	Day	**57.7**	55 (Grade I)
		Night	42.2	45 (Grade I)
#7	Aimin Station	Day	58.0	60 (Grade II)[30]
		Night	40.2	50 (Grade II)

Source: Domestic EIA report

154. **Table IV-22** shows that the sound levels at the three points of the landfill (#1 to #3) and the point #5 met the Grade I Standard of GB 3096-2008 (55 dB (A) for daytime and 45 dB (A) for nighttime); the point #7 met the Grade II standard (60 dB (A) for daytime and 50 dB (A) for nighttime). Only the points #4 and #6 in daytime exceeded the related standards.

[30] Based on the Environment functional Zoning issued by Baishan Municipal EPB in 2013, only the Aimin MSW transfer station (#7) is located in the Grade II acoustic environment functional zone.

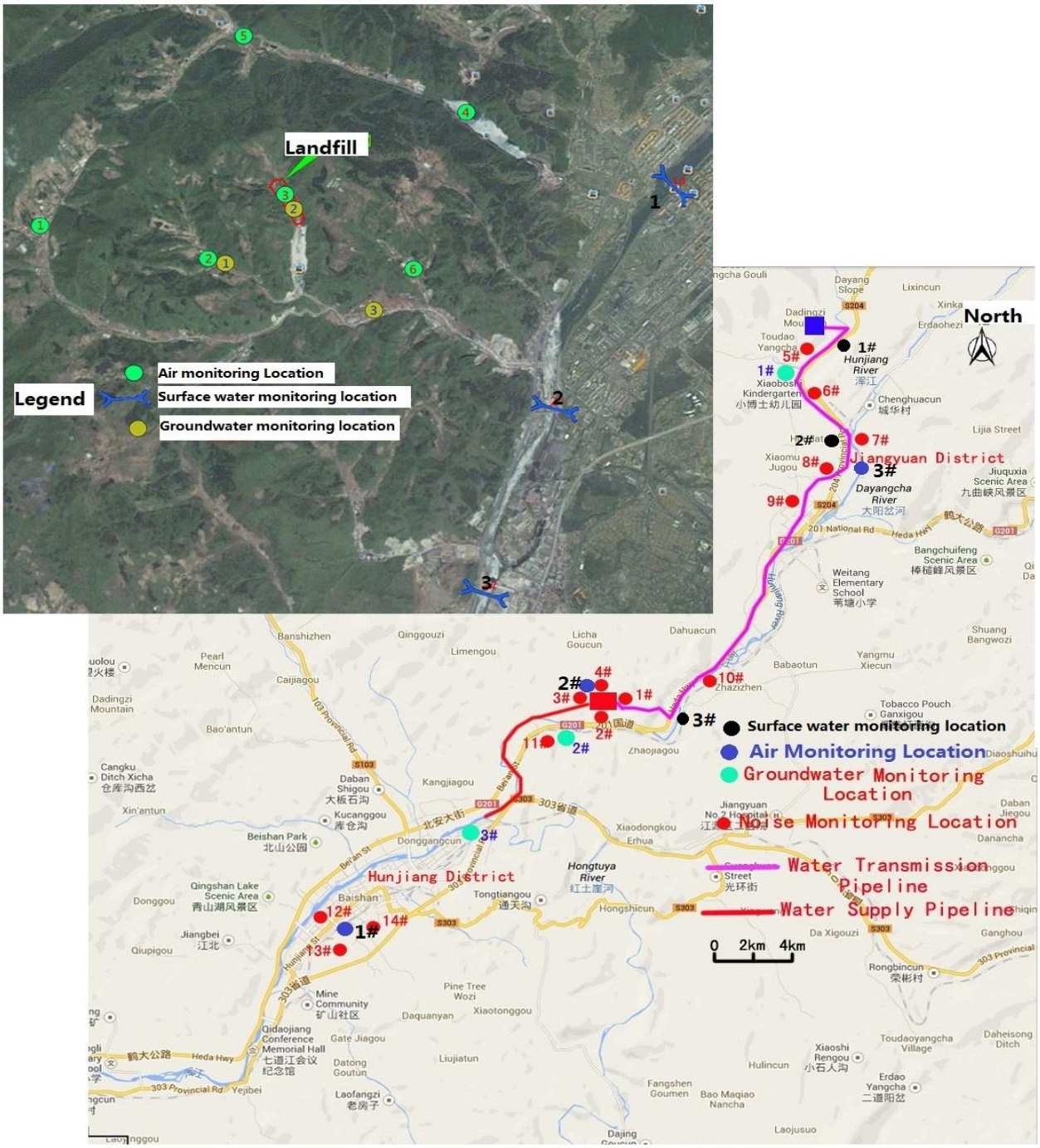

Figure IV-3: Baseline Monitoring Locations for Both Baishan Water Supply and the MSW Components

G. Environment Sensitive Receivers within Project Area of Influence

155. **Baishan Water Supply Component.** Sensitive receptors for noise and air quality impacts during both construction and operation of the water supply components in Baishan City have been identified in the domestic EIA Report, these comprise nearby villages, schools and hospitals etc. (**Figure IV-4** and **Table IV-15**).

Table IV-27: Sensitive Receivers within Project Impact Area – Baishan Water Supply Component

No.	Sensitive Receptor	No. of affected household or (people)	Distance & Direction to water transmission pipeline
1	Ailin Village	45 AHs	60m northwest
2	Sanchazi Forestry Bureau Shantytown area	Planned to be removed before the construction beginning	50m east
3	Sengong Community	30 AHs	20m east
4	The Existing Shantytown	15 AHs	80m west
5	Shantytown on the west of railway	28 AHs	15m west
6	Dongcheng Community	12 AHs	25m west
7	Hexie Community	21 AHs	80m east
8	Jiangyuan District People's Hospital	120 APs	180m east
9	Jiangyuan District Hospital	(30 APSs	45m west
10	Baishan No.3 Middle School	(56 APs)	15m west
11	Baishan No.27 Middle School	(20 APs)	20m west
12	Yulin Village	30 AHs	10m west
13	Xinhua Village	18 AHs	12m west
14	Wengquan Village	7 AHs	15m north
15	Hekou Village	42 AHs	35m south
16	Zhenjiang Primary School	40 APs	70m north
17	Baishan Foreign Language School	90 APs	100m north
18	Yiyuan Community	40 AHs	50m north
19	Chenjiang Garden Community	18 AHs	30m south
20	Mining Bureau Hospital	70 APs	60m south
21	Huixin Community	20 AHs	25m south

Source: The EIA Report. AP – affected people; AH – affected household

156. **Baishan MSW Component.** Sensitive receptor for impacts during both construction and operation of the project components have been identified in the domestic EIA Report. The sensitive receptors of the landfill are shown in **Table IV-28 and Figure IV-4**.

Table IV-28: Sensitive Receivers within Project Impact Area – Baishan MSW Component

No.	Sensitive Receptor	No. of affected household	Distance & Direction to the Landfill Expansion Site
1	Daqiaogou Village	10	1100 m southeast (there is a hill between the site and the village)
2	Qinggouzi Village	16	800 m southwest (there is a hill between the site and the village)
3	Shirengou Village	30	1500 m southeast (there is a hill between the site and the village)

Source: Domestic EIA Report

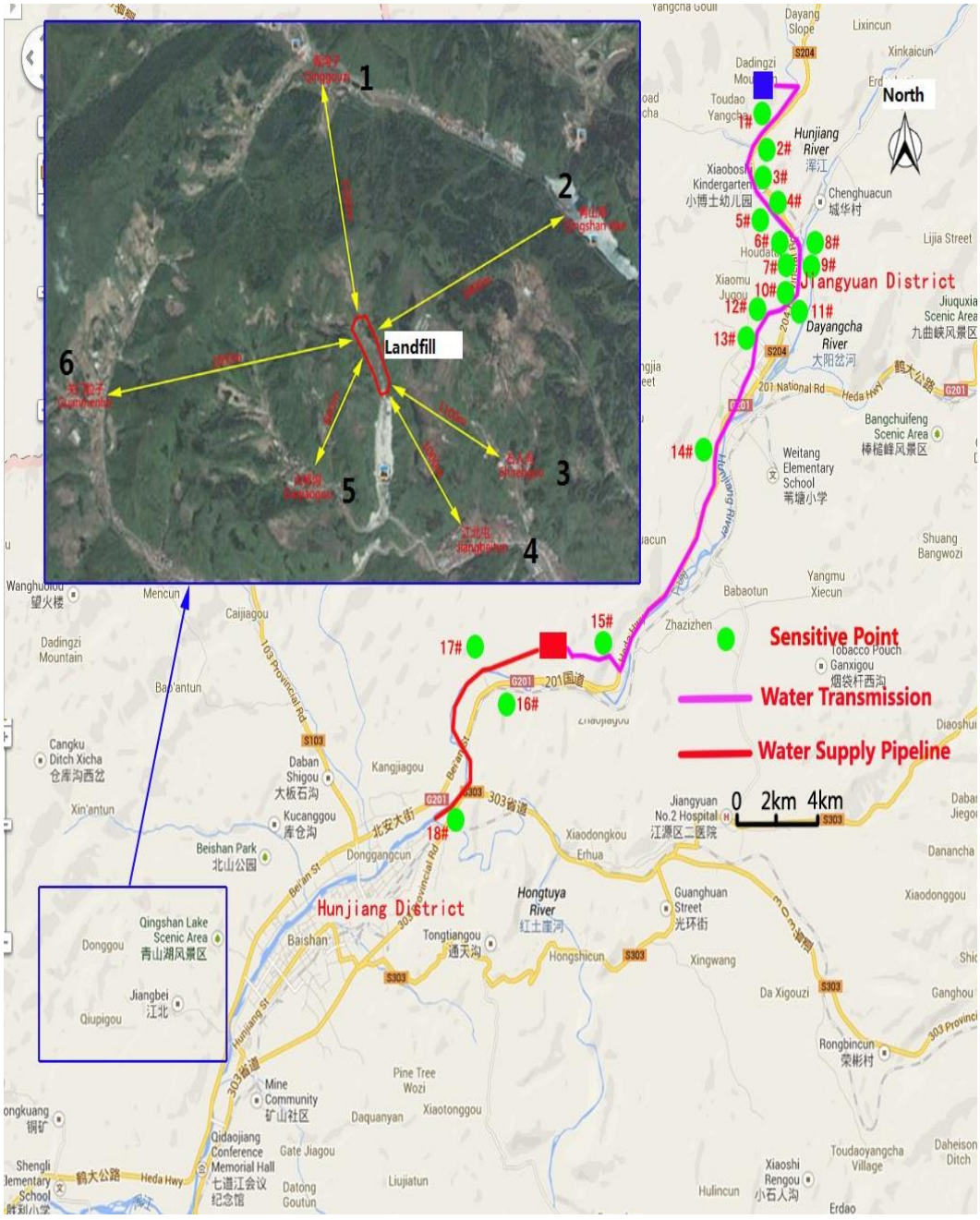

Figure IV-4: Environmental Sensitive Receivers for both Baishan Water Supply and the MSW Component

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

157. Potential project impacts, both positive and negative, were assessed through site visits, technical analysis, as well as consultations with government agencies and local communities, and dialogues among the EA, IAs, DIs, EIA institutes and PPTA consultants. Potential impacts and environmental issues during construction include noise, air, and water pollution, fugitive dust, soil erosion and contamination, construction waste disposal, interference with traffic and municipal facilities, land acquisition and resettlement, and occupational and community health and safety. Issues during operation of the water supply component include noise and energy efficiency of WTP pumps, drinking water source protection (Xibeicha Reservoir), and occupational health and safety during the WTP operation; for the integrated MSW components, the major impact during operation include community health and safety concerns around solid waste transfer stations, sorting workshop, composting yard and expanded landfill (odor and pest control); during the operation of Baicheng road and bridge component, issues include traffic noise and air quality at some sensitive areas along the project roads, as well as traffic safety. Potential impacts to physical, biological and socioeconomic environment are discussed below. Impacts and issues related to design, pre-construction, construction and operation phases of the project are considered separately. The impact assessment covers direct impacts – those directly due to the project itself; indirect and induced impacts – those resulting from activities arising from the project, but not directly attributable to it; and cumulative impacts – impacts which in combination would exert a significant additive influence.

A. Positive Impacts and Environmental Benefits

158. **Direct project beneficiaries.** The project will bring significant benefits directly to about 1.12 million urban residents in the project areas including 0.6 million population in Baishan City and 0.52 million in Baicheng City, by improving drinking water safety and water supply coverage, urban infrastructures and supporting environmentally sustainable 3R MSW disposal, and increasing urban sanitation facilities. Of the total direct beneficiary populations, approximately 49.1% are women, 16.5% live under the local urban poverty lines of less than CNY280 per capita per month in Baishan and CNY297 in Baicheng, and 4% and 6.5% of the beneficiaries are ethnic minorities in Baishan and Baicheng, respectively.

159. **The Baishan water supply** total capacity has reached its maximum and cannot ensure 24-hour water services for the city population. Currently, 70% of the population (140,000 people) does not have full-time access to water. The decline of water supply amount from Dayangcha River in Jiangyuan district is increasing the water shortage in the district. The supply capacity also needs to be increased to serve the growing Hunjiang District population. The city's existing water distribution network is suffering from a high NRW level assessed at 65%. The project will finance the construction of a new WTP, supply Jiangyuan district WTP with a new reliable water source, install new water distribution pipelines, and rehabilitate old water network. It will also finance specific equipment dedicated to NRW reduction, and energy efficiency. This will be guided by the implementation of a 10-year water supply management improvement roadmap, incorporating best practices in water management, and water governance.

160. The **improved urban infrastructure component** in Baicheng will help the city establish efficient, safe, sustainable and environmentally friendly urban transport systems including public transportation facilities, bicycle lanes, pedestrian crossings, and traffic management facilities. The component will improve the municipal services through the provision of pipelines and conduits for water supply, sewer collection, stormwater drainage and district heating, which will benefit the local economies and residents' health, increase the coverage rates of water supply, heating supply, sewage collection and reduce

waterlogging in the urban area. The component will expand the stormwater collection coverage in the project areas by 40 km^2.[31] 9,000 m^3/d of domestic wastewater will be collected in the project's sewers, which will be connected to the existing Baicheng WWTP, where wastewater will be treated to Class I-B standard prior to discharge (see the due diligence for the WWTP below). Curbside stormwater collection and infiltration will be piloted along three project roads, reducing the risk of waterlogging.

161. The **MSW components** will improve the urban sanitation condition by enhancement of the garbage collection and management program to improve the conditions of random dumping and littering in the two urban areas. The project will upgrade the waste collection system introducing segregation at source, maximizing waste recycling, establish a kitchen waste composting program targeting 20% of the cities' population, and providing waste recycling machines. A community-based solid waste management system focusing on source segregation of kitchen waste and recyclates will also be piloted in 41 communities.[32] This will be guided by a 10-year ISWM roadmap in each city.

162. **GHG emission reduction.** The GHG emission reduction benefits of the improved urban infrastructure component in Baicheng are derived primarily from the following major interventions: (i) promoting enhanced energy efficiency through higher quality of road surfaces, grades and curve radii, improved road network connectivity, reduced road congestion and travel time; (ii) promoting public transportation and non-motorized transport (low carbon transportation modes) following the PRC programs on vehicle emissions, clean fuel regulations, and public transport priority policy to maximize the benefits; and (iii) the application of LED street lights, which is expected to save 530,000 KWh[33] per year of electricity, resulting in a CO_2 emission reduction of 528 t/a as compared to conventional street lighting.

163. For the Baishan water supply component, reduction GHG emission reduction benefits are derived primarily from the following interventions: reduction of NRW from 65% to 30%; improvement of energy efficiency through improved pump efficency (through SCADA); and optimized siting of the water treatment plant (to avail of gravity-flow supply). As a result, annual energy savings and GHG emission reduction of 939,328 kWh and 937 tons of CO_2, respectively, will be achieved. [34] The expected energy saving and GHG emission reduction are shown in **Table V-1.**

Table V-1 Energy Savings and GHG Emission Reduction by the Proposed WTP

Item	Unit	Amount
Water supply capacity of proposed WTP	m^3/d	50,000
Annual water supply amount	m^3/a	18,250,000
Unit power consumption of proposed WTP (based on the FSR)	kWh/m^3	0.048
Unit power consumption of the existing WTP (based on the Baishan Nanshan WTP in 2012)	kWh/m^3	0.06587

[31] Source: domestic FSR.

[32] 21 communities in Hunjiang District (Baishan) and 20 communities in Taobei District (Baicheng) were selected to pilot and demonstrate solid waste sorting at source. The communities were selected based on the following principles: (i) the total capacity of the kitchen waste composting plant; (ii) even geographical distribution with the project areas to maximize demonstration potential; (iii) availability of space for protected collection stations within communities (bins for kitchen waste need to be placed near each apartment building) with easy access for collection vehicles; and (iv) a good mix low-, middle- and high-income communities with different types of community organizations. To note that 5 and 4 low-income communities were selected in Baishan and Baicheng, respectively).

[33] Totally 484 LED street lamps will be installed on the proposed secondary and branch roads in Baicheng City, each LED lamp will save 1,095 kwh electricity annually in comparison with conventional high pressure sodium lamp.

[34] Calculated based on comparison with the existing Nanshan WTP in Baishan City (2012 figures); the unit coal consumption is average PRC data for coal-fired power generation; reducing NRW from 65% to 30% will reduce water consumption (and thus production and transport) by 6.3875 million m^3 annually.

Item	Unit	Amount
Annual power consumption for proposed WTP	kWh	876,000
Annual power consumption for equivalent WTP based on existing WTP	kWh	1,202,128
Annual power saving by proposed WTP including NRW reduction	kWh	939,328
Equivalent standard coal saving	tce	376
Annual CO_2 emission reduction	t/a	937
Annual water loss at 65% NRW	m^3/a	11,862,500
Annual water lose at 30% NRW	m^3/a	5,475,000
Annual water saving by reducing NRW from 65% to 30%	m^3/a	6,387,500

Source: calculated by the EIA Institute and the PPTA consultant

164. **Increased resilience to current (and future) climate variability**. During the PPTA, the potential impacts due to increase of extreme weather events including rainstorms or droughts were considered. A water balance analysis was conducted for the source of water for the WTP in Baishan (i.e. the Xibeicha River) in dry years (80% probability of water deficit) and extreme dry years (95% probability of water deficit)[35]. Resilience building activities for current and future climate variability supported by the project in relation to water management focus on: (i) repair and maintenance of the water supply system to reduce NRW from 65% to 30%; (ii) increasing the number of supply options and thus redundancy (by including Xibeicha River and its reservoir as new water source) to deal with changes in conditions or emergency situations; (iii) demand management, i.e. public education to reduce water intensity; and (iv) through water supply safety planning, the city's capacity will be strengthened to identify problems with water resources, establish contingency plans[36] and mobilize resources to tackle water safety risks. Capacity building measures will also enhance the city's ability to internalize past experiences and failures and make improvements to the water supply system. In order to increase the resilience of the improved urban infrastructure component in Baicheng to current and future climate variability, design specifications have been defined for high-capacity drainage pipelines in Baicheng (flagged as project assurance). New roads and bridges will improve road connectivity that will be beneficial in coping with any increase in incidence of natural disasters and extreme weather events, providing efficient and alternative routes for both emergency vehicles and escape.

165. **Poverty reduction and social benefits.** The project will benefit directly 0.786 million people in Baicheng and Baishan by improving municipal services of road network, transportation, and urban water supply, providing safe drinking water, establishing 3R-based solid waste management system, and promoting sustainable and inclusive development. The direct beneficiary people include 86,500 low income population. In addition, the project will benefit indirectly about 0.364 million rural residents in the two cities by solving infrastructural bottleneck and improving municipal services. Both cities have above average urban poverty rates for the province (12.5% in Baishan, 10.5% in Baicheng and 6.0% in Jilin in average) and poor infrastructure and services have been identified as critical constraints for economic and social development.

166. It is estimated that a total of more than 22,600 person-months will be created by the project and most of them will provided to local people, including local poor, and at least 30% will be provided to women. During the project construction, a total of about 3,370 job positions will be created directly,

[35] See discussion on water balance analysis in para. 198-204.
[36] See para. 204 for discussion on draft contingency plan (including emergency preparedness and response) in case of extreme dry years.

including about 337 technical and management positions, about 846 positions of skilled labors, and about 2,187 positions of unskilled labors. During the project operation, a total of about 321 job positions will be created directly during the project operation, including 19 technical and management positions, 107 positions of skilled labors, and 195 positions of unskilled labors.

167. A social action and gender action plan have been prepared for the project. Both plans aim to ensure participation and voice of communities in urban management of the cities. Actions include: implementation of traffic safety[37] and water conservation awareness programs, monitoring of public participation in the public hearing process for water tariffs, targets for employment of local labor, women and the poor during construction and implementation. In addition, The PSA highlighted the necessity and potential of more community involvement in some non-structural activities of the project. This applies in particular to the solid waste sorting at source in 41 communities in two project districts which will contribute to the success of the kitchen waste composting program, improve community solid waste management and help form the basis for the city wide 3R program. Creation of the community-based waste management groups and outreach to schools will help ensure sustainable impacts of the infrastructure improvements. Social and gender indicators will be included in the project performance management system (PPMS), and appropriate consultant inputs for implementation and monitoring of both plans are included in the supervision consultant package.

168. **Gender.** The project has been designed to be effective gender mainstreaming. A GAP was prepared, detailing project measures, to ensure women's participation and employment benefits. The PMO will implement the GAP measures, monitor impacts, and provide ADB with sex-disaggregated data on employment and participation as detailed in the GAP's monitoring section and other project documents. An assurance for implementation of the GAP has been included.

B. Environmental considerations related to Project Location, Planning, Design and Pre-construction Phases

169. A number of environmental management measures have been implemented in the project preparatory phase to ensure that appropriate plans and documentation to determine environmental performance of construction and operation of subprojects are in place. All the project sites (WTP, MSW sorting workshops and composting yards) were carefully selected to avoid and/or minimize earthwork and other potential adverse impacts on the environment and surrounding communities. All components have undergone the EIA process under the PRC laws and regulations. The EIA reports were prepared by qualified EIA institutes, and were approved by Jilin Provincial EPD. The plan EIA for the BEDZ and the EIA for the associated Xibeicha Reservoir have been approved by the provincial EPD. Project level grievance redress mechanisms (GRM) in the two project cities have been defined and will be operational prior to construction. Additional pre-construction measures for this project include:

i) **Updating EMP**. Mitigation measures and monitoring plan defined in this EMP will be updated and incorporated into the detailed design to minimize adverse environmental impacts. This will be the responsibility of the JPPMO and PIUs, supporting by the loan implementation

[37] A traffic safety subcomponent will be planned and implemented under the coordination of international and national transport planning and traffic safety specialists, engaged under the Project's capacity building component. The specialist will, amongst others, conduct an urban traffic safety audit to assess the existing situation (with special focus on pedestrian and bicycle safety, and public transportation system); review and update the urban traffic safety plans of the municipality; and develop and implement a detailed work plan for improving urban traffic safety, addressing the 3E urban traffic safety program (Engineering, Education and Enforcement.

consultant;

ii) **Confirmation of land acquisition and resettlement.** The LAR plans will be updated with the final inventory and the results will be incorporated into the detailed design;

iii) **Bidding document and contract documents.** The updated EMP will be included in the bidding documents and contracts for procurement of civil works, goods and services. All contractors and subcontractors will be required to comply with the EMP;

iv) **Training in environmental management.** Environmental specialists including Loan Implementation Environmental Consultants (LIECs) will provide training in implementation and supervision of environmental mitigation measures to contractors construction supervision companies (CSC), the PIUs and the EMUs;

v) **Institutional strengthening**, including (i) appointment of at least a qualified environment specialist in each PIU; (ii) hiring of LIECs (an international and a domestic) within loan administration consultant services by JPPMO; and (iii) contracting of city environment monitoring stations (EMS) by each PIU to conduct environment monitoring during both construction and operation phases;

vi) Before construction, contractor and CSC will be required to prepare a **Site Environmental Management Plan** and an Environmental Supervision Plan respectively.

C. Impacts and Mitigation Measures during Construction (all Components)

(A) Impacts on Topographic Characteristics and Soils (earthwork, soil erosion, soil contamination)

170. **Earthwork.** The project will require significant earthwork. In Baicheng, the construction of roads and associated services will require 551,000 m^3 of soil excavation, and filling of earth and gravel amounting to 381,000 m^3 and 143,596 m^3, respectively. The total surplus earth is 313,596 m^3. 280,000 m^3 of this surplus will be for within the BEDZ. 24,200 m^3 of inert material will be transported to an approved spoil disposal site. [38] Earthworks for the MSW sorting and composting facility is listed in **Table V-2** below. The estimated surplus earth of 9,388 m^3 will be used as cover material for the nearby sanitary landfill.

Table V-2: Earth Balance for Each Project Component in Baicheng (m^3)

Road/bridge/MSW Facility	Excavation	Filling	Borrow earth	Surplus earth
Third Ring Road	216,000	146,000	56,292	126,292
Xiangyang Street	79,000	58,000	20,588	41,588
Shenglixi Road	45,000	35,000	11,727	21,727
Shengli Road	30,000	21,000	7,818	16,818
Xingfubei Street	20,000	12,000	5,212	13,212
Nanyi Street	10,000	8,000	2,606	4,606
Tao'erhe Road	25,000	18,000	6,515	13,515
Chunyang Road	45,000	32,000	11,727	24,727
Xinggong Road	20,000	14,000	5,212	11,212

[38] The approved spoil disposal site is located on lowland nearby Chunyang Village, 5.4 km southwest of the project site. The site was approved by Baicheng Municipal Urban Management Bureau in 2011. The capacity is 450,000 m3.

Xiangyang Roundabout	10,000	6,000	2,606	6,606
The railway underpass at the Third Ring Road	21,000	15,000	5,473	11,473
Cross-channel bridge (on the Third Ring Road)	8,800	5,000	2,293	6,093
Cross Tao'er River bridge	8,200	4,000	2,137	6,337
Subtotal	**538,000**	**374,000**	**140,206**	**304,206**
Baicheng MSW sorting/composting Plant	13,000	7,000	3,388	**9,388**
Total	**551,000**	**381,000**	**143,596**	**313,596**

Source: domestic EIA report

171. Required earthworks for the Baishan components (water supply and MSW) are listed in **Table V-3**. The components will generate 339,960 m^3 of surplus earth that will be transported to Dayangcha Town of Jiangyuan District, where two new construction sites require 450,000 m^3 of earth.

Table V-3: Earth Balance for Each Project Component in Baishan (m^3)

Water Supply/MSW Facility	Excavation	Filling	Surplus
WTP construction	78,340	13,656	64,684
Water transmission pipeline	293,491	94,679	198,812
Water distribution pipeline	38,413	11,378	27,035
Subtotal	**410,244**	**119,713**	290,531
Landfill expansion works	68,482	22,053	46,429
MSW sorting and composting site	10,000	7,000	3,000
Subtotal	**78,482**	**29,053**	**49,429**
Total	**488,726**	**148,766**	**339,960**

Source: domestic EIA reports

172. **Impact on soil, soil erosion, soil contamination.** Construction activities could affect soil in the project areas through erosion, contamination, and differential compaction. Constructions of water intakes may contribute to sediment entering the Xibeicha Reservoir if construction methods are not strictly followed. The construction of the Xibeicha Reservoir and the water transmission pipeline will need to be properly coordinated. Soil erosion may be caused by construction of WTP and MSW disposal facilities. Other areas prone to soil erosion include foundation pits, pipeline trenches, spoil sites, temporary construction sites, and other areas where surface soil or vegetation are disturbed. The domestic EIAs predict low soil erosion intensities (200 t/km2.a) during construction when surface vegetation is disturbed. Increased soil erosion may also occur after completion of construction if site restoration and re-vegetation is inadequate. Soil contamination may result from the inappropriate transfer, storage, and disposal of polluted earth, petroleum products, chemicals, hazardous materials, liquids and solid waste.

173. Construction plans will include **soil erosion and contamination control prescriptions** for construction work areas, including (i) constructing intercepting ditches and drains to prevent runoff entering construction sites, and diverting runoff from sites to existing drainage; (ii) limiting construction and material handling during periods of rains and high winds; (iii) stabilizing all cut slopes, excavated trenches, embankments, and other erosion-prone working areas while works are going on; (iv) properly storing petroleum products, hazardous materials and wastes on impermeable surfaces in secured and covered areas; (v) removing construction wastes from the site to the approved disposal sites; and (vi) establishing emergency preparedness and response plan (Spill Management Plan) including spill cleanup equipment at each construction site and training in emergency spill response procedures. All earthwork disturbance areas shall be stabilized within 30 days after earthworks have ceased at the sites.

174. Internal **inspection and monitoring** for soil erosion will be conducted by CSCs; compliance inspection and monitoring will be conducted by a licensed institute following the monitoring plan defined the EMP. Inspection and monitoring results will be submitted to the PIUs and JPPMO, each city EPB and WRB to serve as basis for project implementation progress reports and acceptance of construction.

(B) Impact on Air Quality (dust, gaseous air emissions, noise)

175. **Gaseous Air Pollution.** Construction machinery on all sites will consume petrol and diesel, releasing gaseous SO_2, CO, and NOx. Equipment will be maintained to a high standard to ensure efficient running and fuel-burning. High-horsepower equipment will be provided with tail gas purifiers. Atmospheric monitoring will be carried out during the construction period. All vehicle emissions will be in compliance with relevant PRC emission standards.

176. The Baicheng PIU informed that pre-mixed asphalt will be purchased for road surface paving. However, if any asphalt is heated and mixed on site, there is potential for flue gases emissions. Currently, modern asphalt mixing equipment used in PRC releases typical emission concentrations of asphalt flue gases of 22.7mg/m^3. This figure complies with asphalt flue gas discharge requirements of 80-150mg/m^3 of Atmospheric Pollutant Emission Standard (GB16297-1996). It also complies with the Ambient Air Quality Standard (GB3095-1996) which limits the concentration of benzopyrene at 0.01μg/m^3 100 meters downwind from the asphalt mixing station. The use of this equipment, as was the requirement to site asphalt mixing stations at least 200 meters away from residential areas, is stipulated by the EMP.

177. **Dust.** All construction sites will produce fugitive dust from material storage areas, dump sites, concrete mixing, excavation and general site usage – especially under windy conditions. It is estimated that under general conditions (with an average wind speed of 2.5 m/s), dust will impact an area 250m downwind of the source. Road and pipeline construction are a linear activity, and dust impact on a specific location will be short-term and temporary, lasting from several weeks. Material stockpiles and concrete mixing equipment will be equipped with dust shrouds. The operators will regularly maintain the shrouds to ensure their effective operation. For both construction sites and construction roads, water spraying for the suppression of dust and maintenance of driving surfaces will be standard site management practice. Vehicles carrying soil, sand, or other fine materials to and from the construction sites will be covered.

178. **Noise.** A significant increase in noise is expected during construction, due to various construction and transport activities. Construction activities for roads, the WTP, pipelines and MSW facilities will involve excavators, bulldozers, graders, stabilizers, concrete-mixer, drills, screening plants, rollers, and other heavy machinery. Noise during road and pipeline construction will be generated by trench excavators, rollers and other compaction machine. Though noise levels may be severe, the noise will be temporary and localized. The major construction machinery noise testing values are shown in **Table V-4**.

Table V-4: Testing Values of Construction Machinery Noise

No.	Machine Type	Model	Distance between Measuring Site and Machinery (m)	Maximum Sound Level Lmax (B)
1	Wheel loader	Model XL40	5	90
2	Wheel loader	Model XL50	5	90
3	Grader	Model PY160A	5	90
4	Vibrating roller	Model YZJ10B	5	86
5	Two-wheeled two-vibrating roller	Model CC21	5	81
6	Three-wheeled roller		5	81
7	Tire roller	Model ZL16	5	76
8	Bulldozer	Model T140	5	86
9	Tire hydraulic excavator	Model W4-60C	5	84
10	Paver (UK)	Fifond311ABGCO	5	82
11	Paver (Germany)	VOGELE	5	87
12	Generating set	FKV-75	1	98

Source: EIA Reports (Ministry of Transportation, 2006. "Specifications for Environmental Impact Assessment of Road Construction)

179. Construction equipment noise source is considered as a point sound source, and the predictive mode is as follows:

$$L_i = L_0 - 20\lg\frac{R_i}{R_0} - \Delta L$$

Where, L_i and L_0 are equipment noise sound levels at R_i and R_0 respectively. ΔL is additional diffusion attenuation produced by barriers, vegetation and air.

180. As for the impact of multiple construction machineries on a certain future position, sound level superposition is needed:

$$L = 10\lg\Sigma 10^{0.1\times L_i}$$

181. Noise levels at different distances are gained after calculating the impact scope of equipment noise during construction as defined in **Table V-5**. The PRC "Standard of Noise Limits for Construction Sites" (GB12523－90) specifies the noise limit Class II area as 70 dB (A) during daytime and 55 dB (A) during nighttime. The standard compliance noise impact scope (m) of different machineries is listed in **Table V-6**.

Table V-5: Noise Values of Construction Machineries at Different Distances dB (A)

Machinery Name	Distance to Machinery									
	5 m	10 m	20 m	40 m	50 m	60 m	80 m	100 m	150 m	300 m
Excavator	84	78	72	66	64	63	60	58	55	47
Bulldozer	86	80	74	68	66	65	62	60	57	49
Land scraper	90	84	78	72	70	69	66	64	62	54
Loader	90	84	78	72	70	69	66	64	62	54
Roller	86	80	74	68	66	65	62	60	57	49
Concrete-mixer	87	81	75	69	67	66	63	61	58	50
Asphalt concrete paver	85	79	73	67	65	64	61	59	56	48

Source: Domestic EIA Reports.

Table V-6: Civil Works Equipment Noise Impact Scope

Construction Stage	Construction Machinery	Limit Standard (dB)[39]		Impact Scope (m)	
		Daytime	Nighttime	Daytime	Nighttime
Earth and Stone Work	Excavator	75	55	15	150
	Bulldozer	75	55	18	180
	Land scraper	75	55	29	290
	Scraper loader	75	55	29	290
Piling	Pile driver	85	Prohibited	126	/
Structure	Road roller	70	55	32	180
	Truck	70	55	67	266
	Vibrator	70	55	53	224
	Dump truck	70	55	20	112
	Mixing machine	70	55	29	200
	Asphalt concrete paver	70	55	29	160

Source: Domestic EIA Reports.

[39] Standard of Noise limits for Construction Sites (GB 12523-90).

182. The noise impact distances during construction for compliance with the PRC Standard of Noise Limits for Construction Sites (GB12524-90) are up to about 130 m away from the source during the day **and 300 m at** night (**Table V-6**). In addition, construction materials, surplus spoil and construction wastes will be transported to and from the construction sites during the average 10 hour workday for the construction season of about 250 days per year in the project area for about 4 years. As a result, urban residential areas, schools, hospitals and villages through which haul roads pass and which are adjacent to construction sites will frequently experience noise levels at 70–80 decibels in the audible scale. Activities with intensive noise levels not only will have an impact on the residents, but also may cause injury to construction workers operating the equipment.

183. Although the noise impacts will be transient and temporary, the following mitigation measures are essential for construction activities to meet PRC construction site noise limits and to protect sensitive receptors. Construction at night shall be strictly prohibited. During daytime construction, the contractor will ensure that: (i) noise levels from equipment and machinery conform to the PRC standard of GB 12523-90, and properly maintain machinery to minimize noise; (ii) equipment with high noise and high vibration are not used in urban areas and only low noise machinery or the equipment with sound insulation is employed; (iii) sites for concrete-mixing plants and similar activities will be located at least 1 km away from sensitive areas such as residences, schools, and medical centers; and (iii) temporary anti-noise barriers will be installed to shield schools, residences and medical centers.

(C) Impacts on Water Resources

184. **Impact of bridge construction on river hydrology.** Two bridges with 20 m span will be constructed in Baicheng City. One will cross an existing stormwater drainage channel, and the other will cross a planned artificial channel, to be constructed in 2015. Both channels are seasonal drainage channels in urban areas, with no ecological value. The bridges have been designed based on the PRC flood control standard of 1-in-50 years. The construction of these bridges may obstruct peak flows and cause backup of water upstream. It is unlikely that bridge construction will contribute to bank erosion or cause further excessive amounts of sediment to enter the water due to the reinforced channel banks. Bridge pier construction will be conducted during the dry season. Banks will be protected by matting and sediment traps, and on the completion of construction by the planting of grass and stabilizing vegetation to prevent soil and water loss. Slurry from pile drilling in the channel bed will be pumped to shore and properly disposed of. This will reduce the disturbance of sediments and the impact on water quality. Pier construction in will be planned and laid out to ensure adequate opening for water flow.

185. **Surface and groundwater contamination.** Wastewater produced during construction will come from washing aggregates, pouring and curing concrete, wastewater from maintenance and cleaning of mechanical equipment and vehicles. During the construction period, there will be four (4) and three (3) construction sites during same period in Baicheng and Baishan, respectively. The domestic EIAs estimate that each construction site will generate about 6 m^3/d of construction wastewater. The peak work force is estimated at 300 and 250 workers in Baicheng and Baishan, respectively. The daily domestic wastewater discharge from each worker is 0.05 m^3. The construction and domestic wastewaters generated during construction are summarized in **Table V-7**. Wastewater from construction activities will be collected in sedimentation tanks and filter tanks to remove silts and oil. All areas where construction equipment is being washed will be equipped with water collection basins and sediment traps. The risk of surface water contamination during the laying of water transmission lines in Baishan is not considered significant if soil erosion and contamination control measures defined in para. 172-173 are implemented. Water quality (for pollutants such as SS, CODcr, oil, and grease) in rivers will be monitored during construction in accordance with the EMP monitoring program to identify and confirm results of the impact assessment and effectiveness of adopted mitigation measures.

Table V-7: Summary of Wastewater Generated during Construction (m^3/d)

Item	Baicheng	Baishan	total
Construction wastewater	24.0	18.0	42.0
Domestic wastewater	15	12.5	27.5
Total	39	30.5	69.5

Source: Domestic EIA Reports

186. Groundwater in the project's areas of influence is generally relatively deep (5-30 m). No significant impact on groundwater resources is anticipated during construction roads and auxiliary facilities (Baicheng), main transmission pipelines and the WTP (Baishan). No wells are located in the area of potential impact. However, fuels and chemicals used for road and pipeline constructions could contaminate groundwater if they are not properly stored and disposed. Spills of toxic substances resulting from traffic accidents during construction may also contaminate groundwater if no proper emergency response is undertaken. Storage facilities for fuels, oil, and other hazardous materials will be within secured areas on impermeable surfaces, and provided with bunds and cleanup installations. Contractors will be required to develop contingency plans for control of oil and other dangerous substances (Spill Management Plan) as part of the CS-EMP. Contractors' fuel suppliers must be properly licensed. They shall follow proper protocol for transferring fuel and the PRC standard of JT3145-88 (Transportation, Loading and Unloading of Dangerous or Harmful Goods).

(D) Impacts on biological resources

187. Most project facilities will be located in urban areas, and none of the project sites is within a legally protected site or a site proposed for protection. The project sites do not include critical habitats with recognized critically endangered or endangered species. Project sites largely support degraded and modified habitats with low conservation values. No rare and endangered species were identified and recorded in the project areas during the domestic EIA process. The impact on flora and fauna are mainly through land use changes, a reduction in cultivated land (142 ha), and reduced natural vegetation coverage (20.9 ha). The project will increase vegetation coverage by 57.18 ha along the proposed roads and within the WTP and MSW facilities for urban environment improvement and landscaping purposes (**Table V-8**), fully offsetting project-induced losses. In addition, the delineation of a 6.25 km^2 Grade I water source protection zone around the Xibeicha Reservoir will prohibit access to, and exploitation of resources within, the Grade I zone, effectively protecting existing, and creating new, habitats.

Table V-8: Vegetation affected by the Project (ha)

Component	Affected grassland	Affected forest land	Area to be vegetated by the project	Surplus vegetation
Baicheng roads	0.53	2.61	10.24	+7.1
Baicheng MSW	0	2.78	19.41	+16.63
Baishan WTP	0.12	1.19	4.18	+8.93
Baishan MSW			6.06	
Total	1.28	20.90	79.36	+57.18

Source: Domestic EIA Reports

188. In addition, Contractors will be required to implement the following measures to minimize disturbance of habitats:

i) Protect existing trees and grassland during road and pipeline construction. Where trees are to be removed or an area of grassland disturbed, replant trees and re-vegetate the area immediately after construction;

ii) Remove trees or shrubs only as a last resort if they impinge directly on permanent works or approved necessary temporary works;

iii) In compliance with the PRC Forestry Law, undertake compensatory planting of an equivalent or larger area of affected trees and vegetation;

iv) Only native plant species of local provenance shall be used for re-vegetation; and

v) Identify, demarcate and protect sites where small animals, reptiles, and birds of common species live such as vegetated roadside areas, trees, inner areas of bridges and river beaches, etc.

(E) Impacts on Socio-economic Resources

189. **Land acquisition.** The total permanent land acquisition area is 2,425.24 mu (161.7 ha), of which farmland, house plot and other land account for 48.2%, 34.4% and 17.4%, respectively. The total house/building demolition area is 57,824 m^2 including residential houses of 54,446 m^2, rural shanties of 2,261 m^2 and small shops/institution buildings of 1,117 m^2. The breakdown of these losses by subcomponent and land category is shown in **Table V-9.**

190. The IAs must obtain approval from the local land administration departments to alienate farmland. Under the relevant legislation and principles that apply in the PRC in such cases, farmers or residents who lose land permanently will be compensated by replacement with land of equivalent quality and quantity, or through a lump sum payment. This process is detailed in the land acquisition and resettlement plans (LAR plans).

191. **Resettlement.** A total of 1,914 persons from 701 households will be affected, including 364 households affected by land acquisition, 293 households by house demolition, and 44 households by both. Two full LAR pans have been prepared in compliance with “the Land Administration Law of the People’s Republic of China (2004)”, “Law of the People's Republic of China on Administration of the Urban Real Estate (2007 Revised)”; “Regulations regarding the Administration of Urban Housing Removal (2001)”; “Guidelines Regarding Urban Housing Removal Estimation”, and other applicable guidelines. They were also based on local policies regarding LAR in Jilin Province, and the two project cities, and ADB’s SPS. The LAR plans will be updated based on the census of APs and detailed measurement survey, and submitted to ADB for review and approval prior to award of civil works contracts.

Table V-9: Land Acquisition and Resettlement Impacts

Item		Unit	Baishan MSW Component	Baishan Water Supply Component	Baicheng improved urban infrastructure Component	Total
Affected town/urban sub-district		No.	1	1	1	3
Affected village/community		No.	1	2	8	11
Affected village groups		No.	1	0	0	1
Permanent land acquisition	Collective land	mu	82.25	72.0	1,479.41	1,633.66
	Farmland	*mu*	30.67	2.5	754.59	787.76
	House plot	*mu*	11.83	0	550.53	562.36
	Construction land	*mu*	0	0	0	0
	Enterprise land	*mu*	0	0	0	0
	Other land	*mu*	39.75	69.5	174.30	283.55
	State land	mu	0	0	791.58	791.58
Acquisition of residential houses and structures	Rural house	m^2	5,269.70	0	37,446.91	42,716.61
	Rural shanty	m^2	236	0	2,025.26	2,261.26
	Urban house	m^2	0	0	11,729.19	11,729.19
	Urban shanty	m^2	0	0	0	0
	Urban enterprise/shop	m^2	0	0	1,116.66	1,116.66
Affected rural households and persons	Acquisition of farmland	HH	3	4	357	364
		person	9	17	1,011	1,037
	Acquisition of residential houses	HH	27	0	266	293
		person	100	0	639	739
	Both land and house acquisition	HH	6	0	38	44
		person	20	0	118	138
Affected urban households and persons	Acquisition of residential houses	HH	0	0	77	77
		person	0	0	197	197
Total of affected households and persons		HH	36	4	661	701
		person	129	17	1,768	1,914
Total of enterprises/shops		No.	9	0	9	18
		person	41	0	309	350

Source: PPTA social and resettlement consultants' report

192. **Impacts on physical cultural resources.** No registered physical cultural resources are present within the project areas in Baicheng and Baishan. However, construction activities have the potential to disturb unknown underground cultural relics. In the event that any archaeological or other cultural relics are uncovered, construction activities will be immediately suspended, and the JPPMO, the relevant PIU and the local Cultural Heritage Bureau will be promptly notified, in accordance with the Law of the People's Republic of China on Protection of Cultural Relics (1982, latest updated in 2002). A clause for protection of unknown underground cultural relics will be included in construction contracts.

193. **Risks to community health and safety**. Traffic congestion may worsen as construction traffic in urban areas increases, causing temporary inconvenience to traffic, residents, commercial operations, and institutions. Some construction sites will be located close to residential communities, villages, hospitals and schools, presenting a threat to public health and safety. At construction sites, different degrees of mechanical vibration will occur. Such vibration is sudden and discontinuous, which can annoy people nearby the sites. The constructions may also contribute to road accidents through the use of heavy machinery and trucks on existing roads. Construction may cause unexpected interruptions in municipal services and utilities because of damage to pipelines for water supply, drainage, heating supply and gas supply, as well as to underground power cables and communication cables (including optical fiber cables). These risks will be addressed through a number of activities defined in the EMP. The contractors will implement the following measures:

i) **Traffic management.** A traffic control and operation plan will be prepared by contractors, to be approved by the local traffic management administrations before construction. The plan will include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings, selecting transport routes to reduce disturbance to regular traffic, reinstating roads, and opening them to traffic as soon as the construction is completed;

ii) **Underground facilities survey and protection.** Construction activities will be planned so as to minimize disturbances to utility services. Three-dimensional detection of underground facilities will be conducted before construction where appropriate if necessary;

iii) **Information disclosure.** Residents and businesses will be informed in advance through media of the construction activities, given the dates and duration of expected disruption;

iv) **Construction sites protection.** Clear signs will be placed at construction sites in view of the public, warning people against potential dangers such as moving vehicles, hazardous materials, excavations etc., and raising awareness on safety issues. Heavy machinery will not be used at night. All sites will be secured, disabling access by the public through appropriate fencing whenever appropriate; and

v) **Vibration control,** including prohibition of pilling and compaction operations at night.

194. **Risks to occupational health and safety.** The construction industry is considered to be one of the most hazardous industries. Intensive use of heavy construction machinery, tools, and materials present physical hazards including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, chemical hazards such as toxic fumes and vapors, etc. Contractors will implement adequate precautions to protect the health and safety of their construction workers. Each contractor will prepare an environmental, health and safety management plan for the construction works. The plan will include the following provisions:

i) provide clean water for all construction sites and workers' camps;

ii) provide an adequate number of latrines and other sanitary arrangements at construction sites and work camps, and ensure that they are cleaned and maintained in a hygienic state;

iii) garbage bins at construction sites and camps will be set up, which will be periodically cleared to prevent outbreak of diseases;

iv) provide personal protection equipment, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection;

v) an emergency response plan to take actions on accidents and emergencies will be prepared, including environmental and public health emergencies associated with hazardous material spills and similar events. Emergency phone links with hospitals in Baishan and Baicheng will be established. A fully equipped first-aid base in each construction camp will be organized;

vi) ensure that occupational health and safety matters are given a high degree of publicity to all persons regularly or occasionally on each construction site. Posters will be displayed prominently in relevant areas of the site; and

vii) train all construction workers in basic sanitation, general health and safety matters, and on the specific hazards of their work. Implement site HIV/AIDS and other communicable diseases awareness and prevention program to target the local community and construction workers.

195. **Other Social Issues.** No other social risks and/or vulnerability are anticipated as a result of the project. The project construction workers will be engaged locally. Prevention and control of transmissible diseases and HIV/AIDS, and community disturbance training and sensitization will be provided to the contractors, ensured in the loan assurances and monitored in the social action plan. Civil works contracts will stipulate priorities to (i) employ local people for works, (ii) ensure equal opportunities for women and men, majorities and minorities, (iii) pay equal wages for work of equal value, and pay women's wages directly to them; and (iv) not employ child or forced labor. Specific targets for employment have been included in the gender action plan (GAP).

D. Potential Impacts and Mitigation Measures during Operation

(A) Water Supply Component (Baishan)

196. A participatory risk assessment was conducted in Baishan in November 2013 to identify main risks and concerns during WTP operation (**Table V-10**). The assessment was conducted through a workshop facilitated by the PPTA Consultant. Workshop participants included 15 representatives from the Baishan Water Company, the Design Institute in charge of the water supply component, the EIA institute, representatives from Baishan Municipal Government, and the PPTA Consultant. The approach adopted was based on the guidance provided by WHO (Bartram et al., 2009). [40] The process undertaken entailed the following two basic steps:

(i) Risks resulting from the potential hazards for each process of the proposed water supply system (from the water source to the end user) were assessed for each part of the water supply system.

(ii) Control measures included in the component's design were assessed and additional measures defined as needed.

[40] Bartram J, Corrales L, Davison A, Deere D, Drury D, Gordon B, Howard G, Rinehold A, Stevens M. *Water safety plan manual: step-by-step risk management for drinking-water suppliers.* Geneva, World Health Organization, 2009.

197. The assessment identified the following key risks and impacts, which were further assessed in the domestic EIA, the FSR and this IEE: (i) the operation of the Xibeicha Reservoir (an associated facility), including establishment and management of water source protection zones; (ii) impacts on local and regional water resources induced by water extraction; (iii) pollution prevention and abatement at the water treatment plant (noise, wastes, chlorine dioxide); (iv) non-revenue water and energy efficiency considerations.

Table V-10: Risks, hazards and control measures during WTP operation

Process	Risk	Control and Mitigation Measure
Water intake (Xibeicha Reservoir)	Accidental spill, resulting in contamination of water source	• Establishment and enforcement of water source protection zones; • Emergency response procedures in case of contamination, including switch to the existing Nanshan WTP through the pipeline network and shut down the polluted WTP;
Pre-sedimentation basin	Algal bloom in the pre-sedimentation basin, causing algal toxin, water treatment difficulty and taste/odor problems	• Water treatment conducted and supervised by qualified staff; • Comprehensive monitoring at the Xibeicha Reservoir and pre-sedimentation basin
Coagulation and sedimentation	Mechanical or electrical failure of chemical dosing system, resulting in high turbidity and clogging of filter.	• Use backup coagulant dosing system; • Installation and maintenance of automatic dosing pump with integrated alarm system in the event of failure;
	Use of contaminated coagulant, resulting in contamination of water	• Coagulant must be purchased form approved supplier, demonstrating compliance with national product standard of GB1892-2009
Filtration	Failure of filtration system, with high turbidity and potential for pathogen breakthrough	• Installation and regular calibration of on-line filtration turbidity monitoring instruments, with alarm system; • Multiple separate filtration units in parallel; • Keep good operation condition of filtration chamber by regular back flush and maintenance.
Chlorination	Insufficient or excessive chlorine dosing resulting in pathogen breakthrough or chlorine taste and odor	• Automate chlorine dosing and on-line residual chlorine monitoring to achieve chlorine content of 0.5 mg/L to 1.0 mg/L (30 min after chlorination).
Treated water storage	Accidental contamination of the treated water (e.g. rodents)	• Storage tanks for treated water will be roofed; • Vents and overflows will be meshed; • Storage tank walls will be lined with water proof material; • Frequent inspections and maintenance of the treated water tanks
Water supply pumping	Pump failure, power failure, loss of pressure, risk of re-contamination due to back-siphonage	• Backup pumps and dual power system must be installed in the WTP and kept in good condition; • Inspect the backup pumps and dual power system regularly.
Distribution network	B. Pipe burst causing water re-contamination and interrupted water supply service	• Proper pipe material selection; • Procedures for operating system to avoid spikes and water hammering; • Implementation of emergency response action plan, including quick repair of bursts and pipe cleaning and water quality monitoring for the network

198. **Impact of Xibeicha Reservoir and the water supply component on local and regional water resources (Induced Impact).** The impact of the Baishan water supply component and the associated Xibeicha Reservoir (caused by the reduction in water flow) on the downstream reach of the Xibeicha River and the Hunjiang River further downstream was examined via the determination of water balances for different scenarios. The results are presented below.

199. The Xibeicha Reservoir is located on the midstream of the Xibeicha River with a design capacity of 13.5 million m^3 active storage and 0.61 million m^3 of dead storage. The total upper reach catchment

area of the reservoir is 128 km^2. The preliminary design of the Xibeicha Reservoir established mean annual runoff of the Xibeicha River at dam site as 49.25 million m^3 per year (1.62m^3/s; C_v=0.34; C_s/C_v=2.0), and defined annual runoff quantities at different guaranty/probability levels (**Table V-11** and **Table V-12**). These figures were established based on data series from 1952 to 2008. The estimated evaporation from reservoir surface is 629.5 mm, and the mean annual precipitation in the area is 837 mm. [41] The estimated reservoir seepage is 0.149 m^3/s (4.699 million m^3/a), and estimated evaporation is 0.011 m^3/s (346,896 m^3/a).

Table V-11: Annual Runoff of Xibeicha River at Reservoir Site

Items	Average value	C_V [42]	C_s/C_v
Mean annual runoff flow rate (m^3/s)	1.62	0.34	2.0
Mean annual runoff quantity (million m^3)	51.2	0.34	2.0
The depth of mean annual runoff (mm)	**400**	**0.34**	**2.0**

Source: Preliminary Design of the Reservoir (2009)

Table V-12: Annual Runoff of Xibeicha Reservoir at Different Probabilities

Probability P (%)	20	50	80	90	95
Annual Runoff (million m^3)	64.97	49.25	36.20	30.52	26.40
Mean annual flow Rate (m^3/s)	2.06	1.56	1.15	0.968	0.836

Source: Preliminary Design of the Reservoir (2009)

200. Seasonal variability of flows in the Xibeicha River was established using flow data from the nearby Tiechang Hydrology Station. Through analysis of runoff data at the Tiechang Hydrology Station, representative years and monthly flow variations for different guaranty/probability levels of flows were identified: 1974 represents a wet year (P=20%); 1982 represent a normal year (P=50%); 1988 represents a dry year (P=80%); and 2002 represents an extreme dry years (P=95%) The monthly distribution of annual runoff in the representative years during is presented in **Table V-13**. The designed total water supply capacity of the proposed WTP in Hunjiang District and water transmission to Jiangyuan District is 70,000 m^3/d. The total annual amount of water used for water supply is 24.4 million m^3.

201. **Induced impact on downstream section of Xibeicha River.** The water extraction rate from the Xibeicha River to the project WTP in Hunjiang District and to the existing WTP in Jiangyuan District will amount 49% of the mean annual flow of the river[43]. This amount is significant, but acceptable. The 9 km section from the Xibeicha Reservoir to the Hunjiang River is in mountainous areas with high forest coverage. There are no agricultural, commercial or industrial activities in the area, and no water is extracted for domestic, industrial or agricultural purposes along this section. The next settlement (Sanchazi Township) is at the confluence of the Xibeicha River and the Hunjiang River, 9 km away from the reservoir. Downstream use of the water capture point is limited to in-stream ecology and riparian vegetation, with minimal needs during the winter period. A minimum water release (minimum flow) of

[41] Source: Preliminary Design of the Reservoir (2009)

[42] Cv = The coefficient of variation of annual flow of rivers, which is the main indication for the yearly variation in river flow; Cs= coefficient of asymmetry, or coefficient of skewness (Cs = 0 indicating normal distribution)

[43] If water losses in the reservoir are accounted for (including seepage and evaporation), the flow reduction resulting from the reservoir and the water extraction for water supply will amount to 57% of the mean annual flow; see Table V-14.

0.14 m^3/s (4.415 million m^3/a) is defined in the approved EIA of the reservoir for the period from April to September, to support in-stream ecology and riparian vegetation. The need to guarantee minimum water release in compliance with the approved EIA is flagged as loan assurance.

Table V-13: Monthly Distribution of Annual Runoff in Representative Years (Unit: 10,000 m3)

P	Item	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
20%	Distribution factor	0.38	0.18	0.75	10.68	6.26	12.83	17.84	27.43	16.48	3.78	2.49	0.90	100
	Representative year (1974)	24.5	11.8	48.6	693.7	406.9	833.3	1159.3	1782.4	1070.4	245.3	162.0	58.4	6,497
50%	Distribution factor (%)	0.45	0.37	1.24	3.98	18.89	16.90	6.71	37.74	7.40	1.92	2.94	1.46	100
	Representative year (1982)	22.3	18.1	60.9	196.1	930.2	832.5	330.5	1858.6	364.4	94.4	145.0	72.0	4,925
80%	Distribution factor (%)	1.28	0.42	2.71	12.57	17.36	27.50	26.70	3.05	3.39	2.51	1.76	0.74	100
	Representative year (1988)	46.5	15.2	98.2	456.4	630.2	998.2	969.2	110.8	123.0	91.3	63.9	26.9	3,630
95%	Distribution factor (%)	0.32	0.35	2.63	11.29	5.88	2.64	21.58	39.88	4.90	4.46	4.49	1.59	100
	Representative year (2002)	8.40	9.10	69.3	297.8	155.0	69.6	569.2	1051.6	129.1	117.6	118.3	42.0	2,637

Source: Preliminary Design of the Reservoir (2009)

202. **Induced impact on downstream Hunjiang River.** The Xibeicha River is a tributary of Hunjiang River, which is 9 km downstream of the Xibeicha Reservoir. The Hunjiang River in Baishan Municipality has a catchment area of 1,734.2 km^2, and an average annual flow of 2.164 billion m^3.[44] The flow reduction due to the proposed water supply component (26.78 million m^3/a) is 1.5% of the total annual flow of Hunjiang River (Baishan section, see **Table V14**). This figure assumes that none of the extracted water will return to the river, when in fact all return waters (i.e., treated effluent from the WWTP) will flow into the Hunjiang River. Assuming a worst case return water volume of 60%, the net reduction in flow of the Hunjiang River would be around 0.6%. The more usual figure of 80% return waters would result in a net reduction of only 0.3%. Both the domestic EIAs of the Xibeicha Reservoir and the WTP conclude that the impact of the proposed WTP on downstream areas including the Hunjiang River is acceptable.

Table V-14: Water Source Balance based on Mean Annual Flows

(Unit: million m^3/a)

No.	Item	Amount
1	Total flow of the Xibeicha River	49.25
2	Total water supply to the WTP from the reservoir	24.40
3	Total reservoir seepage and evaporation	3.95
4	Total minimum flow required to downstream areas and Hunjiang River from the reservoir	4.03
5	Total flow to Hunjiang River from the reservoir during WTP operation	20.90[45]
6	Total average annual flow of Hunjiang River without WTP operation	2,110
7	Total average annual flow of Hunjiang River with WTP operation	2,078
8	Reduction rate of Hunjiang River flow with WTP operation	1.51%
9	Reduction rate of Xibeicha River flow with the WTP operation	57%

Source: Calculated by the PPTA Consultant based on the domestic EIA

203. **Impact of seasonal variations on reservoir levels and water supply reliability. Table V-13** compares the monthly volumes to be drawn from the reservoir with inflow rates, and confirms that for dry years (i.e., 80% supply guaranty), the water balance is positive. The comparison shows that at an active storage of 13.5 million m^3, there will be no water deficit. For a dry year (80% supply guarantee rate), the minimum active reservoir storage volume (0.6 million m^3) will occur at the end of the dry season (March). In case of extreme dry years (95% supply guarantee), there will be a supply deficit which will be overcome through demand management measures as well as through alternative water sources (i.e., Dayangcha River in Jiangyuan District). This scenario, including the contingency plan, is discussed in the next paragraph.

[44] The 45 years average data from 1961-2006 at Baishan Badaojiang Hydrologic Station.

[45] Includes the minimum ecological flow.

Table V-15(a): Reservoir Volumes for Dry Year (P=50% Guarantee Rate)

Month	Water Inflow	Losses of evaporation and seepage	Minimum release flow	Storable water amount	Water supply capacity	Water storage rate	Storage volume at end of month	Net water release to downstream area	
-	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3)*	*(m3/s)*	*(m3/m)*
10	0.36	0.05	0.14	0.17	0.81	-0.64	10,897,782	0.28	737,856
11	0.55	0.03	0.14	0.38	0.69	-0.31	9,704,090	0.28	737,856
12	0.27	0.01	0.14	0.12	0.69	-0.57	7,828,932	0.28	737,856
1	0.08	0.02	0.07	0.00	0.69	-0.70	5,986,024	0.07	184,464
2	0.07	0.01	0.06	0.00	0.69	-0.70	4,153,785	0.06	158,112
3	0.23	0.04	0.14	0.05	0.81	-0.76	2,194,677	0.13	329,400
4	0.74	0.18	0.14	0.42	0.81	-0.39	**652,158**	0.34	895,968
5	3.53	0.25	0.14	3.14	0.81	2.33	5,477,727	0.64	1,686,528
6	3.16	0.40	0.14	2.62	0.81	1.81	7,083,364	1.34	3,531,168
7	1.25	0.39	0.14	0.72	0.81	-0.09	2,637,428	1.74	4,585,248
8	7.05	0.06	0.14	6.85	0.81	6.04	**13,286,667**	2.14	5,639,328
9	1.38	0.06	0.14	1.18	0.81	0.37	12,943,622	0.64	1,686,528
Total	***49,250,000***	***3,947,530***	***4,031,856***	***41,157,853***	***24,400,000***	-	-	-	***20,910,312***

Table V-16(b): Reservoir Volumes for Dry Year (P=80% Guarantee Rate)

Month	Water Inflow	Losses of evaporation and seepage	Water for ecology	Storable water amount	Designed water supply capacity	Water storage rate	Storage volume at end of month	Net water release to downstream area	
-	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3/s)*	*(m3)*	*(m3/s)*	*(m3/m)*
10	0.34	0.05	0.14	0.16	0.81	-0.65	8,853,157	0.10	263,520
11	0.24	0.03	0.14	0.07	0.69	-0.62	7,322,429	0.10	263,520
12	0.10	0.01	0.09	0.00	0.69	-0.69	5,601,968	0.05	131,760
1	0.18	0.02	0.14	0.02	0.69	-0.68	3,921,345	0.10	263,520
2	0.06	0.01	0.05	0.00	0.69	-0.70	2,190,551	0.01	26,352
3	0.37	0.04	0.14	0.19	0.81	-0.62	**666,808**	0.10	263,520
4	1.73	0.18	0.14	1.41	0.81	0.60	1,835,555	0.29	764,208
5	2.38	0.25	0.14	1.99	0.81	1.18	5,300,817	0.44	1,159,488
6	3.77	0.40	0.14	3.24	0.81	2.43	10,110,844	0.74	1,950,048
7	3.66	0.39	0.14	3.13	0.81	2.32	**13,466,760**	1.19	3,135,888
8	0.42	0.06	0.14	0.22	0.81	-0.59	11,906,226	0.14	368,928
9	0.47	0.06	0.14	0.26	0.81	-0.55	10,462,415	0.14	368,928
Total	***36,169,164***	***3,947,530***	***4,058,208***	***28,086,477***	***24,400,000***	**-**	**-**	**-**	***8,959,680***

204. **Water balance in extreme dry year.** The design of the Baishan water supply system is based on 80% guarantee rate to ensure that the water source will provide adequate water supply for 80% of years. The water balance analysis in Table V-16 below shows that the total annual flow of the Xibeicha River in extreme dry year (95% guarantee rate) will not be able to supply the designed water capacity of 24.4 million m^3/a to both Hunjiang WTP and Jiangyuan District. To address the water safety risks caused by extreme dry years, a water conservation plan and emergency response mechanism will be developed and established in Baishan during project implementation, which will mainly focus on **water demand management** measures including: (i) prohibiting landscape and recreational watering; (ii) reducing production in industries with heavy water consumption; and (iii) city-wide water conservation campaign.[46] In parallel, supply will be adjusted to account for supply realities. The main water **supply management measure** during extreme dry years will be to reduce the water transmission from the Xibeicha Reservoir to the Jiangyuan District by using the existing water source of Jiangyuan WTP (Dayangcha River reservoir) as the backup water source. As a result, the water extraction from the Xibeicha River and its reservoir can be temporary reduced to 15.83 million m^3, with a water release to the downstream Xibeicha River and Hunjiang River of 5.50 million m^3. This corresponds to 125% of the minimum ecological flow (4.06 million m^3/a) as stated in the approved EIA of the Xibeicha reservoir. The reduction of Hunjiang River flow rates with the water supply component in extreme dry years is 2.02%, which shows that the impact to the downstream hydrology is acceptable (Table V-16).

Table V-17: Water Source Balance based on Extreme Dry Year

(P=95%, Unit: million m^3/a)

No.	Item	Amount
1	Total flow of the Xibeicha River	26.37
2	Total water supply to the WTP from the reservoir	15.83
3	Total reservoir seepage and evaporation	3.95
4	Total flow to Hunjiang River from the reservoir with water supply component	5.50
5	Total average annual flow of Hunjiang River without the water supply component	1,034
6	Total average annual flow of Hunjiang River after the water supply component operation	1,013
7	Reduction rate of Hunjiang River flow after the water supply component operation	2.02%

Source: calculated by the PPTA Consultants based on the domestic FSRs and EIAs

205. **Protection Zoning for Xibeicha Reservoir.** The PRC Protection Regulation for Drinking Water Source was issued in 2007.[47] The regulation defines the need to establish two protection zones, plus a buffer zone (not compulsory) around surface water sources, including Grade I zone (prohibited zone, the closest to the water source), Grade II (protection zone, adjoining the prohibited zone), and a buffer zone (not always present, as not mandatory). Jilin Provincial People's Congress issued the Jilin Provincial Regulation for Urban Drinking Water Source Protection on 23 March 2013. The regulation is fully in line with the national regulation for establishment of protection zones. Restrictions for each of the zones are as defined as follows:

i) **Grade I zone**: The State's Surface Water Environmental Quality Standard Category II applies to the quality of surface water in the Grade I protective zone. Within the First-grade zone, the construction or expansion of any projects that have no relation with water supply facilities and protection of water sources is prohibited, unauthorized personnel is forbidden from entering.

[46] The draft water conservation plan and emergency response mechanism will be discussed with, and disclosed to, affected people and main water users (landscaping, agriculture, manufacturing industries, hydropower plant).

[47] Technical Guideline for Delineating Source Water Protection Areas (HJ/T338-2007)

ii) **Grade II zone**: The State's Surface Water Environmental Quality Standard Category III applies to the water quality in the Grade II protective zone. New-construction or expansion of any projects that discharge pollutants into the water body is prohibited. Any reconstruction projects in the Second-grade SWP Zone must cut down its pollutant discharge.

206. The Jilin Provincial Government approved the "The Drinking Water Source Protection Plan for the Xibeicha Reservoir" in 2010 (Approval document No. of Jilin Gov-2010-112), which clearly delineates the total protection area of 92 km^2, including Grade I zone (6.25 km^2) and Grade II zone (85.75 km^2), as illustrated in **Figure V-1** below.

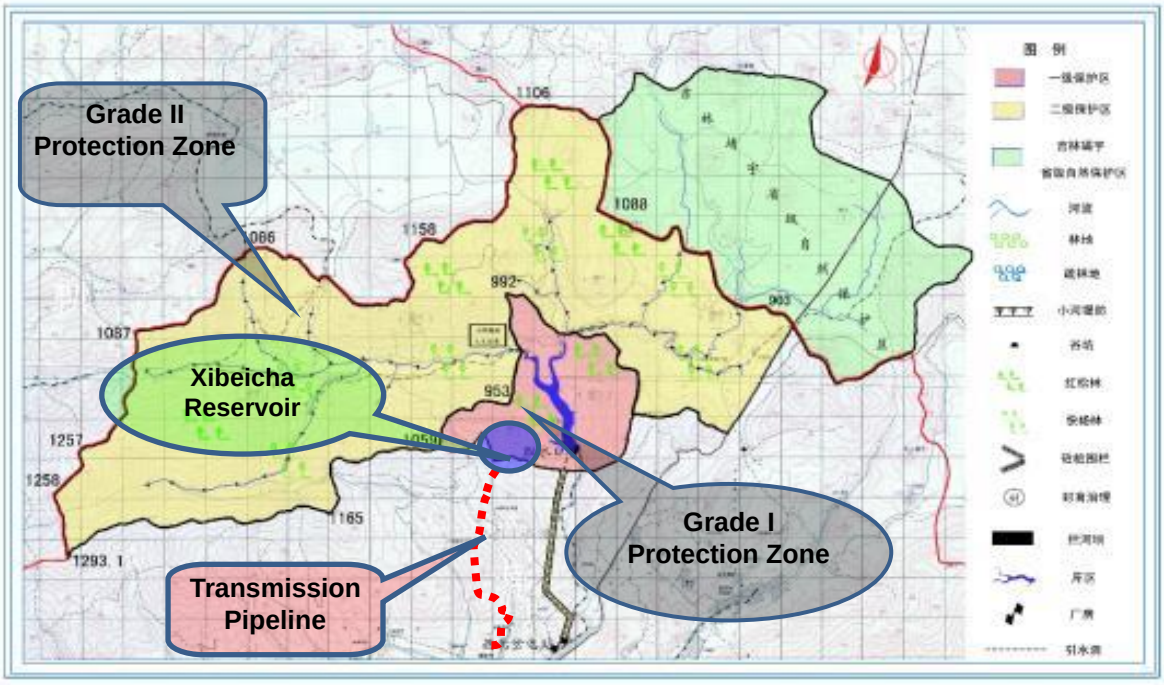

Figure V-1: Drinking Water Source Protection Zone of Xibeicha Reservoir

207. **Handling and disposal of chlorine dioxide at the WTP.** The WTP will use chlorine dioxide (ClO_2) for water disinfection. Chlorine dioxide is safer and produces less harmful organic trihalomethanes (TMHs) compared to liquid Cl_2 water disinfection. The main constituents of chlorine dioxide in a ClO_2 generator, sodium chlorite solution and hydrochloric acid will be transported to and mixed in a reaction tank (batch reactor), in the WTP's preparation room. Hazards exist in preparing, transporting, storing and handling the hydrochloric acid and sodium chlorite used for ClO_2 generation. In the chlorination rooms of the WTP, there is an environmental risk of hydrogen chloride and ClO_2 leakage. The following measures will be implemented to mitigate potential hazards to the health and safety of WTP operators:

i) Chemicals will be transported and managed in compliance with PRC regulations on hazardous chemical substance management (The PRC State Council Order No. 2002-244);

ii) Transport vehicles and personnel will be qualified and trained with hazardous chemical substance handling and transportation;

iii) Storage of hazardous chemicals will be arranged with certificates procured from the police department and fire authorities;

iv) Chlorination rooms and chemical storage rooms in the WTP will be equipped with automatic censors and alarms, which will be triggered by ClO_2 leakage;

v) The WTP will be equipped with gas masks, oxygen breathing apparatus and other rescue materials, to protect staff in the event of leakage of hydrogen chloride and ClO_2. and

vi) An emergency response plan will be prepared and implemented in the WTP. The plan will inform staff and visitors about the characteristics of ClO_2 and hydrochloric acid, potential hazards, and define accident prevention measures and evacuation plan.

208. **Operational noise.** Operational noise impacts may arise from equipment operation at the WTP, including pumps, fans, and sludge dewatering machines (spin-driers). In general, operational noise of machines at a WTP is about 85-90 dB (A). Predictive sound modeling for WTP operation was conducted for the project, which are described in detail in the component EIA. The predicted values are shown in **Table V-17**.

Table V-18: Predicted noise levels in the water supply plant [dB (A)]

Location	Predicted Noise	Standard of GB12348-2008		Standard Compliance
		Day	Night	
East boundary of WTP	47.8	60	50	meet
West boundary of WTP	42.7	60	50	meet
South boundary of WTP	49.0	60	50	meet
North boundary of WTP	43.9	60	50	meet

Source: the domestic EIA report

209. All noise-emitting machinery and equipment will be installed in sound-proof housing within rooms in the WTP. Based on the above calculations by the EIA institute, the projected noise values at all boundaries of the WTP during both daytime and nighttime meet the Noise Standard at Boundaries of Industrial Enterprises" (GB12348-2008). There are no villages or other sensitive receptors within 500 m of the boundaries of the WTP. The impact will not be significant. This will be confirmed through noise monitoring during WTP operation.

210. **Capacity building for water quality monitoring.** Thanks to the high water quality of the Xibeicha Reservoir (Table IV-16), the risk during WTP operation is generally low, and can be adequately managed through comprehensive training and capacity strengthening. The WTP will be equipped with a laboratory capable of examining the 42 key water quality parameters defined in the National Standard for Drinking Water. In addition, water samples taken from the clean water tank of the WTP will be sent to the Changchun Water Supply Company twice per year for an examination of the 106 key water quality parameters defined in the PRC regulation. An automatic monitoring system will be installed in the Xibeicha Reservoir and the pre-sedimentation tank.

211. **SCADA operation and NRW reduction.** A SCADA system was proposed in the FSR. The SCADA system consists of a master terminal unit (MTU) that communicates with and controls a number of remote terminal units (RTUs) at key control points including water intake point at Xibeicha Reservoir, water supply pumping and metering. The main functions of the SCADA for NRW reduction is to adjust water supply network pressure based on the water consumption (e.g. reduce water pumping in nighttime when water users sleep) for both energy saving and NRW reduction. The FSR also proposed water leakage detectors and repairing tools for daily leak detection and repairing.

212. **Pollutant emission from the small boiler.** A small boiler with the capacity of 2 t/h will be installed for the five month heating period in winter. According to the FSR and the EIA, the pollutants emission of flue dust (TSP), SO_2 and NO_2 will meet the National Standard of Air Pollutant Emission from

Boilers (GB13271-2001). The impact on surrounding environment is acceptable (**Table V-18**).

Table V-19: Predicted Emission Concentration and Amount from the Boiler in the WTP

Item	Predicted Value	Standard Value (compliance)
Coal consumption	825 t/a	
Height of chimney	30m	30 m (meet)
Volume of flue dust	8.4 million m^3/a	
Concentration of flue dust (TSP)	74.2 mg/m^3	200 mg/m^3 (meet)
Total flue dust emissions	0.5 t/a	
Concentration of SO_2	194.5 mg/m^3	900 mg/m^3 (meet)
Total SO_2 emissions	2.51 t/a	
Concentration of NO_2	200 mg/m^3	------
Total NO_2 emissions	1.68 t/a	

Source: domestic EIA Report

213. **Induced wastewater production.** The proposed WTP will increase water supply coverage by 50,000 m^3/day, resulting in the production of an estimated 40,000 m^3/d of wastewater (i.e. wastewater induced by increased water supply capacity), which will require additional wastewater treatment. The treatment capacity of the existing Baishan WWTP is 50,000 m^3/d (see due diligence section in Chapter III of this IEE), but it operate far below its capacity, at approximately 25,000 m^3/d. The existing WWTP will be expanded to 100,000 m^3/d before the end of 2016 (before WTP completion). According to the due diligence conducted jointly by the EIA institute and the PPTA Consultant, the Baishan WWTP will have enough treatment capacity to treat additional wastewater generated by the proposed WTP. The effluent from the WWTP will meet the PRC Standard of GB18918-2002 as long as the WWTP keeps normal operation. In addition, the WTP staff will generate wastewater (1,300 m^3/a). This quantity is small and will be treated by septic tanks installed on site.

(B) Operation of Proposed roads, bridges and auxiliary facilities

214. Main environmental issues during operation of the urban roads, bridges and auxiliary piped facilities in the Baicheng project area relate to direct vehicle emissions, traffic noise, pollution from storm-water runoff, traffic safety and the risk of hazardous spills. These impacts are discussed below.

215. No significant induced impact from road operations is anticipated. The expanded road network in Baicheng will support urban development with significant population increases which will induce increases in traffic flows and related emissions, and demand for public services. All proposed roads and bridges as well as future traffic volumes on these roads and bridges and their induced impacts have been examined in the context of relevant development plans. The project roads are in line with approved urban master plans of Baicheng, and will thus not induce uncontrolled development. The proposed roads and bridges will address the inadequacy of the existing road networks and rationalize urban transport. Air quality and noise impacts due to increased traffic flow have been assessed in the domestic EIA and mitigation measures have been identified in the EMP. Significant indirect or induced negative impacts from road components are not anticipated. The installation of pipelines of water supply, sewer and heating supply concurrent with road construction would induce potential impacts on the water supply, heating supply and wastewater treatment systems by increasing the demand on their services. Again, such increase has been fully considered in the urban master plan of Baicheng, with the capacities of the above infrastructures timely expanded to meet such demand. Significant induced negative impacts are not expected.

a. Impacts on Climate and Air Quality

216. **NO_2 and CO** were designated by the EIA institute and Baicheng municipal EPB for assessing traffic emission impact on air quality during operation. The baseline monitoring indicates that the average concentrations of NO_2[48] in Baicheng met Grade II of the PRC Ambient Air Quality Standard of GB3096-1996 (see baseline data in Chapter IV of this IEE).

217. By using traffic volume projections provided in the FSR, air quality was modeled during the domestic EIA study based on the AERMOD methodology (software), which is recommended in the PRC "Technical Guideline on Environmental Impact Assessment – Atmospheric Environment" (HJ2.2-2008). Vehicle emission concentrations at average traffic volumes (both daily average and rush hours) during the operation period at sensitive locations were estimated. **Table V-20** shows that the predicted concentrations of NO_2 and CO for 2019 (short-term), 2025 (medium-term), and 2033 (long-term) on ground level along both sides of the project roads at sensitive locations in Baicheng all meet the national Grade II Standards of GB3095-2012.

[48] CO is not a regular parameter for ambient air monitoring.

Table V-20: Predicted NO2 & CO Concentrations at Sensitive Locations in Baicheng City during Operation of the proposed Roads

Wind Speed: 2.5 m/s

Sensitive Locations	Location & Distance from Roadside (m)	Year	Time	NO_2 (mg/m^3)			CO (mg/m^3)		
				Predicted Concentration	Standard Value	Standard Compliance	Predicted Concentration	Standard Value	Standard Compliance
Changqing Village	50m on two sides of Xingfubei Street	2019	Daily average	0.027235	0.12	meet	1.572664	4	meet
			Rush hours	0.030727	0.24	meet	0.995136	10	meet
		2025	Daily average	0.043696	0.12	meet	1.520887	4	meet
			Rush hours	0.043597	0.24	meet	0.991245	10	meet
		2033	Daily average	0.065644	0.12	meet	1.451851	4	meet
			Rush hours	0.060756	0.24	meet	0.986057	10	meet
Chengfeng Village	45 m north of Third Ring Road	2019	Daily average	0.026169	0.12	meet	1.511092	4	meet
			Rush hours	0.029524	0.24	meet	0.956175	10	meet
		2025	Daily average	0.041986	0.12	meet	1.461342	4	meet
			Rush hours	0.04189	0.24	meet	0.952437	10	meet
		2033	Daily average	0.063074	0.12	meet	1.395009	4	meet
			Rush hours	0.058377	0.24	meet	0.947452	10	meet
Guoshuchang Village	60 m west of Third Ring Road	2019	Daily average	0.024156	0.12	meet	1.53659	4	meet
			Rush hours	0.028182	0.24	meet	0.887062	10	meet
		2025	Daily average	0.039685	0.12	meet	1.441116	4	meet
			Rush hours	0.04026	0.24	meet	0.903741	10	meet
		2033	Daily average	0.06039	0.12	meet	1.313818	4	meet
			Rush hours	0.056364	0.24	meet	0.92598	10	meet
Baopinng Middle School	65 m west of Third Ring Road	2019	Daily average	0.022143	0.12	meet	1.525854	4	meet
			Rush hours	0.026169	0.24	meet	0.867603	10	meet
		2025	Daily average	0.037672	0.12	meet	1.478117	4	meet
			Rush hours	0.03796	0.24	meet	0.885433	10	meet
		2033	Daily average	0.058377	0.12	meet	1.414468	4	meet
			Rush hours	0.05368	0.24	meet	0.909205	10	meet
Baoping Primary School	80 m east of Third Ring Road	2019	Daily average	0.02013	0.12	meet	1.515118	4	meet
			Rush hours	0.024156	0.24	meet	0.848144	10	meet

Sensitive Locations	Location & Distance from Roadside (m)	Year	Time	NO_2 (mg/m^3)			CO (mg/m^3)		
				Predicted Concentration	Standard Value	Standard Compliance	Predicted Concentration	Standard Value	Standard Compliance
		2025	Daily average	0.035659	0.12	meet	1.515118	4	meet
			Rush hours	0.035659	0.24	meet	0.867124	10	meet
		2033	Daily average	0.056364	0.12	meet	1.515118	4	meet
			Rush hours	0.050996	0.24	meet	0.89243	10	meet
Erlong Village	65 m west of Third Ring Road, and 30m north of Xinhuaxi Road	2019	Daily average	0.029282	0.12	meet	1.501012	4	meet
			Rush hours	0.031828	0.24	meet	1.004494	10	meet
		2025	Daily average	0.045105	0.12	meet	1.458454	4	meet
			Rush hours	0.044923	0.24	meet	1.026865	10	meet
		2033	Daily average	0.066202	0.12	meet	1.401709	4	meet
			Rush hours	0.062383	0.24	meet	1.056692	10	meet
Chaoyang Village	90 m west of Third Ring Road, 80m south of Chunyang Road, and 60 m south of Shengli Road	2019	Daily average	0.023022	0.12	meet	1.464469	4	meet
			Rush hours	0.026859	0.24	meet	0.845427	10	meet
		2025	Daily average	0.037822	0.12	meet	1.373476	4	meet
			Rush hours	0.03837	0.24	meet	0.861324	10	meet
		2033	Daily average	0.057556	0.12	meet	1.252153	4	meet
			Rush hours	0.053719	0.24	meet	0.882519	10	meet
Baosheng Village	85 m east of Third Ring Road	2019	Daily average	0.016775	0.12	meet	1.490291	4	meet
			Rush hours	0.023485	0.24	meet	0.823317	10	meet
		2025	Daily average	0.033167	0.12	meet	1.496618	4	meet
			Rush hours	0.034413	0.24	meet	0.834245	10	meet
		2033	Daily average	0.055022	0.12	meet	1.505053	4	meet
			Rush hours	0.048983	0.24	meet	0.848815	10	meet
Xiangyang Village	45 m south and north sides of Third Ring Road, and 40 south and north sides of Tao'erhe Road	2019	Daily average	0.02779	0.12	meet	1.464937	4	meet
			Rush hours	0.030437	0.24	meet	1.011032	10	meet
		2025	Daily average	0.04367	0.12	meet	1.460967	4	meet
			Rush hours	0.042914	0.24	meet	0.987212	10	meet
		2033	Daily average	0.064844	0.12	meet	1.455674	4	meet
			Rush hours	0.05955	0.24	meet	0.955452	10	meet

Sensitive Locations	Location & Distance from Roadside (m)	Year	Time	NO_2 (mg/m^3)			CO (mg/m^3)		
				Predicted Concentration	Standard Value	Standard Compliance	Predicted Concentration	Standard Value	Standard Compliance
Baicheng Central Hospital	150 m west of Xiangyang Street	2019	Daily average	0.009803	0.12	meet	1.070522	4	meet
			Rush hours	0.016666	0.24	meet	0.583297	10	meet
		2025	Daily average	0.022408	0.12	meet	1.079765	4	meet
			Rush hours	0.024228	0.24	meet	0.585398	10	meet
		2033	Daily average	0.039213	0.12	meet	1.092089	4	meet
			Rush hours	0.034312	0.24	meet	0.588199	10	meet
Baicheng Special School	35 m west of Xiangyang Street	2019	Daily average	0.028756	0.12	meet	1.494025	4	meet
			Rush hours	0.031371	0.24	meet	1.01497	10	meet
		2025	Daily average	0.044722	0.12	meet	1.470217	4	meet
			Rush hours	0.044255	0.24	meet	1.01469	10	meet
		2033	Daily average	0.066009	0.12	meet	1.438473	4	meet
			Rush hours	0.061434	0.24	meet	1.014316	10	meet
Baicheng Normal College	40 m east of Xiangyang Street	2019	Daily average	0.027449	0.12	meet	1.446969	4	meet
			Rush hours	0.030063	0.24	meet	0.998631	10	meet
		2025	Daily average	0.043134	0.12	meet	1.443048	4	meet
			Rush hours	0.042387	0.24	meet	0.975103	10	meet
		2033	Daily average	0.064048	0.12	meet	1.437819	4	meet
			Rush hours	0.05882	0.24	meet	0.943732	10	meet

Source: the domestic EIA Report

218. **Estimated GHG emissions.** According to the ADB Environment Safeguards - a Good Practice Sourcebook (2012), an EIA for a road project should determine if the project has the potential to emit GHGs listed in the Kyoto Protocol at the rate of 100,000 tons of CO_2e per year. If the traffic expressed as passenger car units per day (PCU/day) is below the numbers indicated in **Table V-21** in a representative year, the emissions in that year are unlikely to exceed the 100,000 tons CO_2e threshold.

Table V-21: Maximum Number of PCU per Km to Trigger 100,000CO2e/a

Length of Road. (km)	PCU/day	Length of Road. (km)	PCU/day
10	76,000	50	23,000
20	57,000	60	19,000
30	38,000	70	16,000
32.42	**35,580**	80	14,000
35	33,000	90	13,000
40	28,000	100	11,000

Source: ADB Environment Safeguards - a Good Practice Sourcebook (2012)

219. The total length of the proposed roads in Baicheng City is 32.42 km, the projected traffic flows in the representative years of 2019, 2025 and 2033 are 15,465, 23,187 and 28,418 PCU/day respectively, those are below 35,580 PCU/day traffic for emitting 100,000 tons/a of GHGs **(Table V-22**).

Table V-22: Average Daily Traffic Flow on Each of the Roads (No/day)

Road	Length of Rd. (m)	Year	Car	Mid-Size Vehicle	Oversize Vehicle	PCU/day
Third Ring Road	11,304	2019	715	501	215	1,894
		2025	924	647	277	2,448
		2033	1,274	892	382	3,375
Xiangyang Road	4,505	2019	748	523	224	1,980
		2025	1,896	663	284	3,459
		2033	1,248	873	374	3,305
Xinhua Xi Road	2,724	2019	637	445.5	191	1,687
		2025	1,851	647.5	555	3,932
		2033	2,367	1657	355	5,563
Shengli Road	2,068	2019	656	459.5	196.5	1,738
		2025	1,010	707	303	2,676
		2033	1,284	898.5	385	3,401
Chunyang Road	3,881	2019	650	910	390	2,795
		2025	1,835	642	275.5	3,349
		2033	1,245	871	373.5	3,298
Xingfu Bei Street	1,330	2019	708	495.5	212.5	1,876
		2025	925	647.5	277.5	2,451
		2033	1,248	874	374.5	3,308
Nanyi Street	1,024	2019	494	345.5	148	1,308
		2025	735	513.5	220	1,945
		2033	909	636	272.5	2,408
Taoerhe Road	2,657	2019	492	344.5	147.5	1,304

Road	Length of Rd. (m)	Year	Car	Mid-Size Vehicle	Oversize Vehicle	PCU/day
		2025	721	504.5	216.5	1,910
		2033	907	634.5	272	2,403
Xinggong Road	2,927	2019	272	190	163	883
		2025	384	269	115	1,018
		2033	512	358.5	154	1,358
Total	**32,420**	2019	**5,370**	**4,214**	**1887**	**15,465**
		2025	**10,280**	**5,241**	**2,524**	**23,187**
		2033	**10,992**	**7,694**	**2,943**	**28,418**

Source: the FSR and domestic EIA; Note: 1car=1PCU, 1mid-size vehicle=1.5PCU, and 1 oversize vehicle=2PCU

220. **Mitigating air pollution.** Total vehicle emissions will be increased due to increased traffic flows, but this is expected to be partially offset by smoother traffic movements and the government's measures to control vehicle emissions, which are closely related with the policies and measures for emission control of Jilin Province and the PRC. Therefore, the vehicle emission control measures under the infrastructure components of Baicheng City should be considered in the context of provincial and national policies and measures for vehicle emission control. In 2005, the PRC promulgated the "Limits and Measurement Methods for Emissions of Pollutants from Light-duty Vehicles (grade III, grade IV)" (GB18352.3-2005), which became effective on 1st July 2007. At present, Baicheng City is conducting on-road inspection and annual examination of vehicle exhaust pollutants. As a result of these inspections, substandard vehicles, both private and public, are refused registration for road use. The municipal EPB and the local Traffic Management Bureau are in charge of implementing all the policies and measures for vehicle emission control formulated by the state and provincial authorities, and take the corresponding measures to control the exhaust pollutants emission of vehicles running on the proposed roads.

b. Traffic Noise

221. **Prediction model for traffic noise.** The noise prediction during operation from new roads has adopted the road noise prediction model as recommended in Appendix A.2 of the PRC Technical Guidelines for Assessment of Environmental Impact - Acoustical Environment (HJ2.4-2009). It has also used the horizontal noise generation of vehicles at speed from Annex C of Assessment Criterion on Environmental Impact in Road Construction Project (JTG B03-2006) and the attenuation effects of building groups in GB/T17247.2. Using average running velocity of various vehicles type and predicted traffic flows and the calculation of noise at source, the distance at which compliance with PRC ambient noise standards are reached have been calculated in the domestic EIA. The analyses then used these noise/distance calculations to predict the future noise levels at sensitive receptors along the roads.

222. **The noise impact assessment criteria** for the proposed road network in Baicheng are: (i) for areas within 35 m from the edges of road red-lines, the applicable standard is Grade 4a (70 dB for daytime and 55 dB for nighttime) of the Acoustic Environmental Quality Standard (GB3096-2008); (ii) for areas beyond 35 m from the red-lines of roads, Grade II standard for the area in the existing urban area (60 dB for daytime and 50 dB for nighttime) and Grade I standard (55 dB for daytime and 45 dB for nighttime) for the area in the existing suburb area are applicable, respectively according to the Classification of Acoustic Environmentally Functional Zones issued by the Municipal EPB.

223. **Traffic noise prediction.** Traffic noise prediction values at sensitive sites in short, medium and

long terms, are showed in **Table V-23**. The predicted daytime noise level at all sensitive sites meet the standard in the predicted years of 2019, 2025 and 2033, while the predicted nighttime noise levels at most locations slightly exceed the Grade I and II standards.

224. The reasons for exceeding the standard are the predicted increased traffic flows and the short distance from the receptors to the proposed roads. Noise-attenuation measures will include planting of trees with big canopies along the roadside, and installing 70 noise insulation windows on the first row buildings in Erlong village and Hujia village where nighttime noise levels are predicted to exceed the standard in the short term.[49]

Table V-23: Traffic Noise Prediction for the Sensitive location Leq [dBA]

Sensitive Location	Distance from the First Row of Building to Road Edge	Predicted Year					
		2019		2025		2033	
		Day	Night	Day	Night	Day	Night
Sites within Grade I functional zone↓	**Grade I standard Value →**	**55**	**45**	**55**	**45**	**55**	**45**
Special School (1st floor)	40 m (Xiangyang Street)	53.65	**51.97**	54.05	**52.61**	54.46	**53.24**
Special School (2nd floor)	40 m (Xiangyang Street)	53.64	**51.98**	54.04	**52.62**	54.45	**53.24**
Special School (3rd floor)	40 m (Xiangyang Street)	53.63	**51.95**	54.03	**52.60**	54.45	**53.24**
Baicheng Central Hospital	160 m (Xingyang Street)	48.28	46.40	48.64	47.04	49.03	47.66
Baoping Middle School	40 m (Third Ring Road)	53.66	**51.83**	54.09	**52.54**	54.57	**53.28**
Caoyang Village	80 m (Third Ring Road)	50.79	48.86	51.20	49.56	51.66	**50.30**
Guoshuchang Village	200 m (Third Ring Road)	47.13	45.39	47.56	46.08	48.03	46.82
Xiangyang Village	60 m (Tao'erhe Road)	50.90	48.64	51.68	49.81	52.51	**50.44**
Sites within Grade II functional zone↓	**Grade II standard Value →**	**60**	**50**	**60**	**50**	**60**	**50**
Xiangyang Village	60 m (Xingfubei Street)	51.61	49.87	52.06	50.60	52.51	51.30
Sites within Grade 4a functional zone↓	**Grade 4a Standard Value →**	**70**	**55**	**70**	**55**	**70**	**55**
Erlong Village	20 m (Third Ring Road)	57.24	**55.49**	57.67	**56.20**	58.16	**56.94**
Hujia Village	20m (Third Ring Road)	57.20	**55.49**	57.63	**56.20**	58.13	**56.94**

Source: EIA Report. Note: The data exceeding the standard are underlined.

c. Impacts on Surface and Groundwater Hydrology

225. The roads will not directly traverse along surface watercourses during road operations, and as such it is not expected to have significant adverse effect on water quality. As groundwater in the project area is generally relatively deep (> 5m), no impacts to groundwater resources are anticipated. No wells/hand pumps are located in the area of potential impact. There will be no net loss of water access points. Management measures for stormwater and wastewater produced on or along the project roads are described below.

226. **Stormwater runoff.** Stormwater that flows over the ground can entrain debris, rubbish, petroleum, chemicals, sediments and other pollutants. If prevented by impervious surfaces like asphalt pavements and sidewalks from naturally permeating into the ground, it can transport these pollutants into drainage systems, and even directly into the water bodies, contributing to water pollution. The

[49] Included in the procurement plan (packages CBC1 and CBC3 for Erlong village and Hujia village, respectively).

average annual precipitation in Baicheng areas is about 430 mm, but most rainfall is concentrated during June to September. The dry season lasts about 8-9 months every year, during which the roadside greenbelts have to be watered by using scarce water resource. A special stormwater collection, storage and infiltration system located under the roadside landscaping strip will be designed and installed as a demonstration feature for stormwater management along two project roads. During rainfall, partial rainwater collected from paved carriageway and non-motor vehicle lanes will flow into rainwater collecting system and remaining water will flow into the greenbelt to increase groundwater recharge. The water stored in the system will be used for watering the greenbelts in the dry season.

227. **Municipal wastewater.** The Baicheng Road component will construct 62.935 km sewer pipelines along the project roads with a domestic sewer collection amount of 9,000 m^3/d. The collected wastewater will be delivered to the existing Baicheng municipal wastewater treatment plants (WWTPs), where it will be treated to Class I-B Standard prior to discharge.

228. **Risk of spills**. By combining estimated risk occurrence frequencies at predicted traffic volume at the road network, and considering the fact that there is no existing natural river in the project area, the probabilities of pollution on the proposed roads causing by accidental hazardous spills were predicted as extremely low. The domestic EIA concludes that the risk of spills on the project roads and bridges is very minor, and that adequate response procedures are in place to deal with the risk. Baicheng Municipality has an emergency preparedness and response mechanism in place and there is an environment emergency response command office within the Baicheng EPB.

229. In addition, the following surface and groundwater protection measures will be implemented:

i) Routinely collecting and properly disposing litter and debris from sidewalks, driveways, and parking lots, especially near rivers;

ii) Cleaning the roadside catch basins before the rainy season to avoid surface water pollution by storm water runoff flushing debris and silt;

iii) Placing garbage bins and containers along the road networks, which have been included in the components of this ADB project; and

iv) Prohibiting car washing near rainwater drainage networks and channels;

d. Road Safety

230. The concerns over the community safety of the proposed roads have been thoroughly examined during the PPTA. In Baicheng City, the issue of road design features that could enhance the safety of roads was raised in the public consultation activities involving local residents and relevant government divisions. All roads have pedestrian sidewalks. All major roads have separate lanes for non-motorized traffic. Pedestrian-priority traffic lights, safety islands, crosswalks (zebra lines), and boarding bays/islands will be established at all intersections. Road maintenance vehicles will be equipped with warning lights, and staff will wear safety hats and reflective garments and undergo safety training. Under the project's capacity building component, traffic audit and separate traffic safety awareness campaigns both in schools and residential communities will be conducted.

(C) Impacts and Mitigation Measures for Integrated MSW components during operation

231. If not properly controlled, the MSW collection, sorting, composting and landfill processes can create a number of environmental concerns. The major environmental impacts resulting from the MSW components in both Baicheng and Baishan during operation include wastewater and noise emissions from the proposed MSW transfer stations, the MSW sorting and composting plants and the Baishan expanded landfill, increased flying dust and traffic noise from MSW collection and transport vehicles, and impacts on public and occupational safety and health. Odor is a significant impact and major concern of affected people during operation of the MSW facilities. Odors can be produced during collection, transport and disposal of the waste. In particular the landfill can release odors if not properly managed. Improper composting can encourage the formation of odorous compounds (anaerobic conditions encourage generation of odorous compounds like organic acids, mercaptans, alcohols, amines, and hydrogen sulfide gas, and other odorous sulfur compounds).

232. Potential impacts are presented in **Table V-23**. These concerns can be minimized through proper detailed design in accordance with relevant engineering design standards, and operation of the facilities.

Table V-24: Anticipated impacts during operation of MSW components

Impact on	Subcomponent	Issue	Impact
Air quality	MSW collection stations	MSW storage tanks	Odor emission
	MSW transfer stations	MSW compacting process	Odor emission
	MSW transport	MSW collection vehicles	Increased flying dust, off gas, NH_3 and H_2S
Surface Water	MSW transfer stations	Washing of solid waste tanks	Wastewater which contains COD_{Cr}, BOD_5 and SS.
Groundwater	MSW landfill	Landfill leachate	Groundwater pollution
Noise	MSW transfer stations	Compactor, blower and pump	Noise 70-90dB(A)
	MSW transport	Sanitation vehicles	Noise 80-85dB(A)
Solid waste	MSW transfer stations	Domestic solid waste	-----
Traffic	Solid waste transportation	MSW collection vehicles	Traffic congestion and inconvenience to the public
Health and Safety	MSW transfer stations, sorting and composting facilities, landfill	Waste	Infectious diseases, noise, dust, dangerous equipment (shredder), compost quality (heavy metal contamination)

Source: domestic EIA reports

a. Municipal landfill (Baishan)

233. The Baishan landfill expansion may have a number of potential impacts. Water and wind-borne pollution are the most significant impacts. Water-borne pollution may occur mainly through leachate from the base of the landfill leaking into groundwater and contaminating the groundwater. Wind-borne pollution comprises mainly plastic bags, dust and odor. These impacts are discussed below.

234. **Groundwater contamination risk assessment.** The likelihood of groundwater contamination caused by landfill leachate from the existing landfill cell was assessed through groundwater quality

monitoring and assessment. The assessment was conducted by Shenyang Geological Research Institute in January 2014. Five groundwater monitoring wells downstream of the existing landfill site were monitored, with 18 parameters analyzed (**Table V-24**). The assessment also included available monitoring results from April 2011 at the same points (No. 1#, 2# and 4#). The results show that all parameters meet the national Groundwater Quality Standard (GB/T14848-94), with a trend towards improved water quality from 2011 to 2014. The risk assessment concludes that there has been no significant leakage of landfill leachate into the groundwater aquifer since the landfill was put into operation in 2007, and that the risk of groundwater contamination during landfill operation is not significant. The risk of groundwater pollution is mitigated through a number of measures: (i) interception drains will be constructed to divert runoff water from entering the landfill site; (ii) impermeable lining will be installed for the base and sides; and (iii) an adequately sized leachate collection cell has been constructed for Phase 1 and Phase 2 of the landfill to contain and treat leachate. The efficiency of these measures will be confirmed through periodic monitoring of the leachate treatment facility and groundwater quality, in line with the final recommendation of the Shenyang Geological Institute. Groundwater quality will be monitored at the 5 points defined in Table V-24 at least once a year during construction and operation (COD_{mn}, BOD_5 and NO_3-N).

Table V-25: Groundwater Quality of downstream Areas of the Baishan Landfill Site (mg/L, except for pH and coliform)

Sampling site (distance/direction to landfill site	1# (150m south)		2# (Daqiao Valley, 800 m southwest)		3# (Qiupi Valley, 1300 m southwest)	4# (Pharmaceutical Factory, 1000 m southeast)		5# (Jiangbei Village, 1200 m southeast)	Grade III GB/T14848-94
Depth of Groundwater (m)	5.5		10.5		5.6	4.6		2.5	-
Monitoring Year	Apr. 2011	Jan.2014	Apr. 2011	Jan. 2014	Jan. 2014	Apr. 2011	Jan. 2014	Jan. 2014	
Parameter									
pH	7.49	7.76	7.25	7.77	7.82	7.43	7.82	7.74	6-9
Total Hardness	216	212	310	254	122	232	166	220	450
TDS	-	269	-	317	176		216	306	1000
COD_{Mn}	2.0	1.76	1.4	0.54	1.01	1.6	0.45	1.06	3.0
Sulfate (SO_4)	-	29.5		31.4	25.1		23.9	34.8	250
Cl^-	-	1.80		3.86	3.12		1.55	8.05	250
CN^-	-	ND		ND	ND		ND	ND	0.05
NO_3-N	1.57	0.61	21.09	2.50	4.70	3.03	0.50	4.56	20
NO_2-N	0.05L		0.05L			0.05L			0.02
NH_4-N	0.02L	ND	0.02L	ND	ND	0.02L	ND	ND	0.2
Volatile Phenol	ND	ND	ND	ND	ND	ND	ND	ND	0.002
Fe	-	ND		ND	ND		ND	ND	0.3
Mn	-	ND		ND	ND		ND	ND	0.1
Cr^{6+}	ND	ND	ND	ND	ND	ND	ND	ND	0.05
Cd	-	ND		ND	ND		ND	ND	0.01
Cu	-	ND		ND	ND		ND	ND	1.0
As	ND	ND	ND	ND	ND	ND	ND	ND	0.05
Pb	-	ND		ND	ND		ND	ND	0.05
Hg	ND	ND	ND	ND	ND	ND	ND	ND	0.001

ND: Non-detected;
Source: The Groundwater Monitoring Survey for Baishan Landfill Conducted by the Shenyang Geological Research Institute, February 2014

235. **Dust, wind-borne waste.** Dust can frequently be a problem at the landfill sites, particularly during dry and windy days. Dust is generated from dry, uncontained materials, especially during loading and unloading of MSW, and from vehicle traffic over unpaved surfaces. As long as there is an adequate buffer zone around the facility, and transport vehicles are covered, residents along the transport roads and near the facilities generally will not be significantly affected by dust. For wind-borne pollution, to a degree, the location of the MSW facilities (remote from any settlements) is a mitigation feature. Additionally, site management prescriptions covering the opening of a single active tip face at any one time, daily soil covering and fencing to catch wind-borne litter will act to minimize wind-borne pollution.

236. **Odorous emissions.** The EIA institute predicted the NH_3 and H_2S concentrations at the environmentally sensitive receptors nearby the landfill expansion site, which are summarized in **Table V-25** below.

Table V-26: Predicted NH_3 and H_2S Concentrations at Sensitive Receptors nearby the Baishan Landfill Expansion Site (Unit: mg/m^3)

	Daqiaogou Village	Qinggouzi Village	Shirengou Village
Distance downwind from the landfill site	1,100 m	800 m	1,500 m
Predicted concentration of NH_3	0.00028	0.00037	0.00022
Predicted concentration of H_2S	0.00005	0.00007	0.00004
Standard value of NH_3	0.2		
Standard value of H_2S	0.01		
Compliance to the standard	meet	meet	meet

Source: the domestic EIA Report

237. Thanks to the hills between the landfill site and the sensitive receptors, the predicted concentrations of NH_3 and H_2S at the sensitive receptors all meet the Sanitation Design Standard for Industrial Facilities of TJ36-79 - for residential area. Nearby residents will be consulted regularly on odor nuisance, and corrective actions will be defined if necessary Monitoring will be conducted during facility operation to confirm compliance.

b. MSW transfer stations

238. **Wastewater.** The 12 and 15 MSW transfer stations in Baicheng and Baishan, will produce 3,723 and 4,654 m^3 per year of mixed wastewater, respectively (including leachate from waste, washing wastewater and domestic wastewater). This wastewater will be pre-treated in septic tanks on site before being discharged into the municipal sewage networks and sent to the municipal WWTPs for treatment. The septic tanks in the transfer stations will be regularly cleaned, and the accumulated sediments will be transported by covered vehicles to local landfills for disposal. The floor of the proposed MSW stations and the septic tanks will be designed to prevent any potential seepage and pollution of groundwater. The pollutant concentrations in the pre-treated wastewater is predicted to be compliant with Class III of the Integrated Wastewater Discharge Standard of GB8978-1996, which can be discharged into the existing municipal sewage networks and then deliver to the municipal WWTPs for treatment.

Table V-27: Pollutants and Wastewater Generation in MSW Collection Station

Pollutant	Pollutant concentration (mg/L)	Estimated pollutant discharge in Baicheng (t/a)	Estimated pollutant discharge in Baishan (t/a)
CODcr	300	1.12	1.4
BOD_5	150	0.56	0.7
NH_3-N	30	0.112	0.14
SS	200	0.745	0.93

Source: domestic EIA reports

239. **Odor and noise control.** Odor and noise nuisances are the two major concerns of residents nearby planned MSW transfer stations. Since all the MSW collection stations proposed under this components are designed as horizontal compaction type, only limited noise will be generated during compaction at the level about 60-70 dB(A), and no major noise impact is expected around the MSW collection stations according to the EIAs. The following measures have been or will be implemented to minimize operational impacts at the transfer stations to acceptable levels:

i) The sites of the proposed collection and transfer stations have been discussed and selected with potentially affected people;

ii) A 5 m wide buffer zone and a greening belt no less than 2 m will be installed around the MSW transfer stations, which are specified in accordance with ―Technical Specifications for Domestic Solid Waste Transfer Stations‖ (CJJ47-2006);

iii) MSW transfer stations will be designed as closed structure to reduce their impacts on surrounding environment;

iv) MSW transfer stations will have a maximum capacity of 10t/d, and comply with the newest PRC technical guidelines on MSW collection;

v) In the proposed MSW transfer stations, MSW will be compacted and then stored in the closed MSW tanks which are placed in the closed MSW transfer stations; the collected MSW will removed to the landfills daily;

vi) Pest control measures will be enforced (sprinkle with disinfectant at least once a day in summer, and once per 2 days in spring and autumn);

vii) Nearby residents will be consulted regularly, and corrective actions will be defined if necessary; and

viii) Ambient noise monitoring will be performed to determine whether further mitigation measure is required or not.

c. Composting facilities

240. **Leachate, compost quality.** Leachate from the composting plants can have elevated biochemical oxygen demand (BOD) and phenols, resulting from the natural decomposition of organic materials. Leachate generation can be reduced or prevented by monitoring and correcting the moisture levels in the composting pile. The windrows or piles will be placed under a roof to prevent excessive moisture levels due to precipitation. If the composting materials contain excess moisture, leachate will be released during the first few days of composting even without added moisture or precipitation. Following this initial release of leachate, the amount of leachate formed will decrease as the compost product matures and develops a greater capacity to hold water. With regard to compost, its quality might be affected by presence of toxic waste in the material. Compost quality monitoring will be instituted at the plant to regularly monitor compost and confirm compliance with national compost and soil quality standard, covering organic content, nutrient levels, heavy metals, and pathogens.

d. Occupational Health and Safety (all MSW subcomponents)

241. MSW management workers are particularly prone to injuries and diseases if working under poor conditions. Potential health and safety concerns at MSW collection, sorting, composting and disposal facilities include exposure to bio-aerosols, potential toxic chemicals, and other substances. These problems can be minimized by proper operation of the facility and by adequate worker training and education.

242. **Bio-aerosols, endotoxins.** A variety of biological aerosols (bio-aerosols) can be generated during composting and landfill process (mainly bacteria, viruses, molds, and fungi). Another health concern at composting and landfill facilities is exposure to endotoxins. Endotoxins are toxins produced within microorganisms and released upon destruction of the cell in which it is produced. They can be carried by airborne dust particles. The levels of endotoxins in the air at one yard trimmings composting facility ranged from 0.001 to 0.014 mg/m^3. [50] Because bio-aerosols and endotoxins are both carried as dust, dust control measures described above should be incorporated into the design and operation of the composting and landfill facilities. These measures help control worker exposure to and reduce the risk of disease from these airborne hazards. Specific to composting facilities, additional required measures include:

i) keeping compost and feedstock moist;

ii) moistening compost during the final pile teardown and before being loaded onto vehicles, taking care not to over-wet the material, which can produce leachate or runoff; and

iii) Isolating workers from spore-dispersing components of the composting process such as mechanical turning (for example, using tractors or front-end loaders with enclosed air-conditioned or heated cabs).

243. **Worker's protective equipment, training.** Solid waste management workers face a large variety of environmental and work hazards, many of which are unpredictable since the content of the waste changes continually. Prominent among them are: (i) infectious disease from biological wastes; (ii) acute and chronic toxicity from household chemicals, solvents and other chemicals being discarded. This risk is not very great (except when industrial wastes find their way into the residential stream) since household chemicals are usually not very toxic and only relatively small amounts are present; (iii) exposures to heat, cold and bad weather; (iv) noise at harmful levels when heavy machines operate in confined spaces; (v) physical hazards such as slips and falls, puncture wounds, lacerations and abrasions, muscular strains, sprains and repetitive motion injuries. Sorters usually stand continuously, while vehicle operators must sometimes contend with poorly designed seats and operating controls; and (vi) airborne dust and particles. [51] MSW workers will receive training and be provided with personal protective equipment. Training will cover rights and responsibilities of workers under the PRC's labor law; identification of chemical, physical, and biological risks at the site; safe practices and operating procedures; the role of engineering controls and personal protective equipment in preventing injuries and illnesses; procedures for reporting injuries and illnesses; and procedures for responding to emergencies. The topics have been included in the EMP. Personal protective equipment will be provided to employees. Shower facilities will be available. First medical aid kits will be provided.

E. Cumulative Impacts

244. The simultaneous construction of several constructions close to each other in Baishan and Baicheng will cause a magnification of environmental and social impacts in terms of traffic on the existing road network, noise, air-borne dust, waste generation, community disturbance and safety, etc. These construction related cumulative impacts will be mitigated by adopting proper mitigation measures, including: (i) ensuring coordination between all project contracts and other projects in the area of influence in terms of construction schedule, possible access roads and disposal sites sharing; (ii) contractors will be required to develop material transport plans in consultation with local traffic management authorities and local community; (iii) enforcement of impact mitigation measures to

[50] Roderique and Roderique, 1990.

[51] Adapted from http://www.ilo.org/oshenc/part-xvii/public-and-government-services/item/842-municipal-recycling-industry; accessed on 6 March, 2014.

minimize dust, noise and waste generation; (iv) education of construction workers to avoid social conflicts; (v) provision of temporary access for local traffic; and (vi) proper maintenance of access roads and timely restoration upon completion. With effective implementation of good construction management measures, these construction-related cumulative impacts can be adequately mitigated to an acceptable level. The GRM will enable potential APs to report any excessive disturbances during construction. No significant cumulative impacts are anticipated during the operation of project facilities.

VI. ALTERNATIVE ANALYSIS

245. During project preparation, various alternatives for each component were proposed, screened, and compared against technical, economic, social, and environmental criteria. The primary objective with respect to environmental criteria was to identify and adopt options with the least adverse environmental impacts and maximum environmental benefits.

A. Alternatives for Baishan Water Supply Component

246. **Water Source Alternative.** The Xibeicha Reservoir was selected as water source through alternative analysis, which confirmed that the reservoir would be the only real alternative amongst the different source assessed: (i) The Tayangcha River water quality is low; annual and seasonal yield fluctuations are too significant to allow for reliable supply; (ii) If groundwater is proposed to be the water source, high pumping lift would be needed and hence the water treatment cost would be increased accordingly; (iii) the water flow of the Hunjiang River is higher, but if water is extracted directly from the main stream, the energy consumption of water lifting is very high for the significant difference in level between the river and the water supply area; (iv) the Xibeicha River is a branch of the Hunjiang River, and has advantages of good water quality, sufficient yield, absence of upstream pollution sources, and higher water level that makes it possible to transfer water to the water supply area by gravity. The proposed site conforms with key water source selection principles, including (i) good raw water quality meeting the PRC drinking water standard, (ii) quantitative reliability of the water source, (iii) convenience of source water protection; (iv) costs of infrastructure construction and operation; and (v) energy efficiency (i.e., supply through gravity). Thus, the Xibeicha River and the planned reservoir is the preferred main water source.

247. **Water treatment plant site.** For the locational choice of the treatment plant, the FSR considers four options including the reservoir area, Shangdianzi village, Nanshan WTP, and Hunjiang District Tongjiang bridge area. The comparison boils down to reservoir area against Shangdianzi village. The two options are equivalent in terms of energy consumption, but the latter requires less pipeline investment, less site leveling, and no land acquisition and resettlement. The estimated costs are RMB 153.02 million for reservoir area versus RMB 125.87 million for Shangdianzi village, thus the latter is chosen as the least cost option.

Table VI-1: Comparison of Plant Site Alternatives

Land	Land at Shandianzi Village	Land in southern of the power station of Xibeicha Water Hub Project
Diameter, length and pressure of water transmission pipeline	DN900 L=16750m PN0.6MPa DN900 L=900m PN1.0MPa DN900 L=2975m PN1.6MPa	DN900 L=200m PN0.6MPa
Diameter, length and pressure of water distribution pipeline from WSP to Baishan Urban Area	DN1000 L=5602m PN1.0MPa	DN1000 L=17000m PN0.6MPa DN1000 L=900m PN1.0MPa DN1000 L=7300m PN1.6MPa
Resettlement	None	50 households
Site leveling quantity	32,000m^3	49,914m^3
Power cable mode and length	YJV29-10-3×50 L=3000m	YJV29-10-3×50 L=500m
Land area	4.25ha	4.25ha
Total investment	125.87 million CNY	153.02 million CNY

Source: PPTA DFR, Jan 2014

248. **Water transmission pipeline routes.** The project will lay two water transmission pipelines from Xibeicha Reservoir to the districts of Hunjiang and Jiangyuan, respectively. Two options for the pipeline routes were analyzed. Option I is to bury the pipeline under the riverbed from Xibeicha Reservoir to the proposed WTP, requiring no land acquisition, but with significant disadvantages including: i) difficult maintenance and repairing during operation, especially during the flood season; and ii) impact on river water quality during the pipeline laying. Option II consists of laying the pipelines underground along existing roads, with the following advantages: i) relatively simple maintenance and repairing, and ii) pipeline is 640 m shorter that the Option I. The disadvantage of option II include: (i) involving the land acquisition and resettlement; (ii) pipe laying requires breaking up roads. After carefully weighting of advantages and disadvantages, Option II was selected (which is also 38.8 million RMB cheaper)

249. **Water disinfectant.** A conventional water treatment process was selected, consisting of pre-sedimentation – coagulation - sedimentation – filtration - disinfection. For disinfection, liquid chlorine, chlorine dioxide, ozone, and ultraviolet light were considered. As the treated water needs to remain continuously disinfected within distribution pipeline, liquid chlorine and chlorine dioxide are more appropriate. Liquid chlorine is the most common disinfectant, and its operating expense is lower than that of chlorine dioxide. However, chlorine dioxide is safer and produces less harmful organic trihalomethanes (TMHs) compared to liquid chlorine. Furthermore, liquid chlorine is not produced or sold in Baishan, and has to be purchased in Dalian City, about 690 km away. Thus liquid chlorine disinfection is not suitable, and chlorine dioxide is finally selected as disinfectant. Health and safety measures pertaining to handling of chlorine dioxide are defined in para. 207.

B. Alternatives for Baicheng Urban Infrastructure Components

250. **Cross-section of the 3rd Ring Road**. For the 3rd Road in Baicheng, two options are compared. Option I was finally selected due to the consideration of traffic safety and noise impact mitigation.

(i) **Option I:** 2.5 m (sidewalk) + 6 m (NMV) + 3.5 m (green belt) +11.5 m (MV） +8 m (center green belt)+11.5 m (MV) + 3.5 m (green belt) +6 m (NMV) +2.5 m (sidewalk) = 55 m;

(ii) **Option II**：4.5 m (sidewalk) +7 m (NMV) +5 m (green belt) + 11 m (MV)+ 11 m (MV) + 5 m (green belt) + 7 m (MV) + 4.5 (sidewalk) = 55 m (Figure B.1 and B.2).

Table VI-2: Comparison of two cross-sections of the 3rd Ring Road

Option	Advantage	Disadvantage
Option I	i) The MV and NMV lanes are completely separated, benefiting traffic safety; ii) Increased green belt area, benefiting local environment and landscape; iii) The wider green belts between the MV lanes and NMV lands will mitigate traffic noise to pedestrians and first row buildings along the road.	iv) larger area occupied
Option II	v) Wider sidewalks and NMV lanes, and convenience to pedestrians and bicycles.	vi) Without central green belt, easy causing traffic accidents.

251. **Road pavement.** Two kinds of pavement materials for motor vehicle lanes and non-motor vehicle lanes were considered: asphalt concrete pavement and cement concrete pavement. Based on the traffic forecasts and the requirements of urban roads, in addition to other requirements like skid resistance, tire/road noise, durability, rutting and crack resistance, local material supplies, and

hydro-geological conditions, asphalt concrete pavement was selected. This pavement is cheaper and will make the maintenance of underground utilities easier than that of cement concrete pavement. Asphalt concrete pavement is commonly used in the PRC. The correct grade of asphalt pavement will be specified during the detailed design to take into account the specific conditions in the project city/counties.

Table VI-3: Comparison of Asphalt Concrete and Cement Concrete Pavement

Item	Asphalt Concrete	Cement Concrete
Pavement performance	Low noise, low vibration, low dazzle	High noise, high vibration, high dazzle
Driving comfort	High	Low
Traffic disturbance during maintenance	Short time road closure	Long time road closure
Design life	15 years	30 years
Maintenance	Easy to maintain	Difficult to maintain
Load capacity	Average	High
Investment	Average	High
Thermal stability	Low	High

252. **Street lighting**. Two alternatives for street lighting, including high-pressure sodium lamps and light-emitting diode (LED) lighting were compared. Both can meet street lighting requirements, but LED light consumes significantly less power than high-pressure sodium lamps. LED lamps will be used on the proposed roads to satisfy ADB's and the PRC's energy conservation and emission reduction policies. The comparison of the alternatives for the street lighting is shown in **Table IV-4**.

Table VI-4: Comparison of High-pressure Sodium and LED Lamps

Items	High Pressure Sodium Light	LED Street Light
Photometric performance	Low	Excellent
Radiator performance	Low	Excellent
Electric performance	Electric Shock Easy (High voltage)	Safe (Low voltage)
Working life	Short (5,000 hours)	Long (>50,000 hours)
Working voltage range	Narrow (±7%)	Wide (±20%)
Daily power consumption	6kWh	3KWh
CO2 emission (12 hours)	6kg	3kg
SO2 emission (12 hours)	0.2kg	0.1kg
Price	CNY 1000/lamp	CNY5800/lamp
Startup speed	Quite Slow (Over 10 minutes)	Rapid (2 seconds)
Strobe	Yes (Alternating current drive)	No (Direct current drive)
Optical efficiency	Low	High
Color index / distinguish feature	Bad, Ra <50 (The color of object is faith, boring, hypnosis)	Good, Ra >75 (The color of object is fresh, veritable and comfortable)
Color temperature	Quite Low (Yellow or amber , uncomfortable)	Ideal Color Temperature (Comfortable)

Items	High Pressure Sodium Light	LED Street Light
Bad glare	Strong Glare (Dazzle)	No Harmful Glare
Light pollution	Strong	No
Heating	Serious (>300°C)	Cold Light (<60°C)
Lampshade turn dark	Easy (Absorb dust)	No (Static proof)
Lamp aging turn yellow	In A Short Time	No
Shockproof performance	Bad (Fragile)	Good (No filament nor glass)
Environment pollution	Contains Lead Element Etc.	No
Maintenance cost	CNY200/lamp/year	CNY 30/lamp/year
Product cubage	Big	Small (Slim appearance)
Product weight	Heavy	Light
Annual power saving		**1,095 kWh**

Source: DMX Technologies, 2010 and FSR

253. **Drainage and sewer pipe material.** Two types of pipe materials were compared in the FSR (**Table** VI-5 **IV-5**), including high-density polyethylene (HDPE) double-wall corrugated pipe, and reinforced concrete pipe. The reinforced concrete pipe was adopted for the stormwater pipe with a diameter of >800 mm due to lower cost. For the sewage pipe works and the stormwater pipes with a diameter <800 mm, the HDPE double wall corrugated pipe was selected because of easy construction, less scale formation, better corrosion resistance, high rigidity and flexibility, and high resistance to shock and pressure.

Table VI-5: Comparison of Pipe Material Alternatives

Item	HDPE Double Wall Corrugated Pipe	Reinforced Concrete Pipe
Roughness Coefficient	0.009	0.013
Corrosion Resistance	Good	Medium
Quality of Pipe Works and Maintenance Cost	The hot melt is used for pipe connection, which quality is good and is not subject to damage. The quality of pipe installation is guaranteed. The maintenance cost is relatively low.	The joint is subject to damage. Due to the fact that the unit pipe is short, the impermeability is poor. The quality of whole works cannot be guaranteed. Maintenance cost is relatively high.
Length of Unit Pipe	＞6 m	3-5m
Unit Price	High	Low
Weight	5% of reinforced concrete pipe	Very heavy
Environmental Impact	Good for groundwater due to less seepage	Leakages more likely, resulting in groundwater pollution
Service Life	60 years	60 years

C. Alternatives for MSW Components

254. **Waste treatment/disposal.** The engineering alternatives included disposal in sanitary landfill, incineration, and composting. In comparison with developed countries, the net caloric value of MSW in the PRC is very low for waste heat utilization and poorly suited to incineration because of the high concentration of food waste and the moisture content which may not be economically viable. Air pollution control (APC) residues are another significant concern. Although dioxin levels are controlled to comply with the standard, experience from PRC's first large-scale MSW incinerator located in the Pudong New Area of Shanghai shows that the level of Pb in the ash substantially exceeded the permitted level for landfilling, and residues also contained considerable amounts of soluble salts, with a strong potential to pollute the groundwater after landfilling. In view of the high cost, incineration was not considered in this project. Although landfilling is financially the least cost option, the ISWM components of the project aim to implement principles of waste reduction, reuse, and recycling as well as environmental protection. Therefore, waste sorting and composting will be promoted for organic waste. The product of compost will be used for horticulture of municipal gardens.

255. **Composting process.** Two options, including with-turning windrow composting (Option I) and aerated static pile composting (Option II) were compared. Option II (windrow composting without turning) could however take up three to five years for complete degradation. Option I (high rate/efficiency windrow composting system) needs three to four weeks for composting, which requires that the windrow is turned over twice per week, and maintains the composting temperature at above 55ºC. After complete composting, the compost needs to be left to mature for an additional three to four weeks without turning. Odor control is achieved by covering the system in the Option I. After weighting the costs and reliable, the Option I was selected.

256. **Waste compaction (transfer stations).** For waste compacting methods before MSW transferring to landfill, the horizontal compaction process and vertical compaction process were compared on the basis of the technical, economic, and environmental criteria against cost and environmental impacts during the PPTA. The results show that vertical compaction process excels in view of less complicated process, better air tightness, less leachate leakage, less land occupation, lower energy consumption, ease to control MSW falling-out, better adaptability to sorting collection and operation ability with power failure or equipment failure. Therefore, the vertical compaction system was selected.

VII. CONSULTATION, PARTICIPATION AND INFORMATION DISCLOSURE

A. Legislative Framework for Public Consultation and Information Disclosure

257. The Environmental Protection Law of the PRC and the Regulations on the Administration of Construction Project Environmental Protection (Order of the State Council, No. 253) require that an EIA report prepared by a certified EIA Institute shall solicit the opinions of organizations concerned and residents within and nearby the project sites. The PRC National Development and Reform Commission (NDRC) issued a new requirement for "Social Risk Assessment of Large Investment Projects" in August 2012, which emphasizes the importance of public consultation in an effective manner, and requires that the results of public consultation are clearly summarized in the EIA report, including the dates of consultations, number of stakeholders, the comments received, etc. ADB's Safeguard Policy Statement (2009) also requires meaningful public participation, consultation and information disclosure. The consultation process for this project therefore followed both the PRC laws and regulations and ADB's Safeguard Policy Statement (2009). Key activities and results are presented in the following sections.

B. Information Disclosure

258. Two rounds of information disclosure for each project component were conducted by the EIA Institutes, which are summarized in **Table VII-1** and illustrated in **Figure VII-1**.

259. The first round of information disclosure was carried out during the early stage of EIA preparation, of which the content mainly included a detailed description of project scope, contact details of the PMO, the PIUs, the EIA Institute and local EPBs, major procedures and scope of the EIA, and main aspects and approaches for public consultation. The PPTA consultants ensured that people from areas where potential impacts might occur (such as residents nearby the proposed MSW facilities and roadsides) were consulted, as well as the appropriate representatives of age, gender, poverty, and ethnic categories.

260. The second round of information disclosure was undertaken after the preparation of draft FSRs and EIA reports to solicit public comments and suggestions on the preliminary findings of the EIAs, including the potential impacts identified, proposed mitigation measures, as well as the arrangement of environmental management during both project construction and operation. During information disclosure, the EIA Institutes also communicated with local APs and villages, companies/organizations within or nearby project sites to collect preliminary public opinions for the project. The PPTA consultant participated in the meetings.

Table VII-1: Information disclosure during project preparation

Project	1st Information Disclosure		2nd Information Disclosure	
	Date	Media Posted	Date	Media Posted
Baicheng Infra and ISWM	7 Jun. 2013	Posted notices	20 Jun. 2013	Posted on website: http:// www.eiafans.com
Baishan Water Supply	15 Aug. 2013	Posted on Baishan City Government's website: http://www.cbs.gov.cn	1 Dec. 2013	First Posted on Baishan City Government's website: http://www.cbs.gov.cn
Baishan ISWM	21 Apr. 2013	Posted notices	1 Dec. 2013	Posted on the website: www. Eiafans.com;

Baicheng Infra. and MSW

Baishan Water Supply

Baishan MSW

Figure VII-1: Webpages/newspaper for Information Disclosure (Source: domestic EIAs)

C. First Round of Consultation

(a) Baicheng Infrastructure and ISWM Component

261. Fifty (50) questionnaires were distributed by the EIA Institute to fifty (50) APs and beneficiaries from different age groups, gender, educational backgrounds and occupation (**Table VII-2**). All questionnaires were completed and returned. The survey result is summarized in **Table VIII-3**.

Table VII-2: Respondents of 1st Round of Questionnaire Survey

Basic Information of the Consulted APs		No. of Respondents	Percentage (%)
Gender Distribution	Male	36	72
	Female	14	28
Age Group	<25	13	26
	26-45	24	48
	≥46	13	26
Occupation	Civil servant and cadre	2	4
	Worker	13	26
	Farmer	21	42
	Staff in the enterprise and public unit	7	14
	Self-employed individual and others	7	14
Education	High school or below	32	64
	Technical secondary school or above	18	36

Source: EIA Report

Table VII-3: Results of 1st Round of Questionnaire Survey

No.	Question	Option	No. of Respondents (60 APs in Total)	Percentage (%)
1	Did you hear about the project component prior to this meeting?	Very clear	3	6
		General	38	76
		Do not know	9	18
2	What is the main environmental issue in the area?	Surface water	2	4
		Groundwater	0	0
		Air	17	34

No.	Question	Option	No. of Respondents (60 APs in Total)	Percentage (%)
		Solid waste	11	22
		Noise	6	12
		Ecological environment	14	28
3	What do you think about the main impact from the project?	Economic	21	42
		Environmental	11	22
		Social	17	34
		Other	1	2
4	What do you think about the main environmental impact of the project?	Land occupation	17	34
		Vegetation	5	10
		Wild animal	1	2
		Soil erosion	6	12
		Landscape	21	42
5	What is your suggestion to the project?	Support	37	74
		Indifference	12	24
		Support with the requirement	1	2
		Disagree	0	0

Source: EIA Report

262. **Consultation result.** 18% of meeting participants were not aware of the project prior to consultation. In the PRC, the first round of information disclosure (i.e., introducing the project) is through the government's website or newspaper. In addition, notices for the public consultation and a brief introduction of the project are posted on boards of villagers committees' offices. This mode of information disclosure is qualified as meaningful, but does not necessarily reach 100% of potentially affected people. The 18%" indicate that only 82% heard about the project prior to the meeting. However, the questionnaire survey was conducted in a public meeting, whereas prior to questionnaire distribution, the EIA institute introduced the project and its scope. 74% of the consulted APs support the project, and believe that the project will improve the local social and economic development, promote sustainable urbanization and enhance residents' living conditions. The main issues raised by the respondents include: (i) resettlement and related compensation; (ii) the need for noise and dust control, pedestrian safety and traffic management during construction and operation; (iii) quality control of the project construction; and (iv) landscaping maintenance during operation. 24% of consulted people expressed their indifference towards the project.

263. Suggestions provided by the respondents included: (i) avoiding the construction activities at nighttime to minimize the noise and during rush hour of students to guarantee their health and safety; (ii) proper planning should be conducted to avoid repeated excavation of underground pipelines; (iii) undertake water spraying to minimize dust; (iv) timely disposal of construction wastes with necessary covering; (v) improve vegetation along roads to reduce the noise during road operation; and (vi) timely pay the compensation. All these considerations have been included as mitigation and management measures in the updated FSR, EIA and EMP.

(b) Baishan Water Supply Component

264. Fifty (50) questionnaires were distributed by the EIA Institute. The questionnaires were distributed to fifty (50) APs from different age groups, gender and occupations. Forty-eight questionnaires were completed and returned (**Table VII-4**). And the consultation results are shown in **Table VII-5**.

Table VII-4: Respondents of 1st Round of Questionnaire Survey

Basic Information of APs Surveyed		No. of Respondents	Percentage (%)
Gender Distribution	Male	30	60
	Female	20	40
Age Group	<30	3	6
	30-40	16	32
	40-50	17	34
	≥50	14	28
Education	Junior high school or below	36	72
	above the junior high school	14	28

Source: The EIA Report

Table VII-5: Results for Questionnaire Survey on APs

No.	Question	Option	No. of Respondents (48 APs in Total)	Percentage (%)
1	Did you hear about the project component prior to this meeting?	Yes	25	52
		No	23	48
2	What is the main environmental issue in the area?	Surface water	25	52
		Groundwater	11	23
		Air	5	10
		Noise	12	25
		Solid waste	14	29
		No pollution	11	23
3	What do you think about the environmental impact from the construction?	Accept	44	92
		Not accept	1	2
		Indifference	3	6
4	What is the major environmental concern during the project operation?	Ambient air	4	8
		Surface water	13	27
		Groundwater	8	17
		Solid wastes	2	4
		Noise	4	8
		No pollution	25	52
5	Do you know the compensation standard of the land acquisition?	Yes	10	21
		No	38	79
6	Do you agree, if your land is occupied?	Agree	10	11.1
		Disagree	1	33.3
		Agree with the condition	37	15.3
7	What is your attitude towards the project?	Support	39	81
		Not support	0	0
		Indifference	9	19

Source: The EIA Report

265. As in Baicheng, a significant number of meeting participants (48%) were not aware of the project prior to the meeting. However, prior to questionnaire distribution, the EIA institute introduced the project and its scope. Most consulted persons (81%) support the Baishan Water Supply Component. They believe that the component will improve the drinking water safety and residents' health and living condition. The suggestions provided by the respondents included: (i) proper measures should be conducted to avoid pollution and impact on the Xibeicha Reservoir, which is a major drinking water

source of Baishan; (ii) undertaking water spraying to minimize dust during the pipeline construction; (iii) timely disposal of construction waste with covering; and (iv) the compensation of LAR should be reasonably and timely paid. All these comments have been included as mitigation and management measures in the updated FSR and in the EMP and LARP. 19% of consulted people expressed their indifference towards the project.

(c) Baishan ISWM Component

266. Forty (40) questionnaires were distributed by the EIA Institute. The questionnaires were distributed to forty (40) APs from different age groups, gender and occupations. All questionnaires were completed and returned (**Table VIII-6**). And the consultation results are shown in **Table VIII-7**.

Table VII-6: Respondents of 1st Round of Questionnaire Survey

Basic Information of APs Surveyed		No. of Respondents	Percentage (%)
Gender Distribution	Male	22	55
	Female	18	45
Age Group	<18	0	0
	18-30	16	40
	31-50	12	30
	>50	12	30
Education	Primary school or below	20	50
	Middle school	14	35
	University or above	6	15
Occupation	Farmer	26	65
	Cadre	4	10
	Self-employed	10	25

Source: The EIA Report

Table VII-7: Results for Questionnaire Survey on APs

No.	Question	Option	No. of Respondents (48 APs in Total)	Percentage (%)
1	Did you hear about the project component prior to this meeting?	Very	10	25
		General	19	47
		No	11	28
2	What is the main environmental issue in the area?	Surface water	6	15
		Groundwater	16	40
		Air	26	65
		Noise	19	47
		Solid waste	7	18
		Ecological environment	0	0
3	What do you think about the environmental impact from the construction?	Economic	2	5
		Environmental	38	95
		Social	0	0
		Other	0	6
4	What are the major environmental issues from the project?	Wastewater	17	43
		Waste gas	38	95
		Noise	24	60
		Solid wastes	8	20
		Dust	7	18

No.	Question	Option	No. of Respondents (48 APs in Total)	Percentage (%)
		Ecologic	2	5
		Electromagnetic radiation	0	0
5	Your living situation	Temporary	8	20
		Long term	32	80
6	What is your attitude towards the project?	Support	34	85
		Support with the conditions	1	2.5
		Not support	4	10
		Indifference	1	2.5

Source: The EIA Report

267. 85% of the consulted APs supported the project, and 10% of respondents didn't support it (5 consulted APs, including one AP expressing indifference). These are residents living close to existing MSW facilities, who were impacted by odor and flies from the MSW facilities. They think that the project will impact the local environment and residents' daily life if no proper measures are taken. The EIA team introduced the mitigation measures including: (i) a 5 m wide buffer zone and more than 2 m green belt around the MSW facilities in accordance with the PRC specification of CJJ47-2006; (ii) the new MSW facilities will be designed as closed structure to reduce odor release; (iii) pest and odor control measures will be enforced (sprinkle with disinfectant at least once a day in summer, and once per two days in spring and autumn); and (iv) nearby APs will be consulted regularly, and corrective actions will be defined if necessary. After the explanation, the 5 concerned APs changed their view, expressed their basic understanding of the need for the project as a result of increased MSW amounts in Baicheng, and the importance for proper MSW disposal.

D. Summary of Second Round Public Consultation

268. Based on ADB request, a second round of public consultation was undertaken during 10-26 December 2013 by the EIA institutes in Baishan and Baicheng, respectively, through public meetings. The PPTA consultant participated in the meetings. 158 questionnaires were distributed in the public meetings, with a return rate of 100% (including 51 for Baicheng infrastructure and MSW components, 53 for Baishan Water supply Component and 54 for Baishan MSW component. The meeting was also attended by the 5 APs in Baishan who didn't support the component in the first round of consultation. 21 organizations (8 in Baicheng and 13 in Baishan) participated in the consultation meetings.

269. The main opinions and concerns collected from the second round of consultation were as follows: (i) people and organizations knew about the proposed project components through the government websites, local newspaper and public meetings, and were aware of the EIA work and LAR planning undertaken; (ii) people and organizations knew the importance and benefits of the project and support the project, including the 5 APs who originally didn't support the Baishan MSW component; and (iii) people and organizations were satisfied with the mitigation measures proposed to address the anticipated adverse environmental impacts. Most people surveyed who will benefit from the Baishan Water Supply Component were concerned about the water tariff after the component completion, tap water quality, and water pressure supplied to high buildings. Residents who live near the proposed MSW transfer stations were concerned about odor and flies in summer. People who will be affected by the Baicheng Infrastructure Component expressed their views on the resettlement sites and the hope that their future living standards will be improved or at least will not decline. These concerns were considered in the LAR plan. A vast majority of people and organizations surveyed indicated that if the measures and policies proposed in the EIAs and EMPs are strictly carried out during construction and operation, they would be satisfied.

270. After the public consultations, all the concerns and suggestions were provided to the DIs and EIA institutes. In turn, these concerns and suggestions, as well as mitigation measures, were fully taken into account and incorporated in the updated FSRs, EIAs, and EMPs, and reflected in this IEE and project EMP. These include: (i) proper odor control and landfill leachate seepage protection measures should be strictly taken during design, construction and operation of the MSW facilities; (ii) traffic noise impact to the roadside buildings was addressed in the updated Baicheng EIA and EMP through the prescription to install noise insulation windows; (iii) with regard to whether the quality of the water supply will meet the National Drinking Water Standard of GB5749-2006, various measures were incorporated in the updated FSR and EIA, and will be implemented during operation. These include Xibeicha Reservoir Drinking Water Source Zoning and Protection, regular water quality monitoring at the WTP to guarantee that the water supplied will meet the national standard; and (iv) with regard to the construction site management, timely and careful transfer of construction spoil to the designated disposal sites, and dust and noise control measures has been incorporated in the updated EIAs and EMP.

E. Public Consultation conducted by the PPTA Consultants (including social safeguards)

271. Intensive consultations with local government agencies were carried out by EA and the consultants during the PPTA regarding the project components and locations. More than 900 people were consulted, including 500 urban and rural households were surveyed, eighteen (18) consultation meetings with government agencies, six community focus group discussions (FGDs), and six (6) key informant interviews (case studies) during the survey. The opinions and suggestions of participants were reflected in the poverty and social assessment, social action plan (SAP) and gender action plan (GAP). During preparation of LAR plans, four consultation meetings were organized for each component and over 400 affected households were interviewed. More than 2,000 people in total were consulted during the PPTA.

F. Future Consultation and Information Disclosure

272. Dialog will be maintained with the APs and stakeholders throughout project implementation by continued consultation. Such dialog will ensure that public concerns are understood and dealt with in a timely manner. A consultation and participation plan during construction and operation has been developed, which is presented in the attached EMP. Future consultation will be undertaken via questionnaire surveys, household visits, workshops, and public hearing (consultation meeting). Future consultation and participation will also include involvement of APs during inspection of EMP implementation during the construction and operation phases (through informal interviews by LIEC).

273. The project's environmental performance will be disclosed by the local EPBs and ADB as follows:

(i) Copies of the domestic EIAs (in Chinese) are available on request in both the Prefecture's EPB and the EPBs of project city/counties;

(ii) This CIEE is available at www.adb.org; and

(iii) Environment progress and monitoring reports will be prepared on an annual basis and will be disclosed on ADB's project website (www.adb.org).

VIII. GRIEVANCE REDRESS MECHANISM (GRM)

A. Introduction

274. A grievance redress mechanism (GRM) has been defined in accordance with ADB's SPS requirement to address social, environmental, health and safety concerns and assist the project to maximize environmental and social-economic benefits. In consultation with the JPPMO, the IAs and the PIUs, it was agreed that each PMO will establish a GRM to address community concerns and complaints.

275. Grievances will most likely include disturbance of traffic; dust emissions; construction noise; odor and flies from MSW facilities, soil erosion; inappropriate disposal of construction wastes; damage to private houses; safety measures for the protection of the general public and construction workers; or water quality deterioration during water supply plant and pipeline works.

276. The GRM will be accessible to diverse members of the community, including more vulnerable groups such as women, minority and poor. Multiple points of entry, including face-to-face meetings, written complaints, telephone conversations, or e-mail, will be available.

277. Each PMO will establish a Project Public Complaint Unit (PPCU), which will be coordinated by the environment management unit (EMU) of the PMO. The PPCU will instruct contractors and CSCs if people complain about the project activities. The PPCU will coordinate with the local EPB and other government divisions, if necessary, and will be supported by the Loan Implementation Environmental Consultant (LIEC), hired under the Project Implementation Consultant Support (PIC). The PPCU will establish a GRM tracking and documentation system, including procedures to retrieve data for reporting purposes to the JPPMO and ADB.

278. The contact persons for different GRM entry points, such as contractor, operators of project facilities (OPFs), local EPB, PPCU, etc., will be identified prior to construction. The contact details for the entry points (phone numbers, addresses, e-mail addresses) will be publicly disclosed on information boards at construction sites and on the website of the local EPBs. The chart of proposed GRM is shown in **Figure VIII-1.**

B. Step-by-Step GRM Procedure

279. The **procedure and timeframe** for the grievance redress mechanism are described as follows (see **Figure VIII-1**):

- **Stage 1**: If a concern arises during construction, the affected person will submit a written or oral complaint to the contractor directly. Whenever possible, the contractor will resolve the issue directly with the AP. The contractor shall give a clear reply within five (5) days. If successful, the contractor will inform the PPCU accordingly.

- **Stage 2**: If no appropriate solution can be found after the Stage 1 process applied (i.e., after 5 days), the contractor has the obligation to forward the complaint to the PPCU. The AP may also decide to submit a written or oral complaint to the PPCU, either directly or via one of the GRM entry points (local EPB, PIU, community leaders). For an oral complaint, proper written records must be made. The PPCU will assess the eligibility of the complaint, identify the solution and provide a clear reply for the complainant within five (5) working days. The LIEC will assist the PPCU in replying to the APs, if needed. The PPCU will also inform the ADB project manager and

submit all relevant documents. Meanwhile, the PPCU will timely convey the complaint/grievance and suggested solution to the contractors or OPFs. The contractors during construction and the OPFs during operation will implement the agreed upon redress solution and report the outcome to the PPCU within seven (7) working days.

- **Stage 3**: In case no solution can be identified by the PPCU, or the complainant is not satisfied with the proposed solution, the PPCU will organize, within two (2) weeks, a multi-stakeholder hearing (meeting) involving all relevant stakeholders (including the complainant, contractor, OPFs, local EPB, PIU, JPPMO). The hearing shall identify a solution acceptable to all, and formulate an action plan. The contractors during construction and the OPFs during operation will implement the agreed-upon redress solution and report the outcome to the PPCU within the agreed upon timeframe.

280. The PPCU shall accept the complaints/grievances lodged by the AP free of charge. Any cost incurred should be covered by the contingency of the project. The grievance procedures will remain valid throughout the duration of project construction and until project closure.

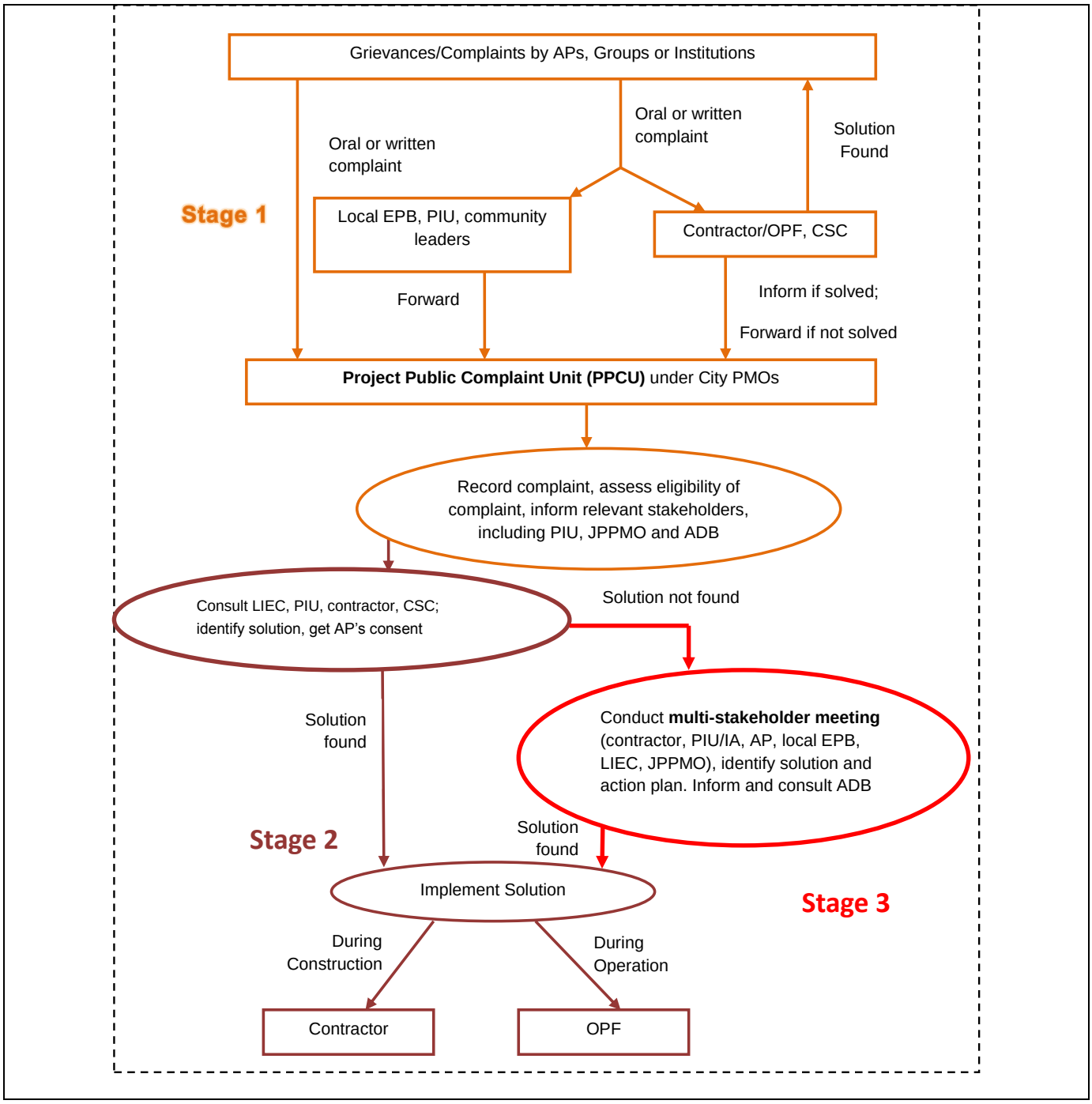

Figure VIII-1: Proposed GRM

Note: AP = affected person, EPB = environmental protection bureau, OPF = operator of project facilities, LIEC = loan implementation environmental consultant; JPPMO = Jilin Provincial project management office; PIU=project implementation unit; CSC=construction supervision company.

IX. ENVIRONMENTAL MANAGEMENT PLAN

281. An environmental management plan (EMP) has been prepared for the project during the PPTA, which is presented in **Appendix I** of this IEE. The development of the EMP drew on the three domestic EIA reports prepared by the two EIA Institutes, discussions with the JPPMO, the PIUs and IAs of Baishan and Baicheng, and consultations with the Jilin Provincial EPD and the local EPBs, as well as other relevant government divisions and local communities.

282. The EMP defines appropriate mitigation measures for the anticipated environmental impacts, and defines the institutional responsibilities and mechanisms to monitor and ensure the compliance with PRC's environmental laws, standards and regulations, and ADB's Safeguard Policy Statement (SPS 2009). The EMP specifies (i) objectives; (ii) major environmental impacts and mitigation measures; (iii) implementing organization and responsibilities; (iv) inspection, monitoring, and reporting arrangements; (v) training and institutional strengthening; (v) a feedback and adjustment mechanism; and (vi) the grievance redress mechanism. The EMP will be reviewed and updated after detailed design, as needed.

X. CONCLUSION

283. The Project is classified as environment Category B since there will be limited, generally site-specific impacts that are largely reversible and that can be readily addressed through mitigation measures. The project is expected to have generally minor, localized negative impacts that are temporary in nature. This IEE and EMP provides the EA, IAs and PIUs with a comprehensive assessment of environmental impacts associated with all project components, and sets out all necessary environmental management measures for design, construction, and operation.

284. The project will have significant environment, health and safety benefits. In Baishan, the project will help reduce non-revenue water (NRW) in Baishan from 65% to 30% and implement water supply monitoring and control system (SCADA) to improve energy efficiency, resulting in annual water savings of 6.4 million m^3 and energy savings of 7.3 million kWh. In Baicheng, the wastewater collection rate will be increased by 9,000 m^3 per day, significantly reducing annual pollution load to the environment. The project will promote low-carbon transport modes by dedicating separate bus priority and non-motorized lanes. The application of LED lights, which is expected to save 530,000 KWh per year of electricity, will result in a CO_2 emission reduction of 528 t/a[52] as compared to conventional street lighting. Curbside stormwater collection and infiltration will be piloted along three project roads to mitigate the risk of waterlogging induced by increased urban soil sealing. The solid waste management components will significantly improve waste management practices by promoting source-segregation and recycling of domestic waste (kitchen waste, recyclates such as glas, metal, clothes) and composting of kitchen waste. As a result, approximately 14,000 tons of kitchen waste will be converted to valuable compost. It is anticipated that the Project will create 2,961 full-time jobs during four years construction and 321 full-time jobs during operation. Targets for employment of women, ethnic minorities and the poor are included in the social action plan (SAP), gender action plan (GAP) and design and monitoring framework (DMF).

285. Anticipated impacts during construction of all project facilities will include short episodes of increased noise and dust pollution during a few concentrated activities, such as the soil excavation for roads, water transmission lines, landfill; road base construction; and asphalt works. Surface water contamination during the laying of water transmission lines in Baishan is not considered significant, provided that measures defined in the EMP are applied. No environmentally sensitive or culturally significant areas will be disturbed. There are no ecologically sensitive areas within 25 km of any of the project facilities.

286. Potential impacts during operation of the Baicheng infrastructure component include traffic noise and air pollution at some sensitive areas along the constructed roads including schools, hospitals, and residential areas. However, noise and air quality predictions indicate that the impact will not be significant according to the predicted data in the EIA, even in the long term. Other impacts and risks during operation include traffic safety caused by over-speed, and potential accidental spills caused by hazardous goods transportation.

287. Major environmental impacts resulting from the MSW components during operation include odorous gases (H_2S and NH_3), which will affect nearby residents, leachate from the landfill expansion site in Baishan, wastewater and noise from the proposed MSW collection and transfer stations and garbage sorting and composting sites, and traffic noise from collection vehicles. Buffer zones (5 m-wide) and greening belts (2 m-wide) will be installed around all MSW facilities; and nearby residents will be consulted regularly on odor nuisance, and corrective actions will be defined if necessary.

[52] A KWh electricity saving reduces 0.997 kg of CO_2.

288. The water supply system has few environmental, health and safety risks, and will be subject to strict operational standards. Impacts of the water extraction on local and regional water resources have been assessed through water balance analysis water supply plant will have no significant impact on regional water resources based on the water balance analysis. Risks to water supply safety identified are mitigated through the following measures: establishing a Drinking Water Source Protection Zone for the Xibeicha Reservoir, strengthening water quality monitoring capacity of the IA; establishing emergency preparedness and response mechanism, including emergency warning and online water source monitoring system, in the event of water pollution within the reservoir and/or accidental spillage of chemicals or other pollutants into the reservoirs or WTP.

289. Environmental clauses will be included in contracts for project works to ensure that Contractors are aware of and committed to implementing environmental requirements associated with the works.

290. The implementation of this IEE and EMP will be supported through training and through ongoing guidance from the PIC. Training will help improve the environmental capacity of the LPMOs, PIUs and contractors and help ensure that the environmental impacts during the construction are minimized and opportunities for environmental benefits are maximized. The capacity building and training component will focus on water supply safety, MSW management promoting 3R principles, EMP implementation and supervision, and urban transport safety and public transportation.

291. The following assurances, addressing identified risks, have been incorporated into the loan documentations as covenants to ensure that the measures are implemented in a timely and complete fashion:

(i) JPG will, and will cause the IAs to ensure that the design, construction, operation and decommissioning of all project facilities comply with (i) all applicable laws and regulations of the PRC and Jilin Province relating to environment, health and safety; (ii) the ADB's SPS (2009); and (iii) all measures and requirements set forth in the IEE, the EMP, and any corrective or preventative actions set forth in a safeguards monitoring report.

(ii) JPG will, and will cause the IAs to ensure that throughout project implementation, (i) any changes to the project design are reviewed that may potentially cause negative environmental impacts; (ii) in consultation with ADB, environmental monitoring and mitigation measures are revised as necessary to assure full environmental compliance; and (iii) provide ADB within 60 days justification for any proposed changes to the mitigation measures required during design, construction and operation.

(iii) JPG will cause the Baishan Municipal Government and the Baishan Xibeicha Quyuan Hydropower Co. Ltd to ensure that (i) the construction of the Xibeicha Reservoir will be completed and operational within 36 months of the loan effective date; and (ii) the Xibeicha Reservoir is constructed, operated, maintained, and monitored in strict conformity with all applicable laws and regulations, including national and municipal laws and regulations and standards on environmental protection, health, labor, and occupational safety.

(iv) JPG will cause Baishan Municipal Government to ensure that (i) any possible pollution from sources or activities in the proximity to Xibeicha Reservoir that might endanger the water quality of the reservoir is adequately controlled; and (ii) a comprehensive emergency preparedness and response plan is to be prepared in advance of the initial filling of the reservoir and made available to ADB, scheduled for November 2016.

(v) JPG will and will cause the Baishan Municipal Government to ensure the implementation of the municipal government approved water source protection plan and the relevant national and municipal laws and regulations on water source protection are complied with, throughout the implementation period of the Project, including (a) the delineation of water source protection zones around the Xibeicha Reservoir, and (b) the implementation of watershed protection regulations, including the disclosure of land use and activity constraints. In the event of land acquisition, resettlement or other livelihood impacts as a result of water source protection zones and implementation of watershed protection regulations, JPG will cause the BMG to ensure that the necessary document will be prepared in accordance with ADB's Safeguard Policy Statement (2009).

(vi) BMG will cause the Baishan water authority to ensure that the Xibeicha River downstream of the Xibeicha Reservoir receives a minimum flow at all times in accordance with the rule on minimum flow provision as defined in the reservoir EIA approved by Jilin Province EPD on 25 Nov. 2008.[53]

(vii) JPG and the IAs will ensure that the contractors select and manage borrow and spoil disposal sites in accordance with the EMP and in consultation with local EPBs.

(viii) JPG and the IAs will ensure that the contractors will take necessary actions to avoid interruptions to water supply, wastewater collection, heating and other utility services during the construction of the project.

(ix) JPG will, and will cause the IAs to ensure that (a) the project implementation consultants are engaged in a timely manner, including the safeguards specialists; (b) licensed EMSs are contracted to conduct periodic environmental impact monitoring in accordance with the approved monitoring plan; and (c) the capacity-building program described in the EMP and the resettlement plans is implemented as planned from the date of engagement of the consultants until project completion.

(x) JPG will cause the Baicheng Municipal Government to ensure all relevant agencies cooperate to promote traffic safety provisions for the road component of the Project, including the provision of adequate traffic safety signage, traffic signals, traffic control and other necessary facilities. JPG shall also cause the Baicheng Municipal Government to ensure that traffic safety education activities are conducted by means of radio and television and traffic safety booklets to enhance the traffic safety awareness of the local people.

292. Overall, the project's potential environmental impacts are expected to be acceptable if all the measures defined in the EMP are strictly implemented, and the environmental management and institutional capacity of JPPMO, the LPMOs, IAs, contractors and CSCs are strengthened through implementation of the training program in the EMP. Category B for environment is confirmed. No further surveys or studies are required as long as there are no major changes in the type and location of project facilities and activities proposed.

[53] The approval document No. of Jilin_En2008-304

Attachment 1 - Environmental Management Plan

TABLE OF CONTENS

A. Objectives

1. This Environmental Management Plan (EMP) was prepared for the proposed **Jilin Urban Development Project** in conjunction with the domestic Environmental Impact Assessment (EIA) Institutes[1], the design institute[2] and Jilin Provincial Project Management Office (JPPMO) based on the domestic EIA reports, the plan EIA of the Baicheng Economic Development Zone (BEDZ), the feasibility study reports (FSRs), as well as the master plans of Baicheng and Baishan cities, and other project documents. The EMP covers all project implementation phases, including design & pre-construction, construction, and operation.

2. The EMP defines appropriate mitigation measures for the anticipated environmental impacts, and defines the institutional responsibilities and mechanisms to monitor and ensure the compliance with PRC's environmental laws, standards and regulations, and ADB's Safeguard Policy Statement (SPS 2009). The EMP specifies (i) objectives; (ii) implementing organization and responsibilities; (iii) mitigation measures; (iv) inspection, monitoring, and reporting arrangements; (v) training and institutional strengthening; (v) future public consultation; and (vi) a feedback and adjustment mechanism.

3. In the design stage the Jilin provincial project management office (JPPMO) will pass the EMP to the design institutes for incorporating mitigation measures into the detailed designs. The EMP will be updated at the end of the detailed design, as needed. To ensure that bidders will respond to the EMP's provisions, the JPPMO, the local PMOs and project implementing units (PIUs) will prepare and provide the following specification clauses for incorporation into the bidding documents: (i) a list of environmental management requirements to be budgeted by the bidders in their proposals, (ii) environmental clauses for contractual terms and conditions, and (iii) component EIAs, and project IEE including updated EMP for compliance.

B. Organizations and Their Responsibilities for EMP Implementation

4. The Jilin Provincial Government (JPG) is the executive agency (EA) of the project. At the provincial-level, JPG has established the Jilin Provincial Project Leading Group (JPPLG) to provide policy guidance and coordination, and Jilin Provincial Project Management Office (JPPMO) to supervise and coordinate overall project implementation. The two participating city governments will be the implementing agencies (IAs), and they have already established local project management offices (LPMOs) to supervise and coordinate overall implementation of subprojects in their respective cities. The project implementing units (PIUs) will physically implement the subprojects on behalf of respective IAs. The EMP implementation arrangements and responsibilities of governmental organizations are summarized in **Table EMP-1.**

[1] China Northeast Municipal Engineering Design and Research Institute for the Baishan Components and Jilin Xinhuan Environment Protection Company for the Baicheng Components

[2] China Northeast Municipal Engineering Design and Research Institute for all components

Table EMP-1: Institutional responsibilities for EMP implementation

Agency	Environmental Management Roles and Responsibilities
Executing Agency (EA) – Jilin Provincial Government (JPG)	Overall policy and direction control. Responsible for project coordination with two project city governments, liaison with ADB, financial management and administration.
Jilin Provincial Project Leading Group (JPPLG)	Responsible for implementation of the entire project Headed by the Vice Governor and consisting of JDRC, JEPD, JHUCD, JFD, and municipal governments of Baicheng and Baishan: • Coordinate and overlook project preparation and implementation; • Provide policy guidance during the project implementation; and • Facilitate interagency coordination.
Jilin Provincial Project Management Office (JPPMO)	Supervision and overall management to ensure smooth implementation of the Project: • Responsible for all day-to-day management work during the project preparation and implementation periods; • Assign one environment specialist as EMP officer/coordinator; • Communicate and coordinate with ADB for project management and implementation; report the project implementation progress and compliance monitoring to ADB; • Submit bidding documents, bid evaluation reports and other necessary documentations to ADB for necessary approval; • Procurement of project implementation consulting services (PIC), including a loan implementation environmental consultant (LIEC) to assist in supervision, tracking and reporting on EMP implementation of all subprojects; • Consolidate environmental monitoring reports prepared by LPMOs and local environmental monitoring stations (EMS) and submit them to ADB for disclosure.
Implementing Agencies (IAs) – Municipal Governments of Baishan and Baicheng cities	Primarily responsible for project implementation for project components in their jurisdiction, including finance and administration, technical and procurement matters, monitoring and evaluation, and safeguard compliance. Day-to-day activities delegated to LPMOs (see below)

Agency	Environmental Management Roles and Responsibilities
Local Project Management Offices (LPMOs), established under IAs[3]	Responsible for all day-to-day management work during the project preparation and implementation periods: • Communicate and coordinate with JPPMO for project management and implementation; • Establish environment management unit (EMU); • In conjunction with PIUs, incorporation of EMP into bidding documents; • Establishment of a Grievance Redress Mechanism (GRM) with a dedicated Project Complaints Coordinating Unit (PCCU); • Supervision and monitoring of the EMP implementation and annual reporting to the JPPMO (with support of LIEC); and • Participation in capacity building and training programs; • On behalf of the implementation agencies and 3 PIUs, submit bidding documents, bid evaluation reports and other necessary documentations to JPPMO and ADB for necessary approval; • Submit withdrawal applications to Jilin Provincial Finance Department; • Submit required annual audit reports and financial statements of project account of the BCMG, BSMG, and PIUs to ADB; • Engage a design institute to complete preliminary and detailed engineering designs; • Engage a procurement agency which supports the implementation agencies and 3 PIUs
Project Implementing Units (PIU)[4]	Ensuring successful implementation of the relevant project components: • Appoint one environment specialist as EMP coordinator; • Tendering contractors and equipment with assistance of the international tendering agency; • Administer and monitor contractors and suppliers; • Construction supervision and quality control • Contracting of local (EMS) to conduct environmental monitoring; • Procurement and management of construction supervision companies (CSC) required for subproject implementation in accordance with the PRC and ADB procedures and regulations; • Participation in capacity building and training programs; and • Commissioning of the constructed facilities.
Facility Operators: (i) Baishan Xibeicha Qiyuan Hydropower Co; (ii) Baishan Solid Waste Disposal Co; (iii) Baicheng BEDC Investment and Development Co.	Ensuring successful ongoing operation and maintenance of the relevant project components: • In conjunction with PIUs, commissioning of the constructed facilities; and • O&M of completed facilities, including environmental management, monitoring and reporting responsibilities.

[3] Baishan LPMO was setup under the municipal Housing and Construction Bureau; Baicheng LPMO was established under the Management commission of Baicheng Economic Development Zone.

[4] There are two PIUs in Baishan, the PIU for the water supply component is Baishan Xibeicha Qiyuan Hydropower Co. Ltd, while the PIU for the MSW Component is Baishan Solid Wastes Disposal Co. Ltd. The PIU for the two Baicheng components is BEDZ Development and Investment Co. Ltd.

Source: Project Administration Manual (PAM), February 2014

5. **Environment staff within local PMOs, JPPMO and PIUs.** The local PMOs will have main EMP coordination responsibility. Therefore, each local PMO will establish an environmental management unit (EMU) and designate a leader and an appropriate number of staff. The EMUs will take charge of (i) coordinating the implementation of the EMP and developing implementation details; (ii) supervising the implementation of mitigation measures during project construction and operation; (iii) ensuring that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management plans; (iv) submitting annual EMP monitoring and progress reports to the JPPMO; (v) coordinating the local grievance redress mechanism (GRM); and (vi) responding to any unforeseen adverse impact beyond those mentioned in the domestic EIAs, the project IEE and the EMP. The EMUs will be technically supported by the loan implementation environment consultant (LIEC). The JPPMO and the PIUs will nominate one staff to act as environmental coordinator to check the overall implementation of environmental management provisions of the EMP, and to work in close coordination with the EMUs of the local PMOs.

6. **Loan Implementation Environment Consultant.** A LIEC will be hired under the Loan implementation consultant services (LIC). The LIEC will advise the JPPMO, local PMOs, PIUs, contractors and CSCs on all aspects of environmental management and monitoring for the project. The LIEC will (i) assist in updating the EMP and environmental monitoring program, as needed; (ii) supervise the implementation of the mitigation measures specified in the EMP; (iii) on behalf of the local PMOs and JPPMO, prepare the annual EMP monitoring and progress reports in English and submit it to ADB; (iv) provide training to the JPPMO, local PMOs, PIUs, CSCs, on the PRC's environmental laws, regulations and policies, ADB SPS 2009, EMP implementation, and GRM in accordance with the training plan defined in **Table EMP-9**; (v) identify any environment-related implementation issues, and propose necessary corrective actions; (vi) undertake site visits as required.

7. **Construction Contractors, Construction Supervision Companies (CSCs).** Construction contractors will be responsible for implementing relevant mitigation measures during construction under the supervision of the CSCs and PIUs. Contractors will develop site-specific EMPs on the basis of the project EMP. CSCs will be selected through the PRC bidding procedure by the PIUs. The CSCs will be responsible for supervising construction progress and quality, and EMP implementation on construction sites. Each CSC shall have at least one environmental engineer on each construction site to: (i) supervise the contractor's EMP implementation performance; and (ii) prepare the contractor's environmental management performance section in monthly project progress reports submitted to the PIUs and local PMOs.

8. **Environmental Monitoring Stations (EMS)**. The PIUs will appoint the EMS of each project city to conduct periodic environmental impact monitoring during construction and operation in accordance with the monitoring plan (**Table EMP-7** and **Table EMP-8**).

C. Potential Impacts and Mitigation Measures

9. **Table EMP-2 to EMP-5** list the anticipated impacts of the project components in Baishan and Baicheng during project preparation, implementation and operation as identified by the domestic EIAs and the this IEE, as well as corresponding mitigation measures defined to minimize those impacts. The mitigation measures will be incorporated into detailed design, bidding documents, construction contracts and operational management manuals, which will mainly be

implemented by the design institutes (during detailed design) and contractors (during construction), under the supervision of CSCs, LPMOs and PIUs, with technical support from the LIECs. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved or adjusted.

Table EMP-2: Potential Impacts and Mitigation Measures during Preconstruction and Construction Phases

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
A. Design & Preconstruction Phases									
Detail design stage	Include low carbon, climate variability and change resilience considerations	1) Design low carbon Baishan Water Supply System including variable speed pumps, SCADA [5] , accurate water metering, water quality monitoring instruments (for monitoring at least 42 parameters), leakage detection and repairing equipment for NRW reduction (ensure reduce the NRW from 65% to 30%); 2) Include high-capacity stormwater-drainage pipelines and rainwater detention and reuse facilities in Baicheng Infrastructure Component.	DIs[6]	JPPMO, LEPBs[7], , LPMOs[8] PIUs[9]	-	-	-	-	Included in the design contracts
	Institutional strengthening for EMP Implementation & supervision	3) Establish an EMU in each LPMO, including at least one environment specialist; 4) Appoint environmental coordinators for EMP coordination within JPPMO and PIUs; 5) Engage loan implementation environmental consultant (LIEC) under the project implementation consulting TA; and 6) Provide training to all environmental staff for EMP implementation and supervision	LPMOs, JPPMO, PIUs	EA, ADB	-	-	-	-	Counterpart funds (EA, IAs, PIUs)
	Updating EMP	7) Update mitigation measures defined in this EMP based on final detailed design, as needed, submit to ADB for review; and 8) In case of major change of project location (or additional physical component) that may cause substantial environmental impacts or involve additional APs[10], IAs and LPMOs should form an EIA team to conduct additional EIA and also public consultation. The revised EIA should be submitted to the JEPD and ADB for approval and disclosure. To determine whether the change is minor or major under assistance of LIEC, JPPMOs and LPMOs should consult with ADB.	JPPMO, LPMOs, LIEC	JEPD[11], LEPBs, ADB	-	-	-	-	Included in JPPMO's operation budget

[5] Supervisory Control and Data Acquisition system
[6] Design Institutes
[7] Baishan and Baicheng Municipal Environment Protection Bureaus
[8] Baicheng and Baishan Project Management Offices
[9] Project Implementation Units
[10] Affected people
[11] Jilin Provincial Environment Protection Department

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
Construction Preparation	Env. monitoring plan	9) Prior to construction, engage Municipal EMS[12]. 10) Prepare a detailed environmental monitoring plan in accordance with environmental monitoring plan defined in this EMP.	PIUs, EMSs	LPMOs, JPPMO, ADB	11.7	5.3	23	11.2	Counterpart funds (IAs)
	Bidding and contract documents	11) Ensure the mitigation measures in the EMP are incorporated in all bidding documents, which will be sent to ADB for review; and 12) Prepare environmental contract clauses for contractors, namely the special conditions (e.g., reference to EMP and monitoring requirements).	DIs, JPPMO, LPMOs, PIUs	LIEC, JEPD, LEPBs, ADB	-	-	-	-	Included in detail design contract
	EMP training	13) LIEC, or invited environment specialists and/or officials from the JEPD or LEPBs provide training on construction environmental management and implementation and supervision of environmental mitigation measures to contractors and CSCs, in accordance with the training plan in this EMP.	LIEC, JPPMO	JEPD, ADB	2.0	1.0	2.0	1.5	Included in the PIC[13] budget
	Establish operational GRM	14) Establish a Project Public Complaints Unit (PPCU) in each LPMO; provide training for PPCU members and GRM access points; and 15) Disclose the PPCU's phone number, fax, address, and email to the public on City EPB's website and on information boards at each construction site.	LPMOs	JPPMO, LIEC, ADB	-	-	-	-	Included in LPMO's operation budget
	Land acquisition and resettlement	16) Update LARP[14] after detail design 17) Establish a resettlement office comprising local government officials to manage the land acquisition and resettlement process; 18) Conduct information dissemination and community consultation programs in accordance with the PRC Land Administration Law (1999) and ADB SPS; and 19) Ensure that all resettlement activities are reasonably completed before construction starts on any component.	PIUs, LAROs[15],	BCA[16]; BLM[17], LBs[18], BCAs	-	-	-	-	Included in the cities' Land Acquisition and Resettlement cost

12 The Municipal Environmental Monitoring Station of Baishan and Baicheng (the licensed environmental monitoring units)
13 Project Implementation Consultant
14 Land acquisition and resettlement plan
15 The Land Acquisition and Resettlement Office in Baishan and Baicheng
16 Baishan and Baicheng Municipal Bureaus of Civil Affairs
17 Baishan and Baicheng Municipal Bureaus of Land Management
18 The Labor Bureaus of Baishan and Baicheng

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
Subtotal					**13.7**	**6.3**	**25.0**	**12.7**	
Total					**57.7 (94,590USD)**				
B. Construction Phase									
Topography and Soils	Earthwork, soil erosion, soil contam.	1) Define spoil disposal sites and borrow pit locations in the construction tender documents; 2) Construct intercepting ditches and drains to prevent runoff entering construction sites, and divert runoff from sites to existing drainage; 3) Limit construction and material handling during periods of rains and high winds; 4) Stabilize all cut slopes, embankments, and other erosion-prone working areas while works are going on; 5) Properly store petroleum products, hazardous materials and wastes on impermeable surfaces in secured and covered areas; 6) Remove construction wastes from the site to the approved disposal sites; 7) Establish emergency preparedness and response plan (Spill Management Plan) including spill cleanup equipment at each construction site and training in emergency spill response procedures. 8) Stabilize all earthwork disturbance areas within 30 days after earthworks have ceased at the sites;	Contractor CSCs	PIUs, EPBs, WRBs, LIEC	100.0	29.25	100.0	80	Included in construction contract
Ambient Air	Dust generated by construction activities, gaseous air pollution (SO2, CO, NOx) from construction machinery and asphalt pavement	9) Equip material stockpiles and concrete mixing equipment with dust shrouds, maintain shrouds regularly; 10) Spray water on construction sites and earth/material handling routes where fugitive dust is being generated; 11) Cover materials during truck transport, in particular, the fine material, to avoid spillage or dust generation; 12) Purchase pre-mixed asphalt for road surface paving (Baicheng); if asphalt is heated and mixed onsite, asphalt mixers must be located at least 200m away from residential areas and other sensitive receptors; 13) Store petroleum or other harmful materials in appropriate places and covering to minimize fugitive dust and emission; 14) Ensure emissions from vehicle and construction	Contractor CSCs	LPMOs, PIUs, LIEC	15.0	2.0	10.0	10.0	Included in construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
		machineries are in compliance with the PRC standards of GB18352-2005, GB17691-2005, GB11340-2005, GB2847-2005, and GB18285-2005; 15) Provide high-horsepower equipment with tail gas purifiers; 16) Carry out atmospheric monitoring during the construction period.							
Noise	Noise generated from construction activities	17) Ensure that noise levels from construction equipment and machinery conform to the PRC standard of GB12523-90, and properly maintain vehicles and machineries to minimize noise; 18) Apply noise reduction devices or methods where piling equipment is operating, such as construction of bridges and WSP & MSW structures, within 300 m of sensitive sites; 19) Locate sites for rock crushing, concrete-mixing, and similar activities at least 1000 m away from sensitive areas; 20) To reduce noise at night, restrict the operation of machinery generating high levels of noise, such as piling, and movement of heavy vehicles along urban and village roads between 20:00 and 06:00 the next day in accordance with the PRC regulations; 21) Place temporary hoardings or noise barriers around noise sources during construction, if necessary; and 22) Monitor noise at sensitive areas and consult potentially affected people at regular intervals (refer to the monitoring plan in the EMP). If noise standards are exceeded, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation;	Contractor CSCs	LPMOs, PIUs, LIEC	15.0	5.0	10.0	10.0	Included in construction contract
Water Resources	Impact of bridge construction on river hydrology (Baicheng)	23) Conduct bridge pier construction during the dry season. 24) Protect banks by matting and sediment traps, and on the completion of construction by the planting of grass and stabilizing vegetation to prevent soil and water loss; 25) Pump slurry from pile drilling in the channel bed to shore and properly dispose to reduce the	Contractor CSCs, EMS	PIUs, LIEC, EPBs, WRB	8.0	-			Included in construction contract and EMS contract (monitoring)

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
		disturbance of sediments and the impact on water quality; 26) Plan pier construction so as to ensure adequate opening for water flow.							
	Surface and GW contam.	27) Develop contingency plans for control of oil and other dangerous substances (Spill Management Plan) as part of the CS-EMP; 28) Collect wastewater from construction activities in sedimentation tanks, retention ponds, and filter tanks to remove silts and oil; 29) Equip all areas where construction equipment is being washed with water collection basins and sediment traps; 30) Place storage facilities for fuels, oil, and other hazardous materials within secured areas on impermeable surfaces, and provide bunds and cleanup installations; 31) Contractors' fuel suppliers must be properly licensed and follow proper protocol for transferring fuel and the PRC standard of JT3145-88 (Transportation, Loading and Unloading of Dangerous or Harmful Goods); 32) Ensure that water quality (for pollutants such as SS, CODcr, and oil) in surface water is monitored in accordance with the EMP monitoring program.				1.0	15.0	11.0	
Solid Waste	Solid waste generated by construction activities and from workers' camps	33) Provide appropriate waste collection and storage containers at locations away from surface water or sensitive receivers; 34) Reach agreement with municipal waste collection services for regular collection of waste prior to construction; 35) Properly remove and dispose of any significant residual materials, wastes and contaminated soils that remain on the ground timely during and after construction to the spoil sites. Any planned paving or vegetating of the area shall be done as soon as the materials are removed to stabilize the soil; 36) Burning of waste is strictly prohibited; and 37) Provide sufficient garbage bins at strategic locations and ensure that they are protected from birds and vermin, and emptied regularly (using the municipal solid waste collection systems).	Contractor CSCs	PIUs, LIEC	8.0	2.0	8.0	5.0	Included in construction contract
Biological resources	Protection of flora and	38) Protect existing trees and grassland during road and pipeline construction. Where trees are to be	Contractor, CSCs	PIUs, LIEC	100.0	10.0	80.0	30.0	Included in construction

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
	fauna around construction sites	removed or an area of grassland disturbed, replant trees and re-vegetate the area immediately after construction; 39) Remove trees or shrubs only as a last resort if they impinge directly on permanent works or approved necessary temporary works; 40) In compliance with the PRC Forestry Law, undertake compensatory planting of an equivalent or larger area of affected trees and vegetation; 41) Only native plant species of local provenance shall be used for re-vegetation; and 42) Identify, demarcate and protect sites where small animals, reptiles, and birds of common species live such as vegetated roadside areas, trees, inner areas of bridges and river beaches, etc.							contract
Socio-economic resources	Impact on physical cultural resources	43) Establish chance-find procedures for physical cultural resources; 44) If a new site is unearthed, work shall be stopped immediately and local BCR and the LPMO promptly notified.	Contractor, CSCs	LPMO,, LIEC, City BCR[19]	30.0	10.0	30.0	20.0	Included in construction contract
	Community health and safety	45) Prepare a traffic control plan, to be approved by LTMB [20] before construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings, selecting transport routes to reduce disturbance to regular traffic, reinstating roads, and opening them to traffic as soon as the construction is completed; 46) Plan construction activities so as to minimize disturbances to utility services. Three-dimensional detection of underground facilities shall be conducted before construction (Baicheng Infrastructures Component); 47) Inform residents and businesses in advance through media of the construction activities, given the dates and duration of expected disruption; 48) Place clear signs at construction sites in view of the public, warning people against potential dangers such as moving vehicles, hazardous materials, excavations etc., and raising awareness on safety issues. Heavy machinery							

[19] Bureau of Cultural Relics
[20] Local Traffic Management Bureau

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
		shall not be used at night (noise and vibration control); 49) Secure all sites, disabling access by the public through appropriate fencing whenever appropriate.							
	Occupational health and safety	50) Prepare environmental, health and safety management plan for the construction works. The plan will include the following provisions: 51) Provide clean water for all construction sites and workers' camps; 52) Provide an adequate number of latrines and other sanitary arrangements at construction sites and work camps, and ensure that they are cleaned and maintained in a hygienic state; 53) Garbage bins at construction sites and camps will be set up, which will be periodically cleared to prevent outbreak of diseases, 54) Provide personal protection equipment, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection; 55) Prepare an emergency response plan to take actions on accidents and emergencies, including environmental and public health emergencies associated with hazardous material spills and similar events. 56) Establish emergency phone link with hospitals in Baishan and Baichen; 57) Organize a fully equipped first-aid base in each construction camp; 58) Ensure that occupational health and safety matters are given a high degree of publicity to all persons regularly or occasionally on each construction site. Display posters prominently in relevant areas of the site; 59) Train all construction workers in basic sanitation, general health and safety matters, and on the specific hazards of their work. Implement site HIV/AIDS and other communicable diseases awareness and prevention program to target the local community and construction workers;	Contractors	CSCs, LPMOs, LBs, EPBs, LIEC	20.0	10.0	20.0	20.0	Included in construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget of Component (10,000 CNY)				Source of Funds
			Who Implement	Who Supervise	Baicheng		Baishan		
					Infra.	MSW	WSP	MSW	
		60) Civil works contracts shall stipulate priorities to (i) employ local people for works, (ii) ensure equal opportunities for women and men, majorities and minorities, (iii) pay equal wages for work of equal value, and pay women's wages directly to them; and (iv) not employ child or forced labor. Specific targets for employment have been included in the gender action plan (GAP).							
Cumulative Impacts	Cumulative Impacts during Construction	61) Contractors shall coordinate with other project contracts and other projects in the area of influence in terms of construction schedule, possible access roads and disposal sites sharing. 62) Contractors shall develop material transport plans in consultation with local traffic management authorities, other contractors, and local community;	Contractors	CSCs, LPMOs, LBs, EPBs, LIEC	-	-	-	-	Included elsewhere in construction contract
Subtotal					**296.0**	**69.25**	**273.0**	**186**	
Total					**824.25 (1.35123 million USD)**				

Source: Domestic EIAs

Table EMP-3: Potential Impacts and Mitigation Measures during Operation - Baicheng Urban Infrastructures Component

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)	Source of Funds
			Who Implement	Who Supervise		
Ambient Air	Excessive vehicle emissions, affecting ambient air quality	1) Conduct periodic examination of emission of vehicle exhaust pollutants for each vehicle in accordance with PRC regulation (such as GB18352.3-2005); 2) Refuse registration to vehicles with excessive emissions; 3) Implement policies and measures for vehicle emission control formulated by the state and provincial authorities.	OPF[21], TMB[22],	LEPB, JPPMO, LPMO	-	OPF's operation budget
		4) Conduct periodic air quality monitoring (through the EMS) in accordance with the monitoring program in this EMP;	EMS[23]	LEPB	10.0/a	LEPB's operation budget
Acoustic Environment	Traffic noise along project roads	5) Plant trees and shrubs along the proposed roadsides after construction; and 6) Install 70 double-glazed windows along the Third Ring Road in Erlong village (CBC1) and Hujia village (CBC3) in accordance with the domestic EIA.	Contractors	PIU, LIEC		Included in civil works contracts (CBC1, CBC3)
		7) Conduct ambient noise monitoring and inspection, determine whether mitigation measures will be required for sites where noise levels are expected to exceed by more than 3 dB(A);	EMS	LEPB	4.0/a	LEPB's operation budget
Water Resources	Pollution from storm water runoff and solid waste	8) Install special stormwater collection, storage and infiltration system under the roadside landscaping strip along two project roads (included in detailed design); 9) Routinely collect and properly dispose litter and debris from sidewalks, driveways, and parking lots, especially near channels; 10) Clean the roadside catch basins before rainy season to avoid surface water pollution by storm water runoff flushing debris and silt; 11) Place garbage bins and containers along the road networks; and 12) Prohibit the construction of car washing near drainage networks and channels.	OPF, MDC[24], EMS	LEPB, WRB[25]	45.0/a	OPF's operation budget
	Sewers, wastewater collection and treatment	13) Regularly inspect and maintain project sewer network; 14) Review performance of linked WWTP[26] (treatment performance, compliance with effluent standards)	OPF, WWTP EMS, MDC	LEPB	3.0/a	OPF's operation budget

[21] Operator of project facilities (Baicheng BEDZ Investment and Development Co.
[22] Traffic Management Bureau
[23] Biacheng Environmental Monitoring Station
[24] Municipal Drainage Company
[25] Baicheng Water Resource Bureau
[26] Wastewater treatment plant

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)	Source of Funds
			Who Implement	Who Supervise		
Socio-Economic Resources	Road safety	15) Conduct traffic audit and separate traffic safety awareness campaigns both in schools and residential communities; 16) All roads shall be designed with pedestrian sidewalks. All major roads shall have separate lanes for non-motorized traffic. Pedestrian-priority traffic lights, safety islands, crosswalks (zebra lines), and boarding bays/islands shall be established at all intersections;	JPPMO, PIC, OPF, Traffic Police, ITS contractor	LEPB, TMB, PSB[27]	1.5/a	Capacity building budget of the PIC[28]
		17) Road maintenance vehicles shall be equipped with warning lights, and staff will wear safety hats and reflective garments and undergo safety training; 18) Proper operation of ITS, include traffic monitoring system, red light and speeding violation monitoring system, real time traffic condition displays			10.0/a	OPF's operation budget
	Spills of dangerous goods	19) Ensure that all trucks carrying hazardous materials are marked according to PRC norms; 20) Enforce traffic controls, and set speed limits for trucks carrying hazardous material; and	OPF, Local Traffic Police	LPMO, LEPB, PSB		OPF's operation budget
Biological resources	Vegetation	21) Routinely inspect and properly maintain all roadside trees, slope stabilization sites, and landscaping vegetation.	OPF	EPB, LFB	12.0/a	OPF's operation budget
TOTAL		**Operation Cost**			**75.5/a**	

[27] Public Security Bureau
[28] Project Implementation Consultancy

Table EMP-4: Potential Impacts and Mitigation Measures during Operation for Water Supply Component in Baishan

Item	Potential Impacts/ Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)	Source of Funds
			Who Implement	Who Supervise		
Water Source	Water source protection, contamination	1) Properly delineate and maintain water source protection zones around the water source (Xibeicha Reservoir) in accordance with Drinking Water Source Protection Paln for the Xibeicha Reservoir (approval document No. Jiling Gov-2010-112); 2) Install and properly operate automatic water source monitoring and emergency warning system in Xibeicha Reservoir (at the water intake point); 3) In case of pollution, shut down water transmission from Xibeicha Reservoir, and temporary switch to existing Nanshan WTP through the pipeline network; and take effective measures to identify and remove pollution source.	PIU (OPF)[29], LEPB	JEPB, WRB, LPHB[30]	30.0/a	Included in PIU's operation budget
Water supply safety (Quality)	Drinking water quality monitoring	4) Equip WTP with laboratory able to examine 42 parameters of the National Standard for Drinking Water (GB5749-2006); 5) Twice a year, send water samples taken from the clean water tank of the WTP to Changchun WSC for examination of 106 parameters according to the PRC regulation; 6) Ensure that WSPs' staff/workers are well trained on all steps of the treatment process, including emergency warning and response actions.	PIU, LIEC	LEPB, IA, WRB	1.5/a	Included in the training budget
Handling and disposal of chlorine dioxide at the WTP	Risk caused by hydrogen chloride and chlorine dioxide leakage	7) Chemicals will be transported and managed in compliance with PRC regulations on hazardous chemical substance management (The PRC State Council Order No. 2002-244); 8) Transport vehicles and personnel will be trained and qualified with hazardous chemical substance handling and transportation; 9) Storage of hazardous chemicals will be arranged with certificates procured from the police department and fire authorities; 10) Chlorination rooms and chemical storage rooms in the WSP will be equipped with automatic censors and alarms, which will be triggered by ClO2 leakage; 11) The WSP will be equipped with gas masks, oxygen breathing apparatus and other rescue materials, to protect staff in the event of leakage of hydrogen chloride and ClO_2; and 12) An emergency response plan will be prepared and implemented in the WSP. The plan will inform staff about the characteristics of ClO_2 and hydrochloric acid, potential hazards, and define accident prevention measures and evacuation plan.	PIU	EPB, WRB	15.0/a	Included in PIU's operation budget
Noise	Operational noise in the WTP	13) All noise-emitting machinery and equipment including pumps, fans, and sludge dewatering machines (spin-driers) shall be installed in sound-proof housing within rooms in the WTP, and be kept in good operation condition. 14) Conduct periodic noise monitoring to confirm compliance with GB12348-2008	PIU	LEPB	---	Included in PIU's operation budget
Sludge in WTP	Sludge in sedimentation tanks	15) Develop and implement a sludge handling plan, including collection and storage of sludge, transport, environmentally sound reuse and/or disposal. Sludge shall be reused for manufacturing bricks and other construction materials, if possible.	PIU	LEPB	20.0/a	Included in PIU's operation budget

[29] The PIU and OPF are same
[30] Baicheng Municipal Public Health Bureau

Item	Potential Impacts/ Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)	Source of Funds
			Who Implement	Who Supervise		
Solid wastes and wastewater	WTP staff will generate wastewater and solid waste	16) Ensure environmentally sound collection, transportation, and disposal of domestic solid waste (13.7 t/a) to the existing Baishan Sanitation Landfill; and 17) Treat 1,300 m3/a of domestic wastewater generated at WTP onsite (septic tank).	PIU	LEPB, LHB	6.0/a	Included in PIU's operation budget
Ecological impact to downstream	Water extraction from Xibeicha Reservoir, reduction of downstream flow, water quality of return waters from use of supplied water reentering the river basin	18) Ensure minimum ecological flow release of 0.14m3/s to downstream of the Xibeicha River and Hunjiang River in accordance with approved EIA for the Xibeicha Reservoir; verify and manage downstream riparian releases; 19) Automatically measure the water flow at the downstream of Xibeicha River, and feedback the measurement result to influence the water extraction operation; 20) Extend capacity of existing Baishan WWTP from 50,000m3/d to 100,000m3/d by 2016 (before WTP completion) to cope with increased wastewater amounts induced by increased water supply capacities; ensure that effluent from the WWTP will meet the PRC Standard of GB18918-2002.	PIU, WRB	LEPB	5.0/a	Included in PIU's operation budget
Total				**77.5/a (127,000USD/a)**		

Source: Domestic EIA Report

Table EMP-5: Potential Impacts and Mitigation Measures during Operation – Integrated MSW Components in Baishan and Baicheng

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)		Source of Funds
			Who Implement	Who Supervise	Baishan MSW	Baicheng MSW	
Municipal Landfill (Baishan)	Leachate treatment, groundwater pollution	1) Construct and maintain interception drains to divert runoff water from entering the landfill site; 2) Install impermeable lining for the landfill base and sides; 3) Operated and maintain leachate collection cell that were constructed for Phase 1 and Phase 2 of the landfill to contain and treat leachate; 4) Conduct periodic monitoring of the leachate treatment facility and groundwater quality to confirm adequacy of protection measures.	PIU, OPF[31]	LEPB, JPPMO	15.0/a	-	OPF operation budget
	Dust, windborne waste	5) Install and maintain an adequate buffer zone around the landfill facility; 6) Ensure that waste transport vehicles are covered; 7) Install and maintain fences around the landfill site to control wind-borne waste; 8) Enforce strict site management prescriptions such as covering the opening of a single active tip face at any one time, daily soil covering to	PIU, OPF	LEPB, JPPMO	15.0/a	-	OPF operation budget

[31] Operator of project facility

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)		Source of Funds
			Who Implement	Who Supervise	Baishan MSW	Baicheng MSW	
		catch wind-borne litter, and watering of dust-prone areas.					
	Odorous (NH3, H2S) and GHGs emissions	9) Collect and flare methane produced in the landfill; 10) Regularly (monthly) monitor methane, H2S and NH3 levels in and around the landfill; 11) Conduct regular inspections of the methane gas outlet pipes to check for blockages or damage, and fire control and lightning protection facilities; 12) Regularly consult nearby residents, and define corrective actions as needed; 13) Prohibit construction of new residential houses or community buildings within 600 m.	OPF	LEPB, JPPMO	10.0/a	-	OPF operation budget
	Pest and disease vector control	14) Timely soil cover to minimize breeding areas for flies and mosquitoes; arrange staff timely soil cover the hollow area within the landfill site 15) Monitor mosquito, fly and rat activities during landfill operation; and 16) Periodic spraying with approved pesticide as needed.	OPF	LEPB, JPPMO	10.0/a	-	OPF operation budget
Waste Transfer Stations	Leachate, wastewater from MSW transfer stations	17) Install and regularly clean septic tanks in each transfer station; transport accumulated sediments by covered vehicles to local landfills for disposal; 18) Design and construct the floor of the MSW stations and the septic tanks to prevent any potential seepage and pollution of groundwater; 19) Conduct periodic monitoring of the pollutant concentrations in the pre-treated wastewater to confirm compliance with Class III of the Integrated Wastewater Discharge Standard of GB8978-1996;	PIU, OPF	LEPB, JPPMO	20.0/a	15.0/a	OPF operation budget
	Odors, noise emissions, pest control	20) Install a 5 m wide buffer zone and a greening belt no less than 2 m around the MSW transfer stations, as specified in Technical Specifications for Domestic Solid Waste Transfer Stations (CJJ47-2006); 21) Design MSW transfer stations as closed structure and with a maximum capacity of 10t/d; 22) Pack and store MSW in enclosed MSW containers; the collected MSW shall be removed daily; 23) Conduct pest control (sprinkle with disinfectant) at least once a day in summer; 24) Monitor ambient noise and odor (H2S, NH3) to determine whether further mitigation measure is required or not; 25) Consult nearby residents regularly on odor nuisance, and define and implement corrective actions as necessary;	PIU, OPF	LEPB, JPPMO	15.0/a	10.0/a	OPF operation budget
Composting facilities	Leachate	26) Control leachate generation by monitoring and correcting the moisture levels in the composting pile;	OPF	LEPB, JPPMO	5.0/a	5.0/a	OPF operation budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Budget (10,000 CNY)		Source of Funds
			Who Implement	Who Supervise	Baishan MSW	Baicheng MSW	
		27) Collect leachate in collection basin, back-spray on compost piles; 28) Place windrows or piles under a roof to prevent excessive moisture levels due to precipitation.					
Occupational health and safety (all MSW facilities)	Bio-aerosols, endotoxins	29) Implement dust control measures described above (to effectively control bio-aerosols and endotoxins dissemination); 30) Keep compost and feedstock moist; moisten compost during the final pile teardown and before being loaded onto vehicles, taking care not to over-wet the material, which can produce leachate or runoff; and 31) Isolate workers from spore-dispersing components of the composting process such as mechanical turning (for example, using tractors or front-end loaders with enclosed air-conditioned or heated cabs).	OPF	LEPB, JPPMO	10.0/a	5.0/a	OPF operation budget
	Personal protective equipment, training	32) Provide training to MSW workers, covering rights and responsibilities of workers under the PRC's labor law; identification of chemical, physical, and biological risks at the site; safe practices and operating procedures; the role of engineering controls and personal protective equipment in preventing injuries and illnesses; procedures for reporting injuries and illnesses; and procedures for responding to emergencies. 33) Provide personal protective equipment (PPE) to employees, as well as shower facilities, and first medical aid kits.	OPF	LEPB, JPPMO	15.0/a	8.0/a	OPF operation budget
TOTAL					**115.0/a**	**43.0/a**	

Source: domestic EIA reports

D. Environmental Monitoring, Inspection and Reporting

10. The project monitoring program focuses on the environment within the project's areas of influence in Baishan and Baicheng. A detailed environmental monitoring program is shown in **Table EMP-8**, which covers the scope of monitoring, monitoring parameters, time and frequency, implementing and supervising agencies, and estimated costs. The monitoring shall comply with the methodology provided in the relevant national environmental monitoring standards. Other associated standards to be followed are the national environmental quality standards of air, water and noise, and the pollutant discharge standards.

11. **Internal monitoring/supervision and reporting by CSCs.** During construction, CSCs will be responsible for conducting internal environmental monitoring in accordance with the monitoring plan (**Table EMP-7**, **Table EMP-8**). Supervision results will be reported through the CSCs' reports to the PIUs.

12. **Environmental compliance monitoring by EMSs.** The PIUs will contract the local EMSs to conduct environmental monitoring in accordance with the monitoring program (**Table EMP-7, Table EMP-8**). A detailed cost breakdown will be provided by the two municipal EMSs when the environmental monitoring program is updated at the start of each component implementation. Monitoring will be conducted during construction and operation period, until a project completion report (PCR) is issued. Semiannual monitoring reports will be prepared by the EMSs and submitted to JPPMO, LPMOs and the PIUs.

13. **EMP implementation monitoring and progress reporting.** The LIECs will review project progress and compliance with the EMP based on field visits, and the review of the environmental monitoring conducted by the EMSs. The findings of the LIECs will be reported to ADB through the annual EMP monitoring and progress reports. The reports will include (i) progress made in EMP implementation, (ii) overall effectiveness of the EMP implementation (including public and occupational health and safety), (iii) environmental monitoring and compliance, (iv) institutional strengthening and training, (v) public consultation (including GRM), and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. The LIECs will help JPPMO prepare the reports and submit the English report to ADB for appraisal and disclosure.

14. **Project progress reports.** A summary of the project's environment performance and compliance with the EMP will be included in the semi-annual project progress reports submitted by the JPPMO to ADB, to be consolidated in annual progress reports. The annual reports will also cover (a) progress achieved by output as measured through the indicator's performance targets, (b) key implementation issues and solutions, (c) updated procurement plan, and (d) updated implementation plan for the next 12 months.

15. **Project completion environmental audits.** Within three months after each subproject completion, or no later than one year with permission of the municipal EPBs, environmental acceptance monitoring and audit reports of each subproject completion shall be (i) prepared by a licensed environmental monitoring institute in accordance with the PRC Guideline on Project Completion Environmental Audit (2001), (ii) reviewed for approval of the official commencement of individual subproject operation by environmental authorities, and (iii) finally reported to ADB through the annual EMP monitoring and progress reporting process.

16. **Quality assurance (QA) /quality control (QC) for compliance monitoring.** To ensure accuracy of the monitoring, the QA/QC procedures will be conducted in accordance with the following regulations:

i) *Regulations of QA/AC Management for Environmental Monitoring* issued by the State Environmental Protection Administration in July 2006;

ii) *QA/QC Manual for Environmental Water Monitoring* (Second edition), published by the State Environmental Monitoring Centre in 2001; and

iii) *QA/QC Manual for Environmental Air Monitoring* published by the State Environmental Monitoring Centre in 2001.

Table EMP-7: Environmental Reporting Plan

Report	From	To	Frequency of Reporting
A. Construction Phase			
Internal progress reports	CSCs	PIUs	Monthly
Environmental monitoring reports	Local EMSs	LPMOs, PIUs	Semi-annually
EMP monitoring progress reports	JPPMO, LPMOs	ADB	Semi-annually (through semi-annual project progress reports)
	JPPMO	ADB	Annually (stand-alone EMP progress report)
Environmental acceptance monitoring and audit reports	Licensed institute	Municipal EPBs, JPPMO, IAs, PIUs, ADB	Within three month after component completion
B. Operation Phase			
EMP monitoring and progress reports	JPPMO	ADB	Annually

Source: Domestic EIAs and Consultant's proposal

Table EMP-8: Environmental Monitoring Program

Subject	Parameter	Location	Frequency	Who Implement	Who Supervise	Estimated Cost (RMB 10,000)			
						Baicheng		Baishan	
						Infra	MSW	WSP	MSW
1. Construction									
1.1 Quality of sewer from work-camp	pH, SS, NH_3-N, COD_{Cr}, oil	Domestic wastewater discharge at selected work-camps (50% of total camps in each city)	Compliance monitoring: four times per year during construction activities	LEMS	LEPB, LPMO	3.0	1.0	5.0	3.0
1.2 Construction wastewater	SS, oil, pH	At the bridge (50m upstream and 100m downstream of the drainage channel in Baicheng); At wastewater discharge points of all construction sites in each city	Compliance monitoring: four times per year during construction activities	LEMS	LPMOL EPB	1.2	1.0	1.0	1.0
1.3 Water quality downstream of the reservoir	pH, SS, DO, NH_3-N, BOD_5, COD_{Cr}, Total coliform, oil	Downstream of Xibeicha River (at the section 2000 m downstream of the reservoir)	Compliance monitoring: twice per year during construction activities	LEMS	LPMO, LEPB	-	-	1.0	-
1.4 Ambient air	Dust mitigation measures (water spraying, cover vehicles, etc.); and maintenance of vehicles & equipment	Visual inspection at all construction sites	Internal monitoring: once a week	CSC	PIU, LIEC	Included in the CSCs' contract			

Subject	Parameter	Location	Frequency	Who Implement	Who Supervise	Estimated Cost (RMB 10,000)			
						Baicheng		Baishan	
						Infra	MSW	WSP	MSW
	TSP, PM10, NOx	At all construction sites (at least one point upwind, one points downwind) and sensitive receivers nearby (see Chapter IV - sensitive receptors within project area of influence)	Compliance monitoring: four times per year during construction activities	LEMS	LPMO EPB	2.0	1.0	2.0	2.0
1.5 Noise	LAeq	At boundaries of all construction sites and sensitive receivers nearby (see Chapter IV-sensitive receivers within project area of influence)	Compliance monitoring: twice per year (twice a day, once in day time and once at night time, for 2 consecutive days)	LEMS	LPMO EPB	2.0	1.0	1.5	1.2
1.6 Solid Waste	Garbage from work-camps and construction waste at construction sites	Visual inspection at all construction sites and work-camps	Internal monitoring: once a week	CSCs	PIU, LPHB	Included in the CSC contract			
			Compliance monitoring: once a year	LIEC	ADB	Included in PIC contract			
1.7 Soil erosion and re-vegetation	Soil erosion intensity	Visual inspection at spoil sites and all construction sites, in particular the water transmission pipeline route and the Baishan landfill site	Internal monitoring: Random check after rain (rainfall＞50 mm)	CSC	PIU, LIEC	Included in the CSCs' contract			
			Compliance Monitoring: At least once a year, and once after completion of construction	LIEC	EPB, EA, ADB	Included in PIC contract			
	Re-vegetation of spoil disposal sites and construction sites	Visual inspection at all disposal sites, and temporary occupied lands	Internal Monitoring: At least four times per year	CSC	PIU	Included in the CSCs' contract			
			Compliance Monitoring: At least once a year, and once after completion of construction	LIEC	JPPMO, ADB	Included in PIC contract			
1.8 Occupational health and safety	Work camp hygiene and safety, availability of clean water and emergency response plans	Inspection at all construction sites and work-camps	Internal Monitoring: once a month	CSC	PIUs	Included in the CSCs' contract			
			Compliance Monitoring: At least once a year, and once after completion of construction	LIEC	LPHB, LLB	Included in PIC contract			
Subtotal						**8.2**	**4.0**	**10.5**	**7.2**
Total						**29.9 (49,000USD)**			
2. Operation Phase									
2.1 Water quality of Xibeicha reservoir	pH, SS, DO, NH_3-N, oil, COD_{cr}, Cr_6+, BOD_5, TN, TP, chloride, NO_3-N, total coliforms, dipterex, dimethoate, dichlorphos,	Two points: (i) center of the Xibeicha Reservoir; and (ii) the water intake point of the water transmission pipeline.	Four times a year (in addition to online monitoring system of WTP operator)	LEMS	PIU, LEPB	-	-	2.0/a	-
2.2 Water quality	42 regular parameters[32] in	Internal monitoring: Clear water tank in the WSP	Once a week	Lab in the PIU	LEPB, LPHB	-	-	20/a	-

[32] The 42 regular water quality in the standard of GB5749-2006 includes: Total coliform, Thermotolerant coliform, Escherichia coliform, Total plate count, As, Cd, Cr^{+6}, Pb, Hg, Se, Cyanide, NO3-N, Chloroform, Tetrachloromethane (CCl4), Fluoride, Bromate, Formaldehyde, NH3-N, Chlorite, Chlorate, Chromaticity, Turbidity, odor & taste, Lookable (appearance),

Subject	Parameter	Location	Frequency	Who Implement	Who Supervise	Estimated Cost (RMB 10,000)			
						Baicheng		Baishan	
						Infra	MSW	WSP	MSW
of treated water at WTP	the standard of GB5749-2006.								
	106 parameters of GB5749-2006	Compliance monitoring: Clear water tank in the WSP	Twice a year	Changchun Water Supply Co.	LEPB, LPHB	-	-	4.0/a	-
2.3 Water quality and quantity downstream of Xibeicha River	m3/s, pH, SS, NH_3-N, Oil, COD_{cr}, Cr_6+, BOD_5, TN, TP, DO, total coliforms,	One sampling at confluence section of the downstream Xibeicha River and the Hunjiang River	Once a month	LEMS	LEPB	-	-	12/a	-
2.4 Landfill leachate	SS, CODcr, NH_3-N, Total bacteria, heavy metals	Landfill leachate	Four times per year	LEMS	LEPB	-	-	-	2.4/a
2.5 Groundwater quality	pH, NH_3-N, COD_{Mn}, Cr(+6), As, Pb, Cd, Hg, volatile phenol, cyanide, fecal coliform, total hardness, chloride	Baishan Landfill site: One sampling at the background well, two at a 50m distance of both sides of landfill site; one at a distance of 50m downstream of the direction of ground water under the landfill site, separately.	Twice per year	LEMS	LEPB, JPEPD	-	-	-	4.0/a
2.6 Noise	LAeq	(i) At the boundary of the WTP; (ii) The boundary of the MSW transfer stations; (iii) landfill site boundaries.	Twice per year (twice a day, once in day time and once at night time for 2 consecutive days)	LEMS	LEPB	-	1.0/a	0.5/a	1.0/a
		All sensitive receivers along the roads and nearby bridges;				1.5/a	-	-	-
2.7 Ambient Air	TSP, SO_2, NOx, PM_{10}	All sensitive receivers along the roads and nearby bridges	Twice a day for 3 consecutive days, twice per year	LEMS	LEPB	1.5/a	-	-	-
	CH_4, TSP, NH_3, H_2S	(i) Upwind and downwind of the MSW sorting/ composting plants and the landfill boundaries; (ii) 20% of MSW transfer stations (random selected)	Twice a year	LEMS	LEPB	-	5.0/a	-	3.0/a
2.8 Soil and Vegetation	Vegetation survival and coverage rate	All re-vegetated sites.	Spot check, twice a year	PIU	LEPB, LFB[33]	-	-	-	-
2.9 Traffic flow and safety	Traffic flow and road use (against predictions), and accident incidents	Project roads	Once a year, in particular in the representative years of 2019, 2025 and 2033	PIU	LTMB[34] JPPMO	0.5/a	-	-	-
2.10 Pest and disease vectors	Rats, mosquitos, fly density (No./m^2)	Four boundaries of MSW facilities and the landfill.	Twice a year (once in summer)	PIU	LPHB	-	0.3/a	-	0.4/a

pH, Al, Fe, Mn, Cu, Zn, Chloride, Sulfate, TDS, Total hardness, CODmn, Volatile phenol, LAS, Total α-radioactivity, Total β-radioactivity, ClO_2, Residual Cl_2.

[33] Local Forestry Bureau

[34] Local Traffic Management Bureau

Subject	Parameter	Location	Frequency	Who Implement	Who Supervise	Estimated Cost (RMB 10,000)			
						Baicheng		Baishan	
						Infra	MSW	WSP	MSW
Subtotal						**3.5/a**	**6.3/a**	**38.5/a**	**10.8/a**
Total						**59.1/a (96,853 USD/a)**			

BOD5 = 5-day biochemical oxygen demand; CODcr = chemical oxygen demand; CSC = construction supervision company; EMS = environmental monitoring station; EPB = environmental protection bureau; IA = implementation agency; LAeq = equivalent continuous A-weighted sound pressure level; LSMI = licensed soil erosion institute; NH_3-N = ammonia nitrogen; NOx = nitrogen oxides; OPF = operators of project facilities; PM10 = particles measuring 10Âµm or less; PMO = project management office; SO_2 = sulfur dioxide; SS = suspended solids; TSP = total suspended particle

E. Training, Capacity Building, Awareness Raising

17. To ensure effective implementation of the EMP, the capacity of the JPPMO, LPMOs, PIUs, OPFs, CSCs and contractors must be strengthened, and all parties involved in implementing mitigation measures and monitoring of environmental performance must have an understanding of the goals, methods, and the best practices of project environmental management. The Jilin Provincial EPB, Baishan and Baicheng municipal EPBs and the LIECs will offer training specific to their roles for all the project components. The main training emphasis will be to ensure that the contractors, CSCs, PIUs and OPFs are well versed in environmentally sound practices and are able to undertake all construction and operation with the appropriate environmental safeguards.

18. The training and awareness raising program addresses immediate training needs, i.e. training needed for project personnel in order to ensure that involved institutes are well versed in environmentally sound practices and are able to undertake all construction with the appropriate environmental safeguards.

19. The training program also addresses long-term capacity building and awareness raising needs, i.e. for the operational phase of the project components. Training and awareness raising campaigns will be provided by qualified experts on MSW management with 3R principal, drinking water safety, drinking water source protection, NRW reduction, operation and maintenance of WSP, strategic urban and regional planning, low carbon and sustainable urban transport management planning, and urban traffic safety.

20. The following training program will be delivered or organized by the project management consulting service during the course of project implementation. Training Needs Assessments will be conducted by the Project Implementation Consultant (PIC) to tailor the training for maximum impact. The trainer will include in their program a before/after assessment to evaluate the success of the training. The LIEC and other PIC members will design an evaluation questionnaire to gauge the usefulness of the training/capacity building design and performance of the trainer. The evaluation will be taken into account in the trainer’s performance evaluation. L

Table EMP-9: Indicative List of Short-term Training Program Related to Environment

Training program	Scope of Training	Trainer	Trainee	Time	Days	Persons	Budget (CNY)
Procurement and contract management	1. ADB's procurement Guideline and process 2. Bidding document preparation, including EMP clauses 3. Risk of improper procurement and mitigation measures 4. Handling variation orders and contract management	PIC	JPPMO, PIUs, IAs, LPMOs, LFBs[35]	1	1	30	12,000
Implementation of EMP and other health and safety requirements including GRM	5. EMP implementation, including implementation responsibilities, environmental monitoring, inspection and reporting, public consultation and participation, mechanism of EMP review, feedback and adjustment; 6. The GRM, including GRM structure, responsibilities and timeframe, types of grievances, eligibility assessment; 7. Environment, Health and Safety (EHS) considerations during project construction and operation, including community and occupational health and safety; 8. Monitoring and inspection methods, data collection and processing, interpretation of data, reporting system; 9. Communication with the public by different means (Innovative community-based advocacy campaigns) 10. Prevention and control of transmissible diseases and HIV/AIDS	PIC, LIEC	JPPMO, IAs, PIUs, LPMOs, LEPBs, LCAB[36], GRM access points, other related local Units	2	2	30	24,000
Drinking water source protection and WTP operation including NRW reduction	11. The PRC and Jilin provincial regulations for drinking water source protection and protection zoning; 12. Point and non-point pollution control, and principles of surface water management 13. Energy saving and GHG emission reduction in water supply sector including NRW reduction strategy and methods 14. Sustainable water management and water saving practices	Experts invited from ADB or IWA[37] (Beijing Office)	PIU, OPF of the WTP, LWRB	1	1	20	10,000

[35] Municipal Finance Bureau
[36] Local Civil Affair Bureau
[37] International Water Association

Training program	Scope of Training	Trainer	Trainee	Time	Days	Persons	Budget (CNY)
Municipal solid waste management	15. International and national good practices for MSW management (3R concept and practice) 16. MSW disposal and management technologies and options including sorting and composting;	Experts from JPEPD, and LIEC	LPMOs, PIUs, LPHB, LEPBs	1	1	30	12,000
Sustainable transport planning, Traffic safety	17. International and national good practice for urban traffic safety 18. Road safety audit tools and approaches 19. Public awareness program and education for traffic safety 20. Use of performance indicators and short-, medium- and long-term planning 21. GHGs emission reduction and climate change adaptation in transport sector	PIC	Baicheng IA, PIU, and other related units (e.g. traffic management bureau)	1	1	20	10,000
Emergency preparedness and response planning	22. Environmental accidents, mitigation measures for the sectors of water supply, urban infrastructures and MSW ; 23. Emergency response team, procedure and actions; 24. Urban drainage and flood emergency response	PIC	IAs, PIUs, OPFS, other related local bureaus.	1	1	30	12,000
Total				**7**	**7**	**150**	**8,000**

ADB = Asian Development Bank, EA = executing agency, EHS = environment health and safety, EMP = environment management plan, EPB = environment protection bureau, GRM = grievance redress mechanism, IA = implementing agency, JPPMO = Jilin provincial project management office, LPMO = project city project management office, OPF = operator of project facilities, PIC = project Implementation consulting service, PIU = project implementing unit,

21. In addition, a series of **awareness raising activities** have been defined in the Social Action Plan (SAP) and Gender Action Plan (GAP) of the Project:

(1) **Awareness raising on municipal waste sorting at source.** This activity defined in the SAP will include, amongst others (i) the preparation of a household garbage 3R instruction handbook; (ii) public consultations on waste sorting in selected communities (21 communities in Baishan and 20 communities in Baicheng); and (iii) public sanitation management campaign including 3R in schools (lecture or picture exhibition, handbooks, etc., targeting 70 primary and 30 middle schools). A budget of CNY 810,000 has been earmarked in the consulting service package to cover handbook production and consultation and awareness raising activities.

(2) **Awareness raising on water conservation and safe drinking water.** This activity defined in the SAP will target Baishan and include, amongst others: (i) the preparation and delivery of water-saving campaign materials; (ii) a public water conservation campaign in schools (lecture or picture exhibition, etc.), and (iii) a public water conservation and safe drinking water campaign in the urban area of Baishan. Campain material costs of CNY 200,000 have been earmarked in the capacity building component of the project.

(3) **Awareness raising on traffic road safety.** This activity defined in the SAP will target Baicheng and mainly consist of a road safety campaign in schools. Campaign preparation costs of CNY 120,000 have been earmarked in the capacity building budget of the project.

F. Public Consultation

22. Meaningful consultation was conducted during the PPTA. Direct public participation was conducted as an ongoing element in the development of the components, which and its outcome are described in Chapter VII of this IEE. These activities were carried out by the EIA institutes in their preparation of the EIAs, and by the PPTA consultants following the PRC National EIA Technical Guidelines and ADB SPS (2009) and PCP (2011).

23. Future plans for public involvement during the design, construction, and operation phases were developed during PPTA (**Table EMP-10**). These plans include public participation in (i) monitoring impacts and mitigation measures during construction and operation, (ii) evaluating environmental benefits and social impacts, and (iii) interviewing the public after the project is completed. The LPMOs and PIUs are responsible for public participation during project implementation. They will be supported by the LIEC. Costs for public participation activities during construction are included in the project funding.

Table EMP-10: Consultation and Participation Plan

Organizer	Approach	Times/Frequency	Subjects	Participants
Project preparation				
EIA Institutes	Questionnaires and interviews	During field work for EIA	Project priority, effects, attitudes to the Project/ components, and suggestions	Residents within project component areas and construction area
PPTA Consultants, ADB	Site visits, and public consultations, and interviews	Two rounds of consultation in each of the two city	Comments and recommendations of APs and stakeholders	Representatives of APs and stakeholder agencies
Construction				
PIUs, LPMOs, LIEC	Public consultation through questionnaire survey, site visits, informal interviews	Once a year during peak construction period	Adjusting mitigation measures if necessary, construction impacts, comments and suggestions	Work staff within construction area; and residents within construction area
	Public workshops	At least once during peak construction period	EMP implementation progress, adjusting mitigation measures if necessary, construction impacts, comments and suggestions	Representatives of residents, APs and social sectors
Operation				
PIUs, OPFs	Public consultation and site visits	At least once	Effects of mitigation measures, impacts of operation, comments and suggestions	Residents, APs adjacent to project facilities
	Public workshop	As needed based on public consultation	Effects of mitigation measures, impacts of operation, comments and suggestions	Representatives of residents, APs and social sectors
	Public satisfaction	At least once after one	Comments and	Project beneficiaries

Organizer	Approach	Times/Frequency	Subjects	Participants
	survey	year of operation	suggestions	

EIA = Environmental Impact Assessment, AP = Affected people, OPF = Operator of Project Facilities, PIU = Project Implementing Unit, LPMO = Local Project Management Office, LIEC = Loan Implementation Environmental Consultant, PPTA = Project Preparation Technical Assistance.

G. Mechanisms for Feedback and Adjustment

24. Based on environmental inspection and monitoring reports, the JPPMO, LPMOs, PIUs shall decide, in consultation with the LIEC, whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices.

25. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the EMP will be made, if necessary. The LPMOs and their EMUs will play a critical role in the feedback and adjustment mechanism.

26. If during inspection, substantial deviation from the EMP is observed or any changes are made to the project that may cause substantial adverse environmental impacts or increase the number of affected people, then the JPPMO and the LPMOs will immediately consult with ADB and form an environmental assessment team to conduct additional environmental assessment and, if necessary, further public consultation. The revised EIA report including the EMP will be submitted to the ADB for review and appraisal, and disclosure. The revised EMP will be passed to the contractors, CSCs and OPFs for implementation. The mechanism for feedback and adjustment of the EMP is shown in **Figure EMP-1.**

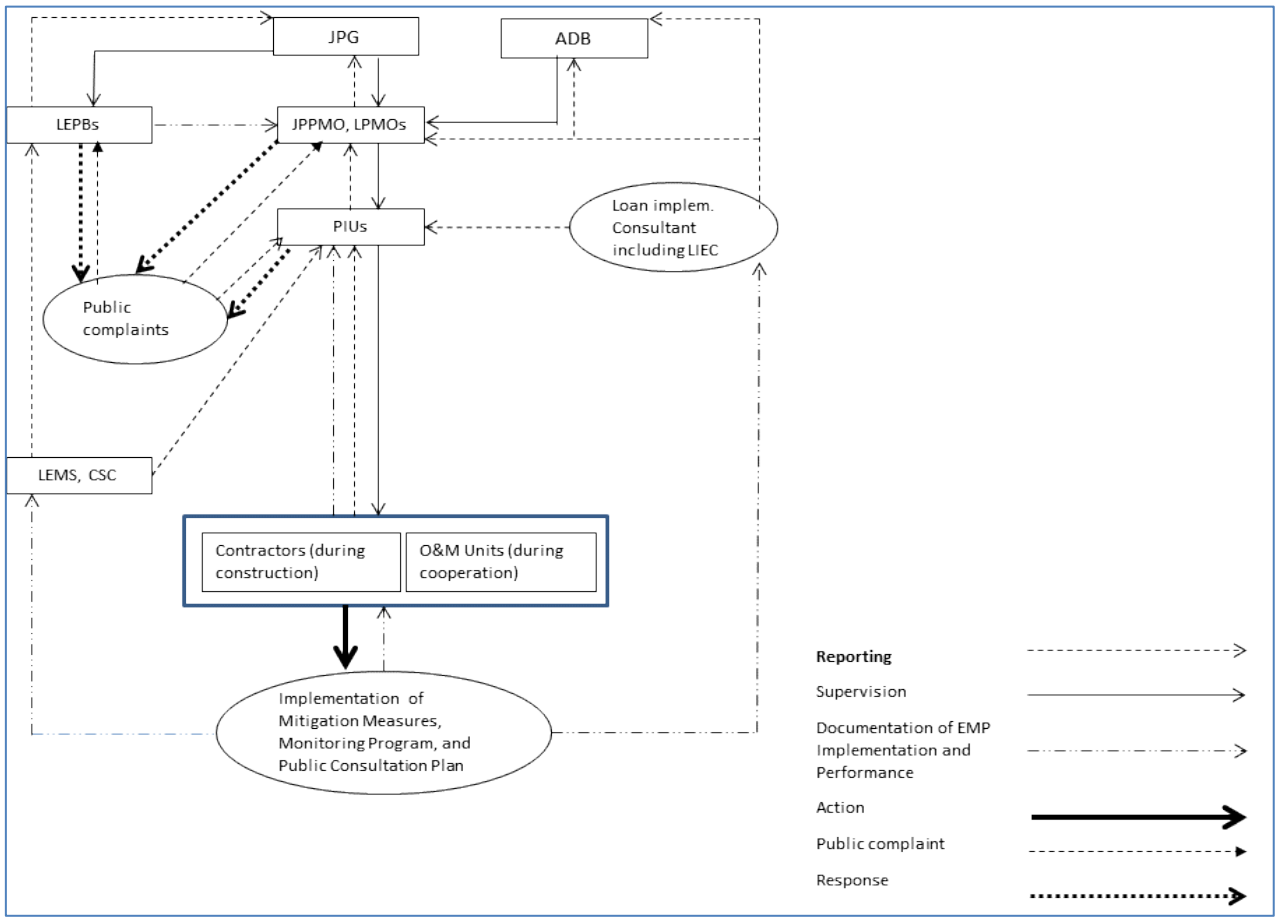

Figure EMP-1: Mechanism for Feedback and Adjustment of the EMP

	Activities	Start	Finish	2014 (Year 1)				2015 (Year 2)				2016 (Year 3)				2017 (Year 4)				2018 (Year 5)			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	**Baicheng Roads & Municipal Services**																						
	1.1 Preliminary design	Q1 2014	Q4 2015																				
	1.2 Bidding document preparation	Q1 2014	Q1 2017																				
	1.3 Final Design	Q2 2014	Q2 2016																				
	1.4 Land acquisition and resettlement	Q2 2014	Q2 2016																				
	1.5 Bidding & contract award	Q2 2014	Q4 2016																				
	1.6 Road, bridge, utility construction	Q2 2014	Q2 2018																				
2	**Baicheng ISWM**																						
	2.1 Preliminary design	Q1 2014	Q1 2017																				
	2.2 Bidding document preparation	Q2 2014	Q2 2015																				
	2.3 Final Design	Q3 2014	Q4 2015																				
	2.4 Land acquisition and resettlement	Q3 2014	Q4 2015																				
	2.5 Bidding & contract award	Q3 2014	Q1 2016																				
	2.6 Sorting and composting facility	Q4 2014	Q4 2015																				
	2.7 MSW transfer stations construction	Q3 2015	Q4 2017																				
	2.8 Equipment procurement	Q1 2016	Q2 2018																				
3	**Baishan ISWM**																						
	3.1 Preliminary design	Q1 2014	Q2 2015																				
	3.2 Bidding document preparation	Q2 2014	Q4 2015																				
	3.3 Final Design	Q3 2014	Q2 2016																				
	3.4 Land acquisition and resettlement	Q3 2014	Q4 2016																				
	3.5 Bidding & contract award	Q3 2014	Q4 2016																				
	3.6 Sanitary landfill construction	Q1 2015	Q4 2016																				
	3.7 Sorting and composting facility	Q2 2015	Q4 2016																				
	3.8 MSW transfer stations construction	Q3 2015	Q2 2018																				
	3.9 Equipment procurement	Q1 2017	Q2 2018																				
4	**Baishan Water Supply**																						
	4.1 Preliminary design	Q1 2014	Q4 2015																				
	4.2 Bidding document preparation	Q2 2014	Q4 2015																				
	4.3 Final Design	Q3 2014	Q2 2016																				
	4.4 Land acquisition and resettlement	Q3 2014	Q4 2016																				
	4.5 Bidding & contract award	Q3 2014	Q2 2016																				
	4.6 Water transmission line construction	Q4 2014	Q4 2016																				
	4.7 Water treatment plant construction	Q1 2015	Q4 2016																				
	4.9 Water distribution network construction	Q3 2015	Q2 2018																				
5	**Capacity Development**																						
	5.1 Recruit and mobilize consultants	Q3 2014	Q4 2014																				
	5.2 Establish project management system	Q4 2014	Q1 2015																				
	5.3 Establish PPMS system	Q4 2014	Q1 2015																				
	5.4 Project implementation support	Q4 2014	Q4 2018																				
	5.5 Capacity development implementation	Q2 2015	Q2 2018																				
	5.6 Environmental monitoring	Q4 2014	Q2 2018																				
	5.7 Resettlement monitoring	Q4 2014	Q2 2018																				
	5.8 PPMS monitoring	Q4 2014	Q2 2018																				

(Source: consultant)

Figure EMP-2: Project Implementation Schedule