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World Bank Financed Highway Project
Yiba Expressway in Hubei • P. R. China
No. 3

Yichang to Badong Expressway Project

Environment Management Plan

(For Appraisal)

The World Bank Financed Project Office of HPCD

July 2008

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1. Introduction

This Environmental Management Plan (EMP) was prepared by Shanghai Ship and Shipping Research Institute (SSSRI) for the World Bank financed Yichang to Badong Expressway project. The EMP was developed based on the findings and recommendations of project Environmental Impact Assessment (EIA) and was reviewed and agreed by the World Bank Project Management Office of the HPCD.

1.1 Project Background

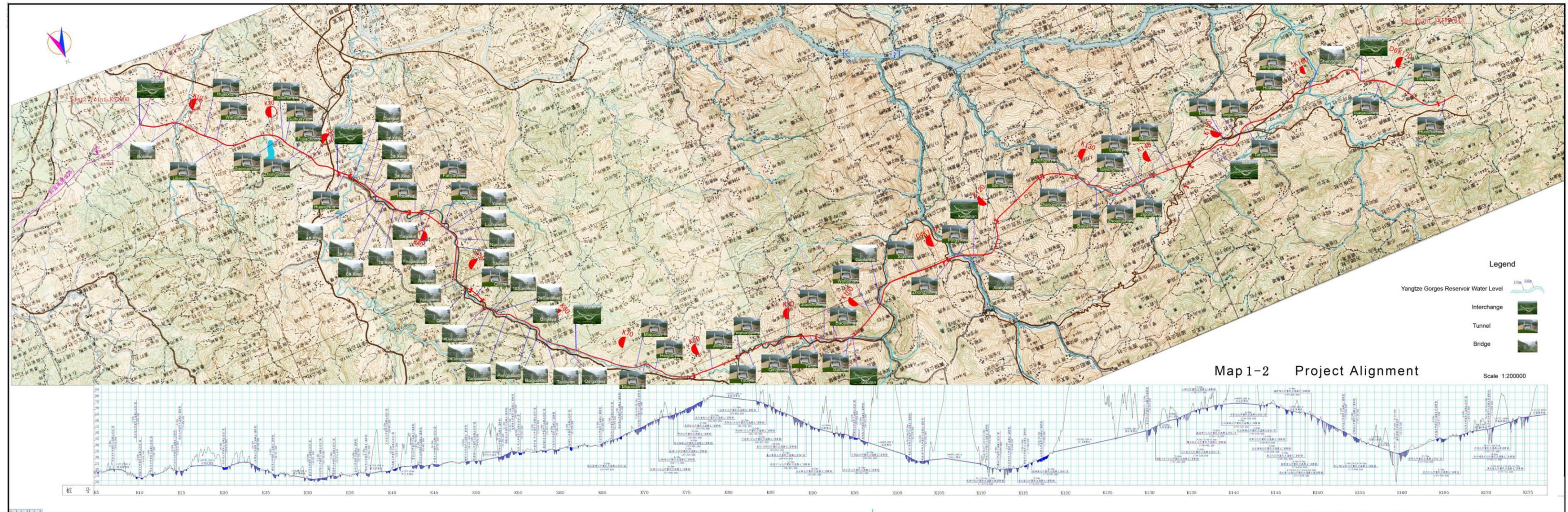
The proposed section from Yichang to Badong expressway (known as the Yiba Road hereafter) within Hubei province is one section of the national trunk road Shanghai-Chengdu Expressway project. This proposed section is located in an area covering Yiling District, Xingshan County and Zigui County under Yichang City, and Badong County under Enshi City. The specific geographic location of the expressway section is shown in Map 1-1. The project implementation will contribute to the completion of Shanghai-Chengdu expressway, greatly improve the transportation links between urban areas of Yichang and provincial capital of Wuhan to the remote mountainous region, help poverty reduction and promote the economy development in the project area.

The proposed expressway section alignment is shown in Map 1-2. This section is designed as a 4-lane expressway standard with controlled access and motor vehicle speed of 80 km/h on a roadbed 24.5 m wide. The total length of the section is 173.614 km with the permanent land acquisition of 8,395.3 mu. The section will include 148 bridges with the combined length of 70,076.5 m, 45 tunnels with the combined length of 61,046.5 m, 7 interchanges, 2 service zones, 2 parking yards, 1 management center, 6 toll stations on the access roads, and 1 toll station on the trunk road.

Environment Assessment (EA) was conducted as part of the project preparation and appraisal, and this Environment Management Plan (EMP) prepared as a part of the EA documents, based on the findings of the EA process particularly the identified adverse impacts during project construction and operation and requirements for mitigation to meet the national and local environmental standards as well as to be in compliance with applicable World Bank safeguard policies. The EA documentation including this EMP was the product of interactions with the project design engineers and planners on project development and alignment comparison and selection to, among other objectives, minimize potential adverse environmental and social impacts.

1.2 PRC Environmental Legislative Framework

The major laws, regulations, national standards and technical guidelines, and the relevant clearance documents that may affect the Environmental Impact Assessment



(EIA) process of the proposed project, are outlined below which are the general guidance to the preparation of EMP.

National Laws and Regulations

- Environmental Protection Law of PRC, December 26, 1989;
- Environmental Impact Assessment Law of the PRC, October 28, 2002
- Land Management Law of PRC , August 28, 2004;
- Noise Pollution Prevention Law of PRC, October 29, 1996;
- Air Pollution Prevention Law of PRC, April 29, 2000;
- Water Pollution Prevention Law of PRC, February 28, 2008;
- Cultural Relics Protection Law of the PRC, October 10, 2002;
- Highway Law of PRC, January 1, 1998;
- Water and Soil Conservation Law of PRC, June 29, 1991;
- Rules of Environmental Protection Management for Construction Projects, issued by the State Council of PRC, November 29, 1998;
- EIA Technical Guideline, HJ/T2.1-93; HJ/T2.2-93; HJ/T2.3-93; HJ/T2.4-1995; HJ/T19-1995;
- Notice on the Noise Issue in the EIA for Road and Railway projects, Huanfa [2003] 94;
- Highway Project Environmental Impact Assessment Guidelines, MOC, JTGB03-2006.
- Letters confirming the standards to be applicable in EIA for the Yiba Road Project, Hubei EPB, Huanhan [2006] 279;
- Specifications for EIA for Road Project, Ministry of Communication, 2006.5.1;
- Measures Concerning Environmental Protection and Management for Transportation Construction Projects, issued by MOC, May 22, 1990;
- Notice to Strengthen the Environmental Impact Assessment and Management of Construction Projects Financed by Loan from International Financial Organizations, jointly issued by SEPA, the State Planning Commission, the Ministry of Finance and the People's Bank of China, June 21, 1993.
- Hubei Provincial Environmental Protection Regulations, Hubei Provincial Congress, Dec. 2, 1994;
- Hubei Provincial Farm Ecological Conservation Regulations, Hubei Provincial Congress, Sept. 29, 2006;
- Hubei Provincial Construction Project EIA Management Method, Hubei Government, Oct. 1993;
- Notice on Enhancing the Protection of the Lawful Rights of Farmers to be Acquired with Land, Hubei Government, Feb, 27, 2005;
- Notice on the Classification of Surface Water Bodies, Hubei Government, Jan. 31, 2000;
- Decision on the Zoning of Guanzhuang Reservoir as Drinking Water Supply Area, Yichang Government, May, 2006

Applicable Standards

According to the approval document issued by Hubei EPB on the project EIA, the

main standards used in the EIA and EMP include the following:

- Surface Water Environmental Quality Standards (GB3838—2002)
- Wastewater Discharge Standards (GB8978-1996)
- Farmland Irrigation Water Quality Standards (GB5084-92)
- Environmental Air Quality Standards (GB3095-1996)
- Boiler Air Pollutants Emission Standards (GB13271-2001)
- Urban Area Environmental Noise Standards (GB3096-93)
- Construction Sites Boundary Noise Limits (GB12523-90)

Surface Water

Class II of the Environmental Standard for Surface Water (GB 3838-2002) will be applied in assessment of Shennongxi River, while Class III will be applied in Xiangxi River, Bolin River, Wudu River, Gaolan River, Huangbo River and other streams.

New discharges outfalls are banned within the Class II water area. Class I of Integrated Wastewater Discharge Standard (GB 8978-1996) will be applied in Xiangxi River, Bolin River, Wudu River, Huangbo River and Gaolan River.

Table 1-1 Environmental Quality Standard for Surface Water (GB3838-2002) mg/l

Item	Class	Environmental Quality Standard for Surface Water (GB3838-2002)				
		I	II	III	IV	V
COD _{Cr}		15	15	20	30	40
Permanganate index		2	4	6	10	15
Oil		0.05	0.05	0.05	0.5	1.0
SS		≤150 (Water Quality for Agricultural Irrigation Use)				

Class I of the Integrated Wastewater discharge Standard (GB8978-1996) is applied for wastewater discharges, detailed standards are presented in Table 1-2.

Table 1-2 Integrated Wastewater discharge Standard (Unit: mg/l)

Pollutant	COD _{Cr}	Oil	SS
Class I	100	5	70

Ambient Air

Class I of Ambient Air Quality Standard (GB 3095-1996) will be applied in assessing the air quality in the scenic spots of Shennongxi River and Gaolan and Xiaofeng; Class II will be applied in other areas. The standard of Boiler Flue Gas Emission Standard (GB 13271-2001) for period II of category II zone will be applied for assessing the impact of flue gas from boilers in scenic spots of Shennongxi River and Gaolan and Xiaofeng, while the standard for period II of category II zone will be applied in other areas.

Table 1-3 Ambient Air Quality Standard (unit: mg/m³)

Pollutant	NO ₂		TSP		CO	
	Class I	Class II	Class I	Class II	Class I	Class II
Measurement time						
Daily average	0.08	0.12	0.12	0.30	4	4
Hourly average	0.12	0.24	—	—	10	10

Table 1-4 Boiler Flue Gas Emission Standards (GB 13271-2001)

Type of boiler		Area to be applied	Concentration of dust (mg/m ³)	SO ₂ (mg/m ³)	NO _x (mg/m ³)	Blackness (degree)
Oil fueled	Light diesel	Class I	80	500	400	I
		Class II	100			
	Other oil	Class I	80*	900*	400*	I
		Class II	150			
Gas fueled		All classes	50	100	400	II

Note: * the boilers fueled with either heavy oil or residue oil are prohibited from the Class I area.

Acoustic Environment

According to the Document No. 94 (2003) issued by the SEPA titled Notice for the Assessment of Noise for such Construction Projects as Road and Railway, the buffer distance for noise should be at 45 ±5 m from the red line of roads. In this project, 50 m is selected for noise assessment. For the noise sensitive receptors in villages either within the buffer distance or outside, Class IV and I of Environmental Noise Standard for Urban Area is applied respectively. For the key sensitive receptors such as school and hospital within the buffer distance, 60 dB is applied for daytime and 50 dB for nighttime; if outside, and Class I of Environmental Noise Standard for Urban Area is applied respectively.

The limits for Environmental Noise Standard for Urban Area are given in Table 1.7-5 (GB3096-93), and the limits to be applied for the construction phase as defined in the Noise Limits at the Construction Site Boundary (GB 12523-90) are given in Table 1.7-6 below.

Table 1-5 Standards of Environmental Noise in Urban Area (GB3096-93) Unit: dB(A)

Classification	Daytime	Nighttime	Applicable zone
1	55	45	Zones of education, health recovery, etc.
2	60	50	Mixed zone of residential, commercial and industrial
4	70	55	Both sides of trunk roads

Table 1-6 Noise Limit for Construction Site Boundary (GB12523-90) Unit: dB(A)

Construction stage	Major source of noise	Noise limit	
		Daytime	Night time
Earth & stone work	Bulldozer, excavator, loader, etc.	75	55
Piling	Pile driver, etc.	85	Forbidden
Structuring	Concrete mixer, etc.	70	55
Finishing	Crane, elevator	65	55

1.3 World Bank Policies

The World Bank requirements include primarily the Bank's ten safeguards policies, including Operational Policies (OP), Best Procedure (BP), Good Practice (GP) and Operational Directives (OD). The Bank's policies and procedures include:

- Environmental Assessment (OP/BP/GP4.01);

- Forestry (OP/GP4.36);
- Natural Habitats (OP/BP4.04);
- Safety of Dams (OP/BP4.37);
- Pest Management (OP4.09);
- Involuntary Resettlement (OP4.12);
- Indigenous People (OD4.20);
- Cultural Property (OP4.11);
- Projects in Disputed Areas (OP/BP/GP7.60); and
- Projects on International Waterways (OP/BP/GP7.50).

Among these safeguards policies, Environmental Assessment (OP 4.01) is the primary requirements and thus the focus of this report. In addition, policies on Indigenous People (OD4.20), Involuntary Resettlement (OP4.12), Cultural Property (OP4.11), and Forest (OP4.36) are also applied in the EA at least in the screening stage or in the full process if triggered.

Since no project components will involve international waterways, dam construction or disputed areas as defined in OP7.50, OP4.37, OP7.60 and Pest Management (OP4.09), policies related to these subjects are not applied in the EA.

Regarding Natural Habitats (OP4.04, 2001), the project will not involve critical natural habitats which are identified in OP4.04, ANNEX A, but part of the project impacted area will pass through habitats where some wildlife is known to exist. The general principle of this policy will be applied to the EA.

1.4 Design considerations

The adverse impacts of the expressway construction to the natural and socioeconomic environments can be best mitigated by preventing them from happening in the first place. One approach to prevent the adverse impacts is to take full considerations of pollution control and environmental protection in the engineering design. In fact the EA team has worked closely and interacted with the project planners and engineers during EA to participate in the planning and engineering since the early project preparation stage. As a result, environmental considerations have been included in the pre-feasibility, feasibility and preliminary design which have been completed, and will be further detailed in the engineering design in the next project stage.

In the project EIA report, there have been specific mitigation measures developed for the design stage, covering mitigation to air, water, acoustic environment, ecosystem, cultural aspects, community severance and landscape. These measures have been communicated to the project design teams and engineers and are and will be included in the design.

As this EMP focuses mainly on the project construction stage, the design stage migration measures are not presented. The details of these measures are presented in the project EIA report. To sum up, the design considerations are as follows:

- During the design stage, EA team worked closely with the design team and tried their best to prevent sensitive areas from the view of selecting the alignment. For

example, In Yiling District, Yicahng City, the original alignment pass the upstream of Guanzhuang Reservoir. After the EA team were aware that the reservoir is the resource of drinkable water, also a protected area for water resource. They negotiated with the client and design team. After careful selection, the alignment has been adjusted to the downstream of the reservoir, which is one kilometer away from the reservoir. Another example is the Xinping Suspended Coffine, which was used to be on the top of the alignment. The original plan is to pass through this area by tunnel from the right bottom area. The EA team considered the possible negative impact to the coffin during the construction stage, and they proposed to adjust the alignment. Finally, the design team shifted the alignment to north for 195 meters, using bridges to replace the tunnel, so as to bypass this area. Some details as follows:

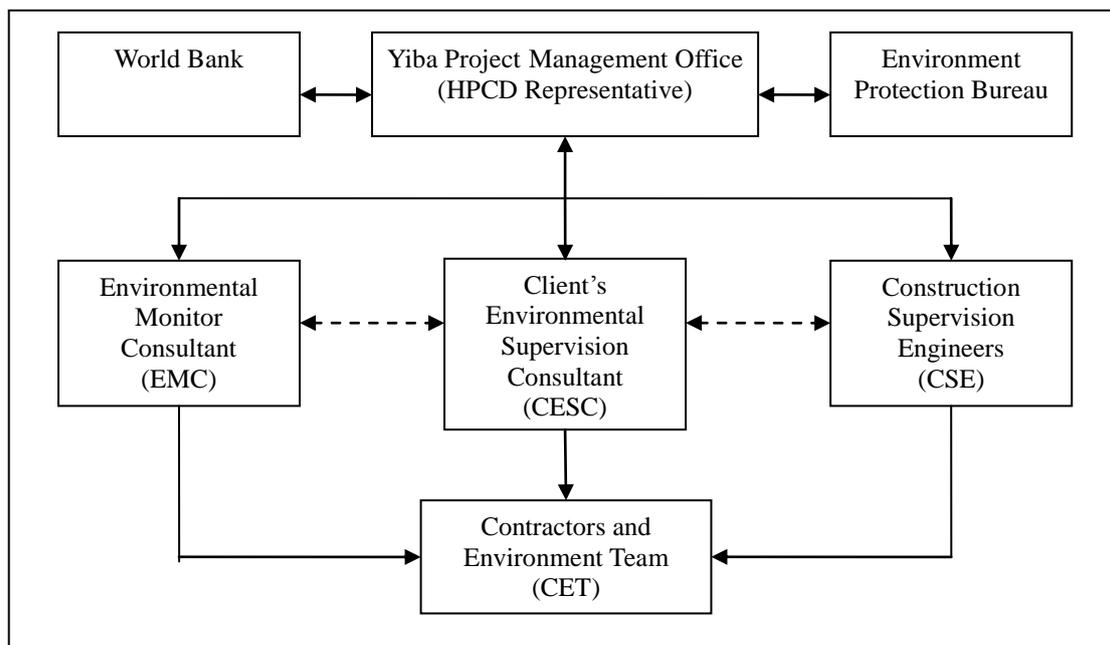
- The EA team tried their best working together with the design staffs, from the view of minimizing the impact to environment during the construction and operation stages, they worked out some design ideas ,for examples:
 - ◆ Make the proposed alignment impact as little as possible for farmland, forestland, habitat areas and scenic spots.
 - ◆ In mountainous area, try best to avoid large scale cutting and fillings even the construction cost will relatively rises.
 - ◆ Optimizing the alignment to avoid high slope protection.
 - ◆ Carefully selecting the location of deposit areas, so as to use the waste land and consider the soil erosion issues. For some available deposit areas, they may be used as reclaimed land as the completion the project.
 - ◆ For access road, efforts have been made to assess and select the available access road to ensure the impact from the access roads can be minimized.
- The EA team work together with the design team to ensure the environment issues form the tunnels can be considered. For example, the ventilation system in tunnels have been optimized to ensure the air quality, water in tunnels, emission and so can be fully well treated at both construction and operation stages.
- The EA team reviewed the relevant content of designs, and required the design team to make their best to optimize the design fully considering the landscaping design, wastewater treatment, dangerous goods transportation, noise reducing as well as the ecology and culture relics' protection.
- The EA team discussed closely with the local government and relevant organizations for the issues of some inevitable sensitive areas and relevant mitigation measures, which have been approved and confirmed.

2. EMP Organizations

A successful EMP will need active involvement from all parties such as the environmental protection bureau (EPB) of various levels of governments, the project proponent (i.e., Project Management Office (PMO) or project owner), the Contractors (CET), Client's Environmental Supervision Consultant (CESC), and the Construction Supervision Engineers (CSE). An organization structure of the above agencies/parties and line of communication on environmental issues are presented in the Schematic 2-1. The roles and responsibilities of the major parties are also presented in the section following the schematic.

In order to achieve a satisfactory outcome of the Project's EMP, the project owner will appoint a Client's Environmental Supervision Consultant (CESC) to supervise and monitor the implementation of the EMP throughout the construction phase of the Project. The CESC reports to the project owner directly. Involvement of the CESC can ensure that the Project's EMP is adequately implemented. The CESC will check, review, verify and validate the overall environmental performance of the Project through supervises and inspections. This will provide confidence that the reported results are valid and the relevant monitoring program or codes of practice as provided in the Project EMP are fully complied with. In addition, the project owner will also engage an Environmental Monitor Consultant (EMC), responsible for regular and focused environmental monitoring of the construction sites.

The EMP organization structure for project construction is shown in Schematic 2-1.



Schematic 2-1 EMP Organization Chart for Construction Phase

The main environmental responsibilities of respective parties are described below:

2.1 Environmental Protection Agency

As the regulatory agency, the various levels of EPBs will make the environmental regulations and the policies, and the guideline to the project construction and operation activities, as well as be responsible for enforcement the laws, regulations, standards and environmental practices of all organizations within their respective jurisdictions.

The newly established Ministry of Environment Protection (MEP, formally State Environmental Protection Administration or SEPA) which is the top regulatory agency in China, will guide the Hubei EPB to enforce all the relevant regulations implementation; review and clearance the EIA report, and be responsible the overall environmental management. The EPBs at the city and county levels within the project regions also have the jurisdictions for regulatory and standard supervision and enforcement.

More specifically, Hubei EPB is the provincial project environmental supervision and administration and their roles and responsibilities are:

- supervise the implementation of EMP;
- enforce applicable laws, regulations and standards;
- coordinate the environmental protection effort between departments concerned;
- check and supervise the construction, completion and operation of environment facilities;
- guide the city and county EPBs to carry out environmental management.

The roles and responsibilities of the project region city and county level EPBs are as following:

- supervise the construction unit to implement EMP and enforce applicable regulations and standard;
- coordinate the environmental protection effort between departments concerned;
- check and supervise the construction, completion and operation of environment facilities thin their jurisdiction scope

2.2 Project Proponent

Yiba Project Management Office (Yiba PMO) of Hubei Provincial Communication Department (HPCD), also known as the Client or project owner has the ultimate responsibility for environmental performance of the project during both construction and operational phases. This is a day to day management organization for management of all aspects of project preparation and construction. As such, it will

also responsible for environmental management with, but not limited to, the following specific responsibilities:

- Prepare EA for project development and appraisal including, supporting and supervising environmental assessment (EA) team to complete EA and EMP to meet the regulatory and World Bank safeguard requirements and receive approval from the regulatory agency for the project and clearance of the safeguard documents from the World Bank.
- Ensure the interactions between the EA team and project planners and engineers for integrating mitigation measures and other environmental considerations and programs and requirements into project design with the necessary budgetary support as may be needed.
- Ultimate supervisor for mitigation and other environmental protection measures during project construction, including incorporation of environmental requirements into construction contracts, organizing training for the contractors, construction supervision and local PMOs, enforcing other environmental management programs and conducting periodical inspection of the construction sites. .
- Engage and supervise environmental monitoring programs, receive and review monitoring reports from the monitoring teams as well as from contractors on their regular reports for environmental performance and timely initiate necessary remedial actions as may be needed in response to the monitoring report findings and/or recommendations, including any emergency, accidental situations and chance finds during construction.
- Consult and/or communicate to the local communities, project affected people, regulatory agencies, the World Bank and other stakeholders during the project preparation and construction to ensure them the full knowledge of the project progress, potential issues and mitigation actions, as well as to listen and respond to their concerns, suggestions and demands for environmental and community protection.

The Yiba PMO will have full time professional and other safeguard (e.g., resettlement) staff on board to directly lead the supervision and management effort from the Yiba PMO for environmental management of the project preparation and construction.

2.3 The Contractors and Environment Team (CET)

The duties of the Contractor(s) and CET include but not limiting to:

- a. strictly implement the listed measures in EMP;
- b. undertake self-check and self-rectify activities;
- c. strengthen the coordination with the CSC and CESC;
- d. compliance with relevant environmental legislative requirements;
- e. work within the scope of contractual requirements and other tender conditions;
- f. each contractor will have 1-2 full time environmental personnel, working with the CESC for mitigation implementation, site inspection and any corrective actions instructed by the client and / or CESC,
- g. provide and update information to the CESC regarding works activities which

- may contribute, or be continuing to the generation of adverse environmental conditions;
- h. in case of non-compliances / discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;
 - i. stop construction activities which generate adverse impacts upon receiving instructions from the client / CESC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts;
 - j. adhere to the procedures for carrying out complaint investigation; and
 - k. take responsibility and strictly adhere to the guidelines of the EMP program and complementary protocols developed by their project staff.

2.4 Construction Supervision Engineers (CSE)

A Construction Supervision Engineers (CSE) is generally included in the Project team and is responsible for overseeing the construction works of the project and monitor other works and activities undertaken by the Contractor(s) for ensuring compliance with the specification and contractual requirements. The responsibilities of the CSE include:

- a. Review construction organization design to ensure compliance with project engineering design and the EMP with regard to environmental protection and impact mitigation. The construction may only be ordered to start after the review is completed and CSE is satisfied with the environmental arrangement;
- b. Provide assistance to the CESC and EM as necessary in the implementation of the environmental monitoring and supervising program;
- c. Regularly monitor the performance of the Contractor's environment staff, verifying monitoring methodologies and results. In case the CSE considers that the Contractor's environment staff fails to discharge duties or fails to comply with the contractual requirements, instruct the Contractor(s) to replace the Contractor's environment staff;
- d. Instruct the contractors to take corrective actions within the CSE determined timeframe. If there is breach of contract or strong public complaints on contractor environmental performance, the CSE will order contractor to correct, change or stop the work, reporting to relevant agencies and the Client at the same time;
- e. Supervise the Contractor's activities and ensure that the requirements in the EMP and contract specifications are fully complied with;
- f. Instruct the Contractor(s) to take actions to reduce impacts and follow the required EMP procedures in case of non-compliance / discrepancies identified;
- g. If the contractor discovered cultural relics by chance, the CSE will order site protection and report to the relevant authorities and the Client;
- h. Request and monitor contractors to cut trees strictly in accordance with the pre-determined area, numbers, species, etc. in the permits. Also monitor contractor activities for wildlife and plant protection during construction.; and
- i. Adhere to the procedures for carrying out complaint investigation.

2.5 Client's Environmental Supervision Consultant (CESC)

Client's Environmental Supervision Consultant (CESC) will be engaged through bid to supervise if contractors fully comply with the requirement of EMP. They are directly responsible for the client. The CESC must have at least five year experience in construction environmental management, impact mitigation, training, and monitoring, and fully familiar with the environment laws, regulations and relevant standards.

The CESC will send a supervisor per 10 km with totally 18 people to cover the entire expressway section. The CESC will familiarize himself with the project works through review of the reports, including the project EMP. In particular, the CESC is expected to perform the following duties:

- a. Review on behalf of the Client if the construction organization design meets the requirements of EIA and EMP particularly with regard to the site environmental management and impact mitigation measures required;
- b. Monitor and inspect site environmental management system of the contractors and CSE and personnel including their performance, experience, and handling of site environmental issues. CESC has the right to recommend to the Client to change contractor and/or CSE environmental personnel if they feel necessary;
- c. Conduct daily inspection of the EMP implementation by the contractors and CSE as they may apply, verify and confirm environmental monitoring procedures, parameters, monitoring locations and monitoring equipment as well as the monitoring results;
- d. Once any breach of environment issues made by any contractor at certain month, the contractor can only get paid after the approval of monthly invoices or payments from CESC.
- e. carry out random sample check and supervise on monitoring data and sampling procedures, etc;
- f. supervise the EIA recommendations and requirement against the status of implementation of environmental protection measures;
- g. Inspect and determine the effectiveness of impact mitigation measures and report to the Client periodically of the observations;
- h. Investigate public complaints occurred and potential environment problems as well as make necessary assessment; Order the contractor to make corrective actions and respond to the public on the corrections conducted. Once environment emergency occurs, the CESC must involve in the coordination and treatment process.
- i. Monitor contractor environmental performance and if find any breach of contract and/or violation of EMP requirements, order temporary stop of work and make recommendations to the Client on further corrective and/or punitive actions; as may be needed;
- j. Promptly provide to the Client and relevant agencies environmental management and other relevant site reports; and
- k. Participate in environmental inspection, monitoring, review and other relevant activities organized or called for by the World Bank task team, the Client and the relevant government agencies; and participate in the soil conservation acceptance upon the construction completion.

2.6 Environmental Monitor Consultant (EMC)

Environmental Monitor Consultant (EMC) will be engaged and reports to the Client directly. EM shall have the appropriate environmental monitoring credential issued by the Ministry of Environmental Protection (MEP), be familiar with the highway project environmental issues and protection need and experience conducting highway project environmental monitoring. Based on the previous World Bank financed highway projects, the PMO is prepared to engage Hubei Provincial Road Environmental Monitoring Station as EMC. The main responsibilities of the EMC are:

- a. Engaged by the Client to monitor regularly noise, air and surface water quality of the construction sites and provide the Client the monitoring reports; The monitoring time will be consistent with the construction activities, i.e., monitoring will be conducted during active construction;
- b. Upon request by the Client, conduct monitoring during environmental pollution accident investigation and provide the Client the monitoring reports and
- c. Upon request by the Client, assist CESC conduct public complaint investigation and assessment.

3. Environmental Impact Assessment Conclusion

The major conclusions of the Environmental Impact Assessment are shown below.

3.1 Alignment selection

In the Expressway Network Planning at the state level, totally 18 horizontal east-west expressways are proposed. One of the 18 proposed expressways, Shanghai-Chengdu Expressway is of great importance, as it connects the eastern and the western regions of China. The Yiba Road is on the west part of the proposed Shanghai-Chengdu Expressway within Hubei province. In addition, the priority of economic development in China is shifting from east to west, from south to north. This road section is intended for assisting in implementation of such economic development initiative. According to the trunk road network planning for Hubei Province in 2020, there are 6 vertical, 5 horizontal and 1 ring trunk roads. The Yiba project is on the west section of the Huangmei-Badong Road which is one of the 5 horizontal trunk roads.

The EA team participated in the early stage of project preparation stage. The team has worked closely with the project owner and the engineers in the pre-feasibility, engineering feasibility and preliminary design stages particularly the expressway corridor and alignment identification, comparison and selection, bringing full environmental consideration into process. The final selected and determined alignment has sufficient environmental considerations and is optimal in terms of the environmental protection or least impacts compared with other available alternatives and environmentally acceptable alternatives.

3.2 Environmental Baseline Assessment

- ◆ The preferred alignment will be in the most part within the same corridor where the existing highway is located. This area has extensive human activities with agricultural land and cash woods. Limited small and normal wildlife are present in the area but no endangered species. Some sections such as K75-K85, K96-K101+600, K120-K144 have good natural and undisturbed setting with more forest and shrubs with relatively more wildlife activities but again no endangered species were observed or reported. Based on the literature, there are 3 protected species in the project region, *Mivus korschun lineatus*, *Falco tinnunculus* belong to the list of CITES; *Macaca mulata* belongs to the IUCN Red List of Threatened Species in category “Vulnerable” and Category II of CITES. In fact, most of them are not in the proposed project alignments although they are in the region as many are situated in remote mountainous areas.
- ◆ The acoustic environmental quality in the project area is fairly good. Most of

the villages and schools acoustic environmental quality can meet the Class I of the *Standard of Environmental Noise of Urban Area*, except some villages. are being affected by traffic of S312.

- ◆ The water environmental quality in the project area is fairly good with each indicator satisfying the zoning requirements, Class II and III of *Environmental Quality Standards for Surface Water*.
- ◆ The air quality in the project area is fairly good. The the air quality at Scenic Area can meet the Class I standard of *Ambient Air Quality Standard*; the air quality in rest area can meet the Class II standard of *Ambient Air Quality Standard*.
- ◆ The project area is rich in tourism resource such as Shennongxi, Gaolan and Xiaofeng Sceneries. Of these spots, Shennongxi is a provincial level scenery while the other two, county level. The proposed expressway will go through the Shennongxi scenery as elevated viaduct at K159+500~K161+500, totaling 2 km. It will not directly impact any scenery spots.
- ◆ Yangtze Three Gorge national geology park covers a very large area totaling about 25000 km², with a core protection area of about 1000 km². All alternative alignments will go through the park but the finally selected alignment will not go through the core area. The proposed route will pass by 2 tourism spots such as Shennongxi Tourism Spot in Badong Garden, and Xiaofeng Tourism Spot in Yichang Garden. The proposed expressway area has four geology relics but all are located at least 500 m from the expressway.
- ◆ There are two cultural properties under the protection at provincial level along the alignment; namely, the Xinping Suspended Tombs and Niejiahe Ancient Military Barracks. The proposed road alignment has been designed to avoid the Niejiahe Ancient Military barracks, a cultural site at provincial level. However, the project will pass near the protected area of the Xinping Suspended Tombs, at provincial protection level at K32+050-K34+050. The Baihuguan and Pingyikou sites will be excavated before the commencement of construction work, since the alignment will go through the two areas.

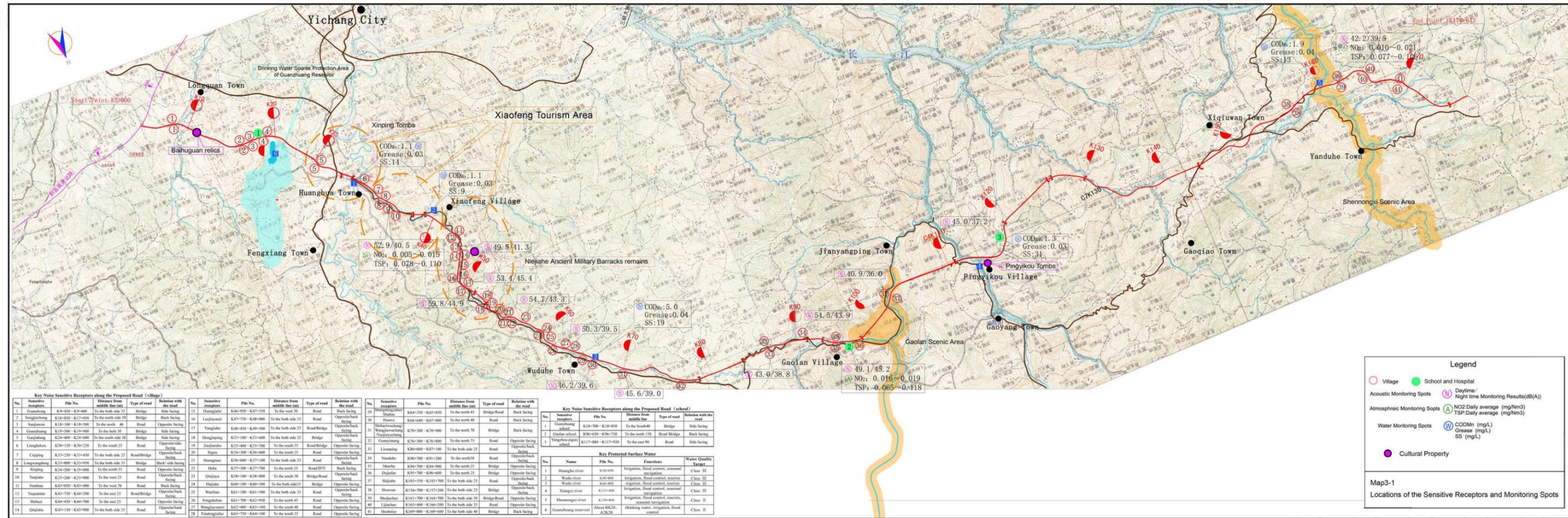
Locations of the Sensitive Receptors and Monitoring Spots see Map 3-1.

3.3 Major environment impact

3.3.1 Construction Stage

Major potential environmental impacts and the mitigation measures are as following:

- ◆ In the construction stage, various impacts such as the soil erosion from the waste, suppress dust of the construction, and the plant depredation introduced from the new access road, can be removed by the construction finished.
- ◆ It is identified that the construction blasting, equipment vibration, and vehicle noise will affected the birds and animal movement, especially the isolation of



- ◆ the two sides of the road. This impact can be minimized by the construction management improvement and schedule optimized.
- ◆ Adopting the low noise equipment and temporary noise insulation measures, and adjusting the construction time to minimize the construction noise impact on the villages and schools.
- ◆ With the advanced construction process adopted, the surface water quality will not be affected by the construction.
- ◆ Minimizing the impact of the suppress dust, material mixture, and asphalt smoke by increase the water spray and centralize mixture.
- ◆ Minimizing the traffic impact on the Yixing Road by the scientific and arranging construction schedule by the assistant of local communication authority.
- ◆ If there are sensitivity receptors such as villages, schools and hospitals, the caution sign will be installed at the dangerous site, the effected persons will be announced before the blasting.
- ◆ The construction can not start until the excavation is finished, and the reporting procedure should be followed once cultural relics are discovered at construction site. In the construction phase, the professionals from provincial cultural department will assist the contractor in the protection of cultural properties. If valuable or invaluable relics are discovered, the local related departments should be notified immediately. The excavation should be stopped until authorized department identifies relics;
- ◆ Preventing the disease diffuse such as AIDS.
- ◆ Arranging the construction schedule in the low season and setting the landscape auxiliary along the construction alignment in order to minimize the construction affecting the Shenongxi Scenic Area, Gaolan Scenic Area, and Xiaofeng Scenic Area.
- ◆ It is identified that the road will pass the Shennongxi Scenic Area of Badong and Xiaofeng Scenic Area of Yichang, and the road will also pass three geological sites, they are the Simian Period to Cambrian Period section in Xiping, Lower Ordovician Period section in Huanghuachang, middle/lower Ordovician Period section, and upper Ordovician Period Section in Fenxiang at the protection level of Class 1, 2, 1 and 1 respectively. These four sites are all within Xiaofeng Scenic Area. After study, the topography and landforms of Ordovician Period section site of Huanghua and the Cambrian Period section site of Xiaofeng will be modified to a certain degree by the project. The ecological environment will be affected slightly in sort term, and the geological sites will not be destroyed by the project. In conclusion, the proposed road construction is feasible, and the adverse impact on the National Geological Park will be minimized by the mitigation measures implementation.

3.3.2 Operation Stage

- ◆ **Eco-environmental impact**

As most proposed road sections will cross the human activity area, the new road will affect the existing inhabited environment, especially in the section of K75~K110 and K120~K165, and produce obvious isolation. The proposed project will not lead to the species perish, and

effect the biodiversity. Although the impact can not be removed absolutely, it can be minimized by the mitigation measures implement.

◆ **Impact on Acoustic Environmental**

The propose project will deteriorate the ambient acoustic environment quality, the sensitivity receptors may not meet the standards, however, it could be minimized or removed by the mitigation measures implement.

◆ **Impact on Water Environmental**

The wastewater generated from the 2 service area and 2 park zones can not discharge without the treatment. The water washing the car with the oil should be flow through the oil separator and recycle as the vegetation. The effluent from the service area should be in accordance with the Class I of the *Integrated Discharge for Wastewater Standard* (GB8978—1996). In sum, the proposed project will have slight impact on the ambient water body quality.

◆ **Impact on Tourism Resource**

There are positive and negative impacts on the tourism resource as follow: the proposed project will improve the transportation status, promote the tourism development, whereas it will produce the environmental issues such as solid waste, wastewater, and the pollutant from the vehicles. These issues can be easily solved by the mitigation measures carried out. So, the proposed project will have slight adverse impact on the tourism.

◆ **Impact on the landscape**

The existing landscape is beautiful and be rich in the landscape resource, although slight adverse impact from the proposed project, can be minimized by the mitigation measures implement. All in all, the adverse impact on the landscape is limited.

◆ **Impact on the regional economy development**

It is temporary impact from the land acquisition, house depredation, but communication capability and efficient increase, will stimulate the regional economy development by the increase employment.

◆ **Impact on the National Geological Park**

It is expect to improve the transportation, promote the communication with outside of the project area, and stimulate tourism of the National Geological Park and the geological relic.

3.4 Public Consultation

Two rounds public consultation had been carried out respectively in the early stage of the EIA preparation and draft EIA is prepared. The public consultation involved directly affected

inhabitants and local authorities by various ways such as public meeting, questionnaire, interview, panel discussion and so on. The important information such as EIA TOR, the preparation status of the EIA and the public consultation plan had been disclosure by local media.

The results of the public consultation indicate that most of the people affected are supportive to the road project and have a good understanding of the potential tourism stimulation and the trip and cultivation convenience arising from the road. Most of the people affected are concerned about the policies concerning land acquisition, relocation and house demolition and thus expect a reasonable compensation for the loss due to land acquisition. Otherwise the affected people also concerned the impact on the community isolation and the farmland irrigation and expected the appropriate mitigation measures will be adopted.

4. Impact Mitigation Measures

4.1 Air Quality

4.1.1 Key Environmental Aspects

Based on the project EIA, the nature and extent of construction activities and the prevailing weather can cause adverse impacts on air quality. Main sources of air pollution generated during construction phase are:

- Fugitive dust emissions due to exposure of slope surface, uncovered stockpiling area, earth moving and excavation activities;
- Dust emission due to blasting;
- Wind blow during transportation of material by vehicles and when transporting on unpaved access roads;
- Gases emissions from batching plants and concrete mixing stations;
- Gases emissions during payment of road surface by asphalt plant; and
- Air pollutant emissions from exhaust of construction plant and vehicles.

Main air pollution problems during the operational phase of the proposed Expressway project are:

- Exhaust from vehicles (e.g. CO, NO_x) that may deteriorate air quality in tunnel and at nearby sensitive receiver locations; and
- Gases emissions during road maintenance and re-surfacing of road surface (e.g. asphalt plant).

4.1.2 Mitigation Measures

- The asphalt melting station will be equipped with flue gas control device, operation of asphalt melting will be in enclosed mode; cement and concrete will be mixed within an enclosed structure.
- Access roads will be paved with gravel in the sections which near the villages and other sensitive receptors to reduce generation of air-borne dust.
- Construction team will be required by contracts to provide water spray vehicles to water the unpaved ground, storage piles and other areas where airborne dust may originate. The water spray operation will be carried out in dry and windy day, at least twice a day (morning and afternoon). The frequency of water spray near sensitive receptors, such as villages and school, will be increased as may be needed.
- The truck transporting powder materials, such as cement, sand and lime, will be covered.

- The dust from the tunnel construction will be managed appropriately. The wet boring machine will be used. In case the area is lack of the water or the rock character is not suit for the wet boring, the dry boring machine could be used. But if the dust prevention measures can not make sure the dust emission in accordance the emission standard, the dry boring is prohibited to use.
- The construction of the boring and the dreg transfer in the tunnel will following the measures below: water spray before the wind blow when the boring; water spray after the blasting; the dreg and the rock wall will be drenched before the dreg transfer; when the fresh wind blow several working faces, the sprayers will be set to reduce the dust in the air; the dustproof veil will be used by the builders.
- The wind speed in the tunnel will be adjusted in order to eliminate the dust. According to the experimentation, the wind speed will be more than 0.15m/s, base on this wind speed, the breathing dust could suspending and mixture with the air symmetrical; when the wind speed is 1.5~3.0m/s, the dust concentration will be minimum, it is considered as the best wind speed; if the wind speed is big than it, it is easily lead to the dust fly secondly. The exact best wind speed could be finalized via the site experimentation.

4.1.3 Monitoring and Parameters

In order to ensure all air quality impacts are properly managed and controlled, and to evaluate the effectiveness of the implemented air quality mitigation measures, monitoring on air quality parameters will be carried out.

Table4-1 Monitoring Plan for Ambient Air Quality

Phase	Monitoring point	Parameter	Frequency	Duration	Timing
Construction	Asphalt mixing station and cement mixing station	TSP Asphalt smoke	4 times per station per year, ad hoc	2 days	During construction
	unpaved road, outlet/inlet of tunnels	TSP	4 times /year, ad hoc	2 days	During construction
	In tunnels	TSP, temperature	4 times /year, ad hoc	2 days	In construction
	Guanzhuang Primary School, Gaolan Primary School, Yangzhou Zigui Primary School and Xiadengjiafan	TSP	4 times /year, but actual frequency is subject to the project progress	5 days	According to technical specifications
Operation	In tunnels longer than 1km	CO,NO ₂	2 times/year	5 days	According to technical specifications
	Guanzhuang Primary School, Gaolan Primary School, Yangzhou Zigui Primary School and Xiadengjiafan	NO ₂ TSP	2 times/year	5 days	

4.1.4 Environmental Quality Performance Evaluation

Environmental quality performance criteria in terms of Action Level (AL) and Limit Level (LL) will be established for air quality at sensitive receivers as identified in the EIA of the proposed project. Performance criteria will be established for the results of the regular site walks carried out by the CESC, weekly inspections carried out jointly by the CESC Contractor(s) and CSE, and results of routine air quality measurements. Table 4-2 below shows some standard action and limit levels for air quality.

Table 4-2 Main Action / Limit Levels for Air Quality

Event	Action Level	Limit Level
Environmental site walks / inspections	<ul style="list-style-type: none"> - One environmental observation / non-compliance or discrepancy relating to air quality issue; OR - Receipt of one documented complaint. 	<ul style="list-style-type: none"> - Repeated / continuous environmental discrepancy / non-compliance or observation relating to air quality issue for two consecutive events; OR - Receipt of notification of summon or prosecution.
Environmental monitoring by measurements	<ul style="list-style-type: none"> - Close to or at the PRC criteria level 	<ul style="list-style-type: none"> - Breach of the relevant PRC air quality standard.

4.1.5 Event and Action Plan for Air Quality

Immediately after each site walk / inspection or environmental measurement, the CESC will compare the results with the air quality performance criteria. In case of non-compliance with the AL / LL, the event and action procedures stated in Table 4.3 will be carried out and additional monitoring (i.e. ad hoc monitoring) may be required. Communication between relevant parties to identify the cause of non-compliance and the required associated remedial actions will also be carried out accordingly.

Table 4-3 Main Event / Action Plan for Air Quality

EVENT	ACTION		
	CESC	CSE	CONTRACTOR (CET)
Breach of the Action Level (AL)	<ol style="list-style-type: none"> 1. Check monitoring data submitted by Contractor's environment staff; 2. Identify source, investigate the causes of exceedance / non-compliance and Notify CSE and Contractor(s); 3. Check Contractor's working method; 4. Advise Contractor's on the required remedial actions, if required; 5. Supervise the effectiveness of Contractor's remedial actions; 	<ol style="list-style-type: none"> 1. Notify Contractor(s) to take action within a specified time frame; 2. Supervise the implementation of remedial actions carried out by Contractor(s); 3. Instruct Contractor(s) to take further actions to remedy remaining impact. 	<ol style="list-style-type: none"> 1. Strictly implement the listed measures in EMP. 2. Undertake self-check and self-rectify activities. 3. Strengthen the coordination with the CSC and CESC. 4. Propose and rectify any unacceptable practice; 5. Amend working methods if appropriate; 6. Ensure efficient and adequate wastewater treatment facilities are in place; 7. Timely implementation of remedial actions recommended by CESC; 8. Notify CSE and CESC upon completion of remedial actions.
Breach of the Limit Level (LL)	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance / non-compliance and Notify CSE and Contractor(s); 2. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 3. Discuss amongst CSE, and Contractor(s) on the potential remedial actions; 4. Attend the meeting with the CSE and Contractor(s), if appropriate; 5. Review Contractor's remedial actions and adequacy of environmental control measures whenever necessary to assure their effectiveness and advise the CSE accordingly; 6. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor(s) to take immediate action; 3. In consolidation with the CESC, agree with the Contractor(s) on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance / non-compliance continues, consider what portion of the work is responsible and instruct the Contractor(s) to stop that portion of work until the exceedance is abated; 6. Proceed with the 'Penalty and Rewarding' process if appropriate; 	<ol style="list-style-type: none"> 1. Strictly implement the listed measures in EMP. 2. Undertake self-check and self-rectify activities. 3. Strengthen the coordination with the CSC and CESC. 4. Take immediate action to avoid further exceedance / non-compliance; 5. Submit proposals for remedial actions to CSE and CESC within 3 working days of notification; 6. Implement the agreed proposals; 7. Resubmit proposals if problem still not under control; 8. Stop the relevant portion of works as determined by the CSE until the exceedance is abated; 9. Submit written report to the CSE and CESC providing

EVENT	ACTION		
	CESC	CSE	CONTRACTOR (CET)
	7. Inform EPB if appropriate.		reasons of exceedance / non-compliance, actions taken, and proposal to prevent it from happening again in the future.

4.2 Noise and Vibration

4.2.1 Key Environmental Aspects

There will be a wide range of noise causing construction activities during project construction works (e.g. concrete mixers, backhoes, bulldozers, cranes, lorries, air compressors, batching plant, generators, earth work, piling, transportation, construction vehicle movement, etc.). The EIA have identified the following noise sources:

- Operation of the various equipment during construction (air compressor, powered mechanical equipment, bulldozers, excavators, etc);
- Vehicles transporting materials within construction site and beyond the construction boundary;
- Piling activities during construction of foundations / piers;
- Ventilation systems during tunnel construction; and
- Noise due to blasting and vibration during tunnel construction;

During the operational phase, noise may be generated as a result of the following:

- Traffic noise from road and honking of vehicles;
- Noise from service areas and car parking areas; and
- Construction plant used during road maintenance.

4.2.2 Mitigation Measures

Construction Phase

- The construction schedule should be carefully developed for the section near Guanzhuang School (K19+650~K19+720), Gaolan School (K96+650~K96+750) and Yangzhou-Zigui School (K117+880~K117+930). Noise activities will be arranged during school vacations and/or after classes. If such an arrangement is not feasible, the contractors will be required to consult with the schools in question first to provide advanced warning and to develop other possible mitigation.
- The construction materials will be transported on the existing road to the construction sites. The transportation schedule should be carefully designed to minimize the adverse impact on residents and students, as well as the traffic on the existing road. The transportation vehicles will be required to slow down and banned from honking when passing townships and nearby schools. The main sensitive areas are located in Xinping,

Shijiaba, Shibazi, Qingjiaba, Dengjiaping, Shigou, Heba, Wanlitan, Songshubao, Shujiacao, Lijiacao.

- The construction activity in residential area will be scheduled in daytime only, and the noisy equipment should be prohibited from night operation. During the construction in daytime, the construction site should be fenced.
- The construction equipment will be well maintained to keep it best operating conditions and lowest noise levels possible. Since the transportation route is yet to be decided, the contractors will be required to provide the transportation route in advance and arrangement the environmental staff in charge of the mitigation. The project owner will be supervision the mitigation implementation by the leader of the local Environmental Protection Bureau.
For workers who must work with highly noisy machines such as piling, explosion, mixing, etc., ear pieces will be provided for noise control and workers protection
- Constriction team should be equipped with potable detecting device to monitor the noise level at the sensitive receptors.

Night Time Construction Noise Mitigation

Although in general night time construction will be banned for this project, some may still occur for technical and other reasons (e.g., bridge piles required continued, around clock concrete pouring). As night time construction, if occurred near villages and other residential areas would result in particularly significant impacts to residents and other sensitive receptors, besides the above mitigation measures, the following special measures will be taken during the construction phase:

- Villages living within the potentially impacted areas will be noticed ahead of time for the length and noise intensity of the proposed night time construction. Information on why the night construction is necessary and mitigation measures to be taken will be provided to these urban and rural residents to obtain their understanding. These residents will be consulted for their concerns, difficulties, and suggestions for noise control prior to the commencement of night time construction. These concerns will be responded and suggestions adopted where appropriate.
- Night time construction will be arranged in such a way to avoid school exam time (about one week in the summer) in the urban area and harvest time (about half month each in the summer and fall) in the rural area. These are particularly sensitive time when students need the good night sleep in preparation for exams and farmers for the heavy farming activities in the field.
- Concreted mixer, power generated and other stationary equipment will be carefully placed to be far away from residential areas and villages to ensure no noise impacts from these machines. Where possible, municipal power supply will be utilized in construction including night time construction as diesel generators are extremely noise and avoiding using them is the best mitigation.
- Equipment with lower noise levels will be used for concrete pouring operations, which may require 24 hours non-stop operation;
- Temporary noise barriers at the appropriate places should be erected to reduce the noise impacts at the night time. These areas should include noisy stationery construction machines and/or areas with sensitive receptors.

- If necessary, the contractor will arrange temporary accommodation away from the impacted area for the extremely vulnerable people who need good night time rest, such as persons with illness and the elderly,
- Notice boards will be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, telephone number and other contact information so that any affected people can have the channel to voice their concerns and suggestions, and
- Close supervision personnel from the PMO will be assigned to the construction sites during the period of night time construction to ensure that the above measures are taken and to respond to any un-anticipated impacts by necessary mitigation measures.

All these mitigation measures are included in the bid documents and later the contracts to ensure that these mitigation measures and actions will become contractual obligations for the contractors which can be enforced by the PMO and the environmental monitoring team.

Mitigation Measure for Operation Phase Impact

As some acoustic sensitivity receptors exceed the standard during the operation phase, noise reduction mitigation measures such as noise insulation window, noise barriers, heighten wall will be carried out. Detailed presented in the Table 4-4 below. The exact locations are seen in Map 4-1 and the impact mitigation measures for the three primary schools are seen in Annex I. Typical noise barrier design is given in Figure 4-1.

It is predict to some acoustic sensitivity receptors not list in Table 4-4 can not meet the standards after 2019. So, the noise monitoring will be carried out, and the noise insulation windows will be installed before 2019. As there is 11 years span, and the road will be operation 7 years later, so this EMP not includes this kind of the acoustic sensitivity receptors.

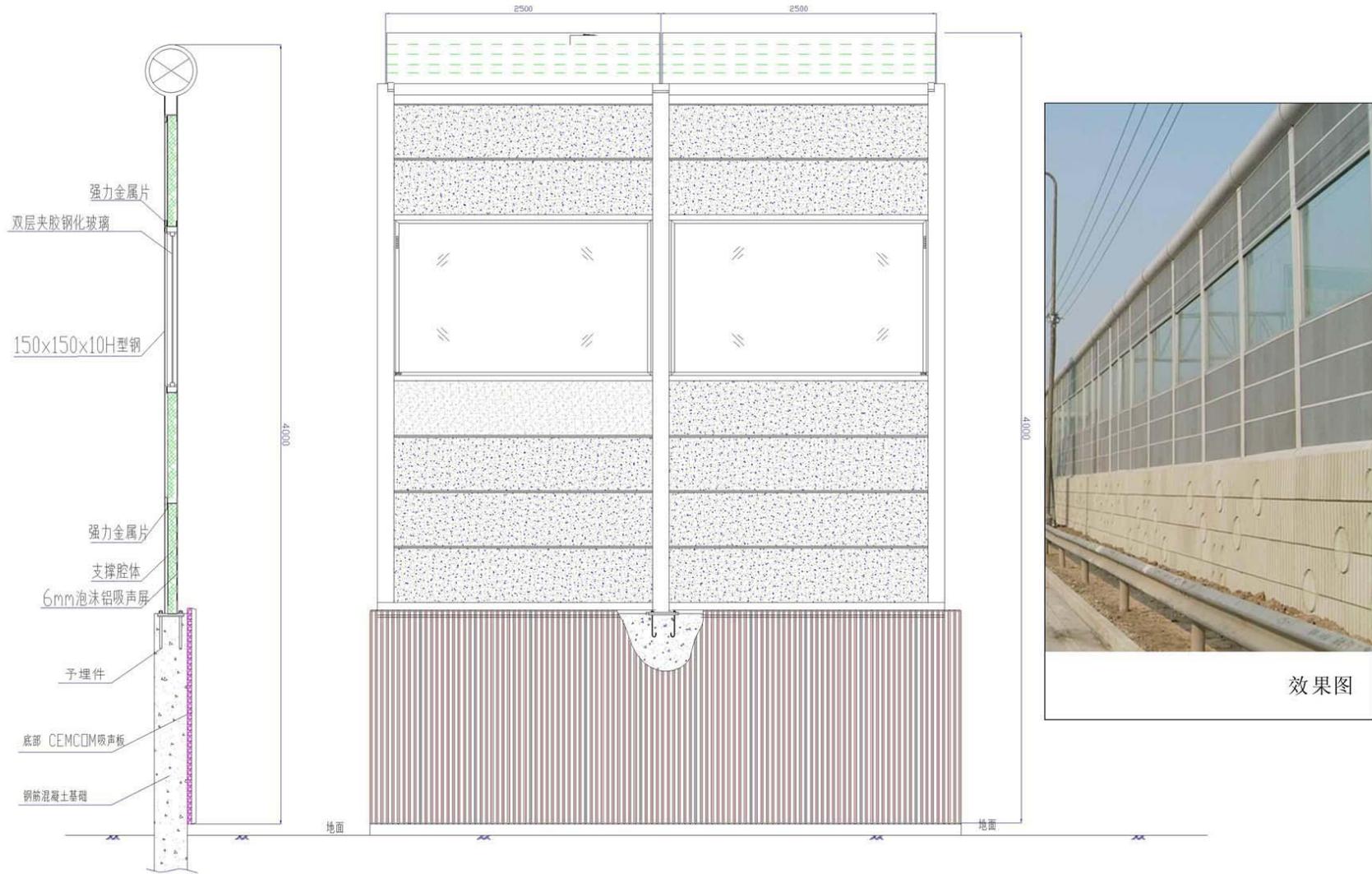
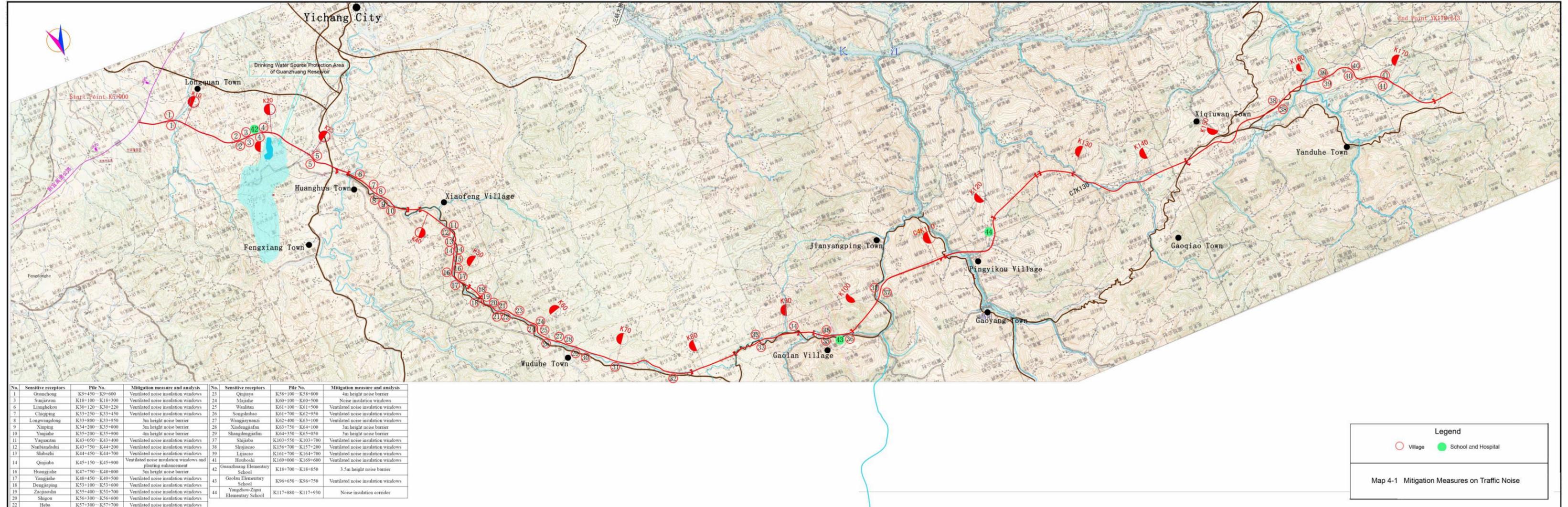


Figure 6.4-1 Typical noise barrier design



Map 4-1 Mitigation Measures on Traffic Noise

Table 4-4 Mitigation Measures on Traffic Noise

N o.	Sensitive receptors	Pile No.	Distanc e from middle line (m)	Mitigation measure and analysis	Time	Cos t (10 ⁴ RM B)
1	Guancho ng	K9+450 ~ K9+600	To the both side 35	Ventilated noise insulation windows will be installed in the 6 householders that noise is exceeded and the 12 householder in the Class 4. It is predicted can be 15dB noise reduction.	2009	9.0
3	Sunjiawa n	K18+100 ~ K18+300	To the north 40	Ventilated noise insulation windows will be installed in the 22 householders that noise is exceeded. It is predicted can be 15dB noise reduction.	2009	11.0
6	Lianghek ou	K30+120 ~ K30+220	To the south 25	Ventilated noise insulation windows will be installed in the 17 householders. It is predicted can be 15dB noise reduction.	2009	8.5
7	Chiqiping	K33+250 ~ K33+450	To the both side 25	Ventilated noise insulation windows will be installed in the 15 householders near the road. It is predicted can be 15dB noise reduction.	2009	7.5
8	Longwan gdong	K33+800 ~ K33+950	To the both side 35	3m height noise barrier will be set at K33+750~K34+000 on both sides,500m long totally. It is predicted can be 7dB noise reduction.	2014	150. 0
9	Xinping	K34+200 ~ K35+000	To the north 55	3m height noise barrier will be set at K34+150~K35+050 on north side, 900m long totally. It is predicted can be 6dB noise reduction.	2014	270. 0
10	Yanjahe	K35+200 ~ K35+900	To the west 25	4m height noise barrier will be set at K35+150~K35+950 on west side, 800m long totally. It is predicted can be 9dB noise reduction.	2014	320. 0
11	Yuquanta n	K43+050 ~ K43+400	To the west 70	Ventilated noise insulation windows will be installed in the 5 householders that noise is exceeded. It is predicted can be 15dB noise reduction.	2009	2.5
12	Nanbiand adi	K43+750 ~ K44+200	To the east 25	Ventilated noise insulation windows will be installed in the 5 householders that noise is exceeded. It is predicted can be 15dB noise reduction.	2009	2.5
13	Shibazhi	K44+450 ~ K44+700	To the east 25	Ventilated noise insulation windows will be installed in the 8 householders in Class 4 area and the 3 householders in the Class 1 area. It is predicted can be 15dB noise reduction.	2009	5.5
14	Qinjiaba	K45+150 ~ K45+900	To the both side 25	Ventilated noise insulation windows will be installed in the 5 householders on east side of the road section and planting enhancement at K45+150~K45+900 on west side of the road section, It is predicted can be 3dB noise reduction.	2009	5.5
16	Huangjia he	K47+750 ~ K48+000	To the both side 25	3m height noise barrier will be set at K46+900~K47+600 on west side, 700m long totally. It is predicted can be 7dB noise reduction.	2014	210. 0
17	Yangjiahe	K48+450 ~ K49+500	To the both side 25	Ventilated noise insulation windows will be installed in the 10 householders in Class 4 area and the 8 householders in the Class 1 area. It is predicted can be 15dB noise reduction.	2009	9.0

N o.	Sensitive receptors	Pile No.	Distance from middle line (m)	Mitigation measure and analysis	Time	Cost (10 ⁴ RM B)
18	Dengjiaping	K53+100 ~ K53+600	To the both side 25	Ventilated noise insulation windows will be installed in the 5 householders in Class 4 area and the 12 householders that noise is exceeded. It is predicted can be 15dB noise reduction.	2009	8.5
19	Zaojiaoshu	K55+400 ~ K55+700	To the south 35	Ventilated noise insulation windows will be installed in the 5 householders in Class 4 area and the 7 householders in the Class 1 area. It is predicted can be 15dB noise reduction.	2009	6.0
20	Shigou	K56+300 ~ K56+600	To the south 25	Ventilated noise insulation windows will be installed in the 10 householders in Class 4 area and the 4 householders in the Class 1 area. It is predicted can be 15dB noise reduction.	2009	7.0
22	Heba	K57+300 ~ K57+700	To the north 35	Ventilated noise insulation windows will be installed in the 10 householders that noise is exceeded. It is predicted can be 15dB noise reduction.	2009	5.0
23	Qinjiaya	K58+100 ~ K58+800	To the south 30	4m height noise barrier will be set at K58+080~K58+720 on both sides, 1280m long totally. It is predicted can be 8dB noise reduction.	2014	448.0
24	Majiahe	K60+100 ~ K60+500	To the both side 25	Noise insulation windows will be installed in the 10 householders in Class 4 area and the 5 householders in the Class 1 area. It is predicted can be 15dB noise reduction.	2009	7.5
25	Wanlitan	K61+100 ~ K61+500	To the both side 25	Ventilated noise insulation windows will be installed in the 14 householders. It is predicted can be 15dB noise reduction.	2009	7.0
26	Songshubao	K61+700 ~ K62+950	To the north 45	Ventilated noise insulation windows will be installed in the 20 householders. It is predicted can be 15dB noise reduction.	2009	10.0
27	Wangjiayuanzi	K62+400 ~ K63+100	To the south 40	Ventilated noise insulation windows will be installed in the 26 householders that noise is exceeded. It is predicted can be 8dB noise reduction.	2009	13.0
28	Xiadengjiafan	K63+750 ~ K64+100	To the south 35	3m height noise barrier will be set at K63+730~K64+120 on both sides, 780m long totally. It is predicted can be 7dB noise reduction.	2014	234.0
29	Shangdenjiafan	K64+350 ~ K65+050	To the north 45	3m height noise barrier will be set at K64+330~K65+07 on north side, 740m long totally. It is predicted can be 7dB noise reduction.	2014	222.0
37	Shijiaba	K103+550 ~ K103+700	To the both side 25	Ventilated noise insulation windows will be installed in the 15 householders that noise is exceeded. It is predicted can be 10dB noise reduction.	2009	7.5
38	Shujiacao	K156+700 ~ K157+200	To the both side 25	Ventilated noise insulation windows will be installed in the 14 householders. It is predicted can be 15dB noise reduction.	2009	7.0

No.	Sensitive receptors	Pile No.	Distance from middle line (m)	Mitigation measure and analysis	Time	Cost (10 ⁴ RMB)
39	Lijiacao	K161+700~K164+700	To the both side 30	Ventilated noise insulation windows will be installed in the 19 householders. It is predicted can be 15dB noise reduction.	2009	9.5
41	Houboshi	K169+000~K169+600	both sides 40	Ventilated noise insulation windows will be installed in the 17 householders. It is predicted can be 15dB noise reduction.	2009	8.5
42	Guanzhuan Elementary School	K18+700~K18+850	To the South 40	3.5m height noise barrier will be set at K18+650~K18+900 on south side, 250m long totally. It is predicted can be 7dB noise reduction.	2014	87.5
43	Gaolan Elementary School	K96+650~K96+750	To the north 150	Ventilated noise insulation windows will be installed in the school building and dormitory. It is predicted can be 15dB noise reduction.	2009	12.0
44	Yangzhou-Zigui Elementary School	K117+880~K117+930	To the east 90	Ventilated noise insulation material will be used to installed the closed corridor in the school building. It is predicted can be 15dB noise reduction.	2009	16.0

4.2.3 Monitoring and Parameters

In order to ensure all noise impacts are properly managed and controlled, and to evaluate the effectiveness of the implemented noise mitigation measures, monitoring on noise parameters will be carried out.

Table 4-5 Monitoring Plan for Noise

Phase	Monitoring Sites	Parameter	Frequency	Lasting time	Sampling time
Construction	Lianghekou, Chiqiping, Yanjiahe, Yuquantan, Huangjiahe, Zaojiaoshu, Qinjiaya, Wangjiayuanzi, Xiadengjiafan, Guanzhuang Primary School	Leq, A	4 times/year, Ad hoc	2 days	One time in the morning and in the night
Operation	In tunnels	Leq, A	2 times/year	2 days	One time in the morning and in the night
	Guanzhuang Primary School, Yangjiahe, Xiadengjiafan, Gaolan Primary School, Yangzhouzigui Primary School	Leq, A	2 times/year	2 days	

4.2.4 Environmental Quality Performance Evaluation

Environmental quality performance criteria which is in terms of Action Level (AL) and Limit Level (LL) has been established for noise and vibration. Performance criteria will be established based on the results of the regular site walks carried out by the CESC, weekly inspections carried out jointly by the CESC, Contractor(s) and CSE, and results of routine noise measurements. Table 4-6 below shows Main action and limit levels for noise and vibration.

Table 4-6 Main Action / Limit Levels for Noise and Vibration

Event	Action Level	Limit Level
Environmental site walks / inspections	- One environmental observation / non-compliance or discrepancy relating to noise issue; OR - Receipt of one documented complaint.	- Repeated / continuous environmental discrepancy / non-compliance or observation relating to noise issue for two consecutive events; OR - Receipt of notification of summon or prosecution.
Environmental monitoring by measurements	- Closed or at the relevant criteria.	- Breach of the relevant PRC noise limits.

4.2.5 Event and Action Plan for Noise and Vibration

Immediately after each site walk / inspection or environmental measurement, the CESC will compare the results with the noise performance criteria set above. In case of non-compliance with the AL / LL, event and action procedures will be carried out. Main AL / LL exceedance procedure are shown in Table 4-7 will be carried out and additional monitoring (i.e. ad hoc monitoring) may be required. Relevant parties will be notified. Communication between relevant parties will be undertaken to identify the cause of non-compliance and the required associated remedial actions will be carried out accordingly.

Table 4-7 Main Event / Action Plan for Noise and Vibration

EVENT	ACTION		
	CESC	CSE	CONTRACTOR (CET)
Breach of the Action Level (AL)	<ol style="list-style-type: none"> 1. Check monitoring data submitted by Contractor's environment stuff; 2. Identify source, investigate the causes of exceedance / non-compliance and Notify CSE and Contractor(s); 3. Check Contractor's working method; 4. Advise Contractor's on the required remedial actions, if required; 5. Supervise the effectiveness of Contractor's remedial actions; 	<ol style="list-style-type: none"> 1. Notify Contractor(s) to take action within a specified time frame; 2. Supervise the implementation of remedial actions carried out by Contractor(s); 3. Instruct Contractor(s) to take further actions to remedy remaining impact. 	<ol style="list-style-type: none"> 1. Strictly implement the listed measures in EMP. 2. Undertake self-check and self-rectify activities. 3. strengthen the coordination with the CSC and CESC 4. Propose and rectify any unacceptable practice; 5. Amend working methods if appropriate; 6. Ensure efficient and adequate wastewater treatment facilities are in place; 7. Timely implementation of remedial actions recommended by CESC; 8. Notify CSE and CESC upon completion of remedial actions.
Breach of the Limit Level (LL)	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance / non-compliance and Notify CSE and Contractor(s); 2. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 3. Discuss amongst CSE, and Contractor(s) on the potential remedial actions; 4. Attend the meeting with the CSE and Contractor(s), if appropriate; 5. Review Contractor's remedial actions and adequacy of environmental control measures whenever necessary to assure their effectiveness and advise the CSE accordingly; 6. Supervise the 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor(s) to take immediate action; 3. In consolidation with the CESC, agree with the Contractor(s) on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance / non-compliance continues, consider what portion of the work is responsible and instruct the Contractor(s) to stop that portion of work until the exceedance is abated; 6. Proceed with the 'Penalty 	<ol style="list-style-type: none"> 1. Strictly implement the listed measures in EMP. 2. Undertake self-check and self-rectify activities. 3. Strengthen the coordination with the CSC and CESC. 4. Take immediate action to avoid further exceedance / non-compliance; 5. Submit proposals for remedial actions to CSE and CESC within 3 working days of notification; 6. Implement the agreed proposals; 7. Resubmit proposals if problem still not under control; 8. Stop the relevant portion of works as determined by the CSE until the exceedance is abated; 9. Submit written report to the CSE and CESC providing

EVENT	ACTION		
	CESC	CSE	CONTRACTOR (CET)
	implementation of remedial measures. 7. Inform EPB if appropriate.	and Rewarding' process if appropriate;	reasons of exceedance / non-compliance, actions taken, and proposal to prevent it from happening again in the future.

4.3 Water Quality

4.3.1 Key Environmental Aspects

The project EIA has identified the following key issues during construction:

- Wastewater generated from construction equipment (e.g. uncontrolled release of bentonite from tunnel drilling machine);
- Wastewater from bored piling locations. Re-suspension of bottom sediment and mud caused by cut-trench river crossings and construction of bridge foundation within rivers;
- Soil erosion / flush away from uncovered stockpiling locations, uncovered excavation site and unprotected slope surface during adverse weather conditions;
- Uncontrolled surface water run-off carrying sediment laden discharges directly into natural water bodies such as streams, fish ponds, rivers and local irrigation channels;
- Domestic sewage generated by construction workers, such as kitchen, shower etc.

Main water quality issues during operational phase are:

- Wastewater generated during routine road surface cleaning and surface runoff from road surface during heavy rainfalls;
- Pollution of nearby water body due to vehicle accidents leaking fuel, hydraulic oil, toxic materials or dangerous goods; and
- Wastewater discharge from service areas, car parking and toll station.

4.3.2 Mitigation Measures

Mitigation to Water Pollution by Bridge Construction

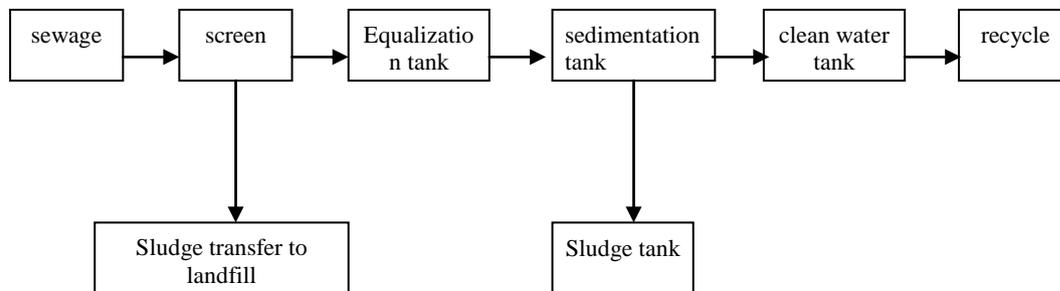
- The material stockpile site should be far away from surface water body and the area prone to surface run-off. The loose materials should be bagged and covered. Open ditch should be built around the stockpile site to intercept wastewater.
- The construction solid waste arising from pier construction should be collected and conveyed to designated place for safe disposal in timely manner. The solid waste should be used as the materials for road construction wherever possible, otherwise should be disposed in the small deposit area invulnerable to surface run-off, along with soil erosion prevention measures.
- The bridge works should be scheduled to avoid high flow season;
- Prevent the oil leak from the operation of the machinery by the regular check;
- It should be settled the temporary wall to prevent the soil erosion, especially the

- construction site near the Huangbohe, Xiangxihe and Shennongxi
- Enhance the environmental supervision on construction stage, especially the construction supervision of the Huangbohe, Xiangxihe and Shennongxi bridge;
- Education of surface water protection should be provided to the workers

Main river impact and mitigation measures are Summarized in Annex I.

Wastewater Treatment in Tunnel Construction

The wastewater produced in the construction of tunnels will be discharged in to settling tanks to remove solids with the sediments cleared and transported in timely manner and the supernatant being recycled into the process of construction. The surface water body without beneficial use or functions can be used to receive the discharge of supernatant, but it is forbidden to discharge into the river with the functions without any treatment. The treatment process is shown in the below flow chart.



Schematic 4-1 Construction wastewater Treatment Flow

Groundwater Impact Mitigation

Advance inspection of karst and karst water is the major mean for geology forecast. The dynamic design and construction will be applied to handle this geology features. According to the development of karst caves and their relations with the tunnels, use TSP for advance monitoring, inspection and handling. The final handling procedures and methods may be based on the boring results of the sites and the water flows from karst formation.

If Karst formation is intersect with tunnels, concrete protection with filling of above cavities will be used to prevent dropping rocks. The concrete pouring may also be used to filling the cavities. If the bottom of tunnels have large cavities and the top of the cavities and bottom of tunnel are such they are not thick enough to ensure the safety, the cavity top will be reinforced with pillar support or other measures. When the cavity is too big and the filling cannot ensure needed strengths, piling may be needed. All in all, various engineering measures will be taken to mitigate the geology instability of the Karst formation and Karst water, based on the good understanding of this geology features in the project areas.

According to the site geology assessment, the tunnels with the above concerns are Wofushan, Xiakou, Shimenya, Majiapo, Leijiapo, Tanjiashan, Hualebao, Liangshuijing, Tianchi and Huoshaoyan tunnels.

Other Mitigation Measures

- Temporary settling tanks will be dig where canals, pond or paddy fields are near the construction site. At the outlet of the geotextile will be installed to remove the fine solids so as to minimize the impact on receiving waters;
- If the construction solid waste such as the deposable lubricating oil, mineral oil, organic solvent, acid and alkali, oil paint belong to hazardous waste, it will be in accordance with the environmental standard, regulation and management policies of SEPA. The hazardous waste management, transportation, and disposal will be sent to the qualified operation entity to treatment and disposal in accordance with the relational regulation.

4.3.3 Monitoring and Parameters

In order to ensure all surface water impacts are properly managed and controlled, and to evaluate the effectiveness of the implemented surface water mitigation measures, monitoring on noise parameters will be carried out.

Table 4-8 Monitoring Plan for Surface Water

Phase	Monitoring point	Parameter	frequency	Duration	Timing
Construction	Huangbo River, Wudu River, Gaolan River, Xiangxi River and Shennongxi River	Permanganate index, SS, oil	4 times/year, ad hoc	2 days	One each time in mooning and afternoon
Operation	WWTW of service zone	COD, NH ₃ -N, SS, oil	2 times/year	2 day	

4.3.4 Environmental Quality Performance Evaluation

Environmental quality performance criteria in terms of Action Level (AL) and Limit Level (LL) will be established for water quality. Performance criteria can be established for the results of the regular visual inspections carried out by the CESC, weekly inspections carried out jointly by the CESC, Contractor(s) and CSE, as well as the results of routine water quality monitoring. Table 4-9 below shows some Main action and limit levels for water quality.

Table 4-9 Main Action / Limit Levels for Water Quality

Event	Action Level	Limit Level
Environmental site inspections / visual inspections	When any of the following occurs: <ul style="list-style-type: none"> - One environmental non-compliance or discrepancy relating to water quality issue; - Impact to aquatic environment (aquatic animals / plants) (e.g. dead fish, bad smell of water) at the nearby water bodies when there are construction works; - Discharge of silty water into water 	When any of the following occurs: <ul style="list-style-type: none"> - Repeated / continuous environmental discrepancy / non-compliance or observation relating to water quality issue for two consecutive events; - Lacking of wastewater treatment facilities or improper design; - Large scale / serious affection on aquatic environment (aquatic animals / plants) (e.g. dead fish, bad smell of

Event	Action Level	Limit Level
	body / insufficient wastewater treatment facilities during the visual inspections; and - Receipt of one documented complaint.	water) at the nearby water bodies when there are construction works; and - Receipt of notification of summon or prosecution.
Environmental monitoring by measurements	- A variety of parameters can be monitored depending upon the relevant criteria, such as COD, SS, oil, ph etc.	- Breach of the relevant PRC river / marine water quality standards.

4.3.5 Event and Action Plan for Water Quality

Immediately after each site inspection and upon receiving water quality test results, the CESC will compare the results with the water quality performance criteria. In case of non-compliance with the AL / LL, the event and action procedures such as those stated in Table 4-10 will be carried out and additional monitoring (i.e. ad hoc monitoring) may also be required. Communication between relevant parties to identify the cause of non-compliance and the required associated remedial actions will be carried out accordingly.

Table 4-10 Main Event / Action Plan for Water Quality

EVENT	ACTION		
	CESC	CSE	CONTRACTOR (CET)
Breach of the Action Level (AL)	<ol style="list-style-type: none"> 1. Check monitoring data submitted by Contractor's environment staff; 2. Identify source, investigate the causes of exceedance / non-compliance and Notify CSE and Contractor(s); 3. Review the adequacy of wastewater treatment facilities; 4. Check Contractor's working method; 5. Advise Contractor's on the required remedial actions, if required; 6. Supervise the effectiveness of Contractor's remedial actions; 	<ol style="list-style-type: none"> 1. Notify Contractor(s) to take action within a specified time frame; 2. Review the adequacy of Contractor(s) wastewater treatment facilities; 3. Supervise the implementation of remedial actions carried out by Contractor(s); 4. Instruct Contractor(s) to take further actions to remedy remaining impact. 	<ol style="list-style-type: none"> 1. Strictly implement the listed measures in EMP; 2. Undertake self-check and self-rectify activities; 3. Strengthen the coordination with the CSC and CESC; 4. Propose and rectify any unacceptable practice; 5. Amend working methods if appropriate; 6. Ensure efficient and adequate wastewater treatment facilities are in place; 7. Timely implementation of remedial actions recommended by CESC; 8. Notify CSE and CESC upon completion of remedial actions.
Breach of the Limit Level (LL)	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance / non-compliance and Notify CSE and Contractor(s); 2. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 3. Discuss amongst CSE, and Contractor(s) on the potential 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor(s) to take immediate action; 3. In consolidation with the CESC, agree with the Contractor(s) on the remedial measures to be implemented; 4. Ensure remedial measures 	<ol style="list-style-type: none"> 1. Strictly implement the listed measures in EMP. 2. Undertake self-check and self-rectify activities. 3. Strengthen the coordination with the CSC and CESC. 4. Take immediate action to avoid further exceedance / non-compliance; 5. Submit proposals for remedial actions to CSE and CESC within

EVENT	ACTION		
	CESC	CSE	CONTRACTOR (CET)
	remedial actions; 4. Attend the meeting with the CSE and Contractor(s), if appropriate; 5. Review Contractor's remedial actions and adequacy of environmental control measures whenever necessary to assure their effectiveness and advise the CSE accordingly; 6. Supervise the implementation of remedial measures. 7. Inform EPB if appropriate.	properly implemented; 5. If exceedance / non-compliance continues, consider what portion of the work is responsible and instruct the Contractor(s) to stop that portion of work until the exceedance is abated; 6. Proceed with the 'Penalty and Rewarding' process if appropriate;	3 working days of notification; 6. Implement the agreed proposals; 7. Resubmit proposals if problem still not under control; 8. Stop the relevant portion of works as determined by the CSE until the exceedance is abated; 9. Submit written report to the CSE and CESC providing reasons of exceedance / non-compliance, actions taken, and proposal to prevent it from happening again in the future.

4.4 Ecology and Biodiversity

4.4.1 Key Environmental Aspects

Based on the findings of the project EIA, the majority of ecological impacts during construction are related to:

- Site clearance, formation and removal of vegetation at the beginning of construction which results in loss of habitat and vegetation for nearby animals;
- Disturbance of soil profile during earth moving activities and disturbance to sediment and aquatic environment due to works within rivers;
- In sections where the existing areas have very limited human activities and undisturbed environmental setting resulting in relatively more wildlife activities, construction activities will impact the wildlife driving them temporarily away from the construction areas;
- Temporary and permanent land occupation;
- Land occupation at ecological sensitive areas, damage to vegetation beyond proposed working areas, and illegal hurting of wild animals by construction workers, etc. due to lacking of awareness / training of ecologically important / constraint areas;
- Lacking of re-construction of loss habitat and re-creation of affected biodiversity of ecosystem.

During the operational phase, key ecological issues that may lead to ecological impact include:

- Traffic noise and lighting at night will force some wildlife away from the expressway areas;
- Lacking of evaluation of the success of recreation of habitat and identification of further measures required improving the ecological condition.

4.4.2 Mitigation Measures

Temporary Land Occupation

Top soil should be collected separate from sub-soils for reuse in the land reclamation; Immediately after the construction is completed, the site should be leveled and top soil be returned for vegetative establishment; and the original land use should be restored.

For new construction access roads, design should consider minimizing excavation and filling. Erosion control measures will be taken for soil land water conservation in and around the access road areas. Following the completion of the project, the access roads may be turned back to local government and if desired, used as rural roads or wood land roads. If local governments elect not to use these access roads, the contractors will be responsible for reclaim the land including necessary landscaping.

Ancient Trees Protection

The construction access roads and construction sites will be strictly controlled and located 300m away from the ancient trees. All the ancient trees should be fenced before the construction. Temporary barrier must be set in the middle of the project and ancient trees No.3-No.6 (in EIA) before construction to avoid the falling soil and rock in roadbed construction hurt them.

Wildlife Protection

The woodland is the primary concern for ecological protection for this road project. The construction should be carefully scheduled to reduce the construction period and the blasting operation, so as to minimize the disturbance to the wildlife. Early morning and late night are the golden time for breeding and feeding and birthing for animals, thus during the construction at the sections of K75-K85、K97-K101+600、K120-K144, blasting operation should be avoided from early morning(before 6:00AM) and late night(after 8:00PM).

The workers' camp should be banned from the woodland and the plants and soils should be protected. Strictly control redlines for the expressway, access roads and other construction sites. No construction activities will be allowed outside these areas and contractor workers and vehicles won't be allowed to enter into the forest areas.

The wild animal is expected to cross the proposed road via the under the bridge or up the tunnel, it is usually need several years to adapting artificial architecture. So it is necessary to protect the nature vegetation on the outlet of the tunnel and the bridge during the construction phase. When the construction completed, it is necessary to plant some similar vegetation in order to minimize the trace of the human activities. The ruderal and the shrubbery will be used to recover the nature sight. The piers of the viaduct also need to be plumb greening. These measures could help the wild animal to adapting the artificial landscape, and be good for the animal transference.

The impact and mitigation measures for the three ecologically sensitive areas are summarized

in Num 8, 12, 16 of Annex I.

Fish Protection

All construction camps will be required, as contractual obligations, to build septic tanks, as wastewater from construction camps will not allowed discharging to the environment directly. All municipal solid waste will be trucked to nearby landfills or buried at the dedicated locations.

Stockpiles will be located away from water bodies and areas where runoff flushing impacts would be minimum. If some must be placed near bridge construction sites, the stockpiles will be surrounded by interception ditches or retaining structures to prevent the erosion and materials into the water bodies. The fuel storage and equipment maintenance yard will have weather/rain protection and will be on concrete pads. This will prevent any dripping and leaking oils from entering the water bodies via surface runoff. All spoil soil disposal sites will only be allowed in the dedicated areas where will be erosion control measures and landscaping plan following the disposal operations

For any in water construction for bridges, there will be strict waste control plan to restrict discharge or dumping of any directly discharge of wastewater, slurry, waste, fuels and waste oil into the water. All these materials must be collected and disposed at the banks. The slurry and sediment will also pump to the banks for disposal and will not be allowed to discharge to the rivers directly.

Cave Diversity Protection

Before the start of construction, fence will be erected surrounding the Shujiacao No.1-4 caves (E13, E14, E15, E16) which could be impacted by the construction. No contractor workers or other personnel will be allowed to enter into the caves for hunting, collect stalactite or other activities. The contractor will be required to conduct all its on site activities including setting up construction camp at least 2km from these four caves, to minimize the direct impact of construction activities to the caves. In addition, the contractors and expressway operators will also be required to maintain environmental quality and minimize pollution. Particularly during construction, the contractor will be demanded not to place any construction materials or waste near the cave portal. The surrounding vegetation will be reserved to the maximum extent possible.

Most important of all, the contractor personnel including all workers and temporary labors must raise awareness for cave and environmental protection in general. This will be achieved through training pro to the start of construction to all workers. Such training will be repeated regularly as refreshment and to any new comers during the course of construction.

The impact and mitigation measures for the Shujiacao No.1 sinkhole summarized in Annex I.

Chance Finding Procedure

In the event that a previously unidentified cave is uncovered during construction the following procedure shall apply:

- The contractor's work crew shall halt work at the location of the cave and immediately notify the CET, CESC and the CSE.
- The CESC shall examine the entrance to the cave and confirm whether it is (i) part of a larger system with dark passages or, (ii) a short void well-lit from the outside.
- If the cave is considered to be part of a larger system shall arrange for the project cave survey team to visit the cave to take samples of any animal specimens.
- The CESC, in consultation with the CSE shall confirm the appropriate mitigation measure given the location and size of the cave. This shall be confirmed by the project office and the World Bank

Soil Conservation in Initial Stage of Construction

The initial stage of construction often involves construction of roadbed where guard works are not built. Thus temporary measures will be put in place where severe soil erosion would occur.

Prior to construction, the site for deposit should be constructed with peripheral interceptors which will divert storm water into rivers downstream, so as to avoid direct erosive impact by storm water. Where necessary, retarding basin should be constructed to remove sands and other solids in storm water before it reaches rivers downstream.

The design document indicates that the largest percentage in the spoil is rocks and stones. Thus in order to reclaim the stockpiles after dumping of spoil is completed, the top soil should be removed and stockpiled at other place before the site clearance is commenced. Top soil will be stored at the side structured to minimize soil erosion and sharing the interception ditches and settling pond to further control erosion.

As the soil texture on the slopes to be filled is too loose to resist erosive forces of storm water, a weir at the size $W\ 0.5\ m \times H\ 0.2\ m$ is suggested to construct along the edge of the roadbed to retain storm water from running down through the soils on side slopes. In addition, a temporary drainage ditch is to be constructed along the roadbed at an interval of 50 m to divert the excessive storm water. A retarding basin should be provided whereas necessary downstream of the drainage ditch to remove solids in the run-off.

Measures for Guarding and Restoration at Deposit Site

The main measures for soil erosion control at deposit site include retaining wall, drainage works, land restoration and reclamation measures.

- Side slope of waste: the side slope of waste is 1:2.5, and the bending is 4 m wide.
- Retaining wall: it is armored with stock materials. The top width is 0.5 m. the outside

face is vertical to the ground, while the inside face is stepped with the sides slope being 1:0.3 and the rooting depth more than 0.5 m. It is made of concrete beam filled with stones.

- Drainage works: peripheral ditch will be constructed at the deposit site, where as necessary, to divert excessive storm water into rivers downstream. The ditch will be armored with stone materials with a slope side 1:1.
- Vegetative establishment: after deposit is completed, the site should be reclaimed with addition of top soils for vegetative establishment.

Measures in Rainy Season

Rainfall is often considered to be one of the triggering elements for soil erosion at gravity which include water erosion, collapse and landslide. As the project is located in an area with adequate rainfall which often concentrates in a certain period, proper measures such as well scheduled construction and improvement of drainage system might considerably reduce the soil erosion that would occur due to land disturbance by road construction. In rainy season, prior to construction of roadbed, culverts will be completed with drainage system. Before construction side slope the storm water interception and drainage system will be constructed.

On the sections involving high filling and deep cutting or where landslide or collapse are likely to occur, the construction of road will be scheduled to avoid rainy season; if can not, drainage system will be improved to ensure that storm water be drained smoothly and quickly, and the working surface will be covered .

Management of Contractor

Prior to the construction, an education program will be provided for the contractors and workers on the knowledge of wildlife and bio-diversity.

Measures also will be developed to encourage good practice of wildlife protection and penalty the people who violate the clauses of wildlife protection.

4.4.3 Monitoring and Parameters

The CESC will need to continuously monitor the implementation progress and review the effectiveness of the proposed measures based on the construction progress. Ecological survey by the project ecologist at the affected areas and those of re-created habitat areas so that the proposed / implemented mitigation measures are evaluated for adequacy.

4.5 Landscape and Visual

4.5.1 Key Environmental Aspects

Based on the project EIA, landscape and visual impact can result from road construction due to the following:

- Poor / inadequate aesthetic design and landscaping design of the proposed road structures;
- Large-scale earth moving activities, disturbance of soil profile and removal of vegetation during the project construction which may result in soil erosion and visual impact;
- Poorly implemented temporary mitigation measures and slope protection measures during excavation and slope works;
After the completion of construction and before operation of the project, landscape and visual impact may occur because of:
- Lack of appropriate compensatory planting at the end of construction or non-native species are planted that are visually incompatible to the background environment;
- Lack of proper maintenance / watering of newly planted vegetation during the post-construction period.

4.5.2 Mitigation Measures

- At the highly sensitive scenery zones (e.g., Shenongxi, Gaolan and Xiaofeng scenery zones) the construction may be scheduled where possible at the low tourist seasons. The construction trucks will operate at night where possible and kept clean and covered when shipping bulk materials.
- The construction sites should be surrounded with fence if located at the scenery zones to avoid direct visual sights of the construction sites.
- There will be no construction camps in the three scenery zones and use local village houses for workers working in these areas.
- Municipal solid waste from construction workers will be collected timely and disposed in the dedicated areas. Strictly ban random disposal of solid waste.
- All mixing stations will not be located near the rivers. No such stations in the three scenery zones. The stockpiles will be located in hidden areas with outside of the sight from tourists. Avoid occupy the green areas if possible.
- Use the existing roads as access road if possible to minimize the need for new access roads which lead to damage the existing land form and/or greens. If must be built, the access roads should select areas which are away from major scenery and may be used as village roads once construction completes.

Impact and mitigation measures for the three sceneries are summarized in Annex I.

4.5.3 Monitoring and Parameters

The proposed Master Landscaping Plan and its implementation will be checked and monitored by a qualified staff (e.g. Landscape Architect). Follow up monitoring by the Landscape Architect will continue until the specified post-construction period. Regular field inspection of the implementation of landscape measures will be undertaken by the CESC during the regular site walks and weekly site inspections. Findings of the inspections will need to be duly reported to the CSE.

4.6 Waste Management

4.6.1 Key Environmental Aspects

Based on the project EIA, waste is generated due to construction activities such as those listed below:

- Surplus excavated materials requiring disposal due to earth moving activities and slope cutting;
- Disposal of used wooden boards for trenching works, scaffolding steel material, site hoarding, packaging materials, containers of fuel, lubricant and paint;
- Waste generated by demolition of existing houses / buildings affected by the project or breaking of existing concrete surface;
- Waste from on-site wastewater treatment facility (e.g. treatment of bentonite from tunneling works by sedimentation process);
- Disposal of hazardous waste / chemical waste such as spent waste oil, spent lubricant, contaminated soil material due to leakage of hydraulic oil / fuel from construction plant / vehicles; and
- Domestic waste generated by construction workers, construction campsite and canteen. Wastes that are likely to be generated during the operational phase are:
 - Demolition waste due to breaking of concrete / asphalt surface during road maintenance works;
 - Hazardous waste / chemical waste such as spent waste oil, spent lubricant, contaminated material due to leakage of hydraulic oil / fuel from construction plant / vehicles; and
 - Domestic waste generated from service areas and car parking locations.

4.6.2 Mitigation Measures

During construction, inert construction materials / excavated soil will be reused on site as much as possible and minimize the volume requiring disposal. The Contractor(s) will incorporate the recommendations in the EIA report, detailed designs and contractual requirements into a Contractor's Waste Management Plan (WMP). The WMP will be verified by the CESC and submitted to the CSE for approval prior to commencement of project construction works. The WMP will be reviewed and updated by the Contractor(s) regularly. As a minimum, the WMP will provide details such as:

- The Contractor's commitment to waste reduction;
 - The Contractor's waste management organization chart and responsibilities;
 - The Contractor's proposed waste management methodology and works method statement, providing details on type and volume of waste to be generated due to the project works at each stage of the construction;
 - A method statement on waste recycle, re-use and minimization of waste generation; and
 - A detailed map indicating the design and locations of borrow pits, temporary soil storage locations and waste disposal sites for each section / stage of the construction works.
- Waste management can be carried out to handle the above issues through measures such as:

- The amount of surplus excavated material for each road segment will be estimated during the design phase. Excavated material will be re-used on-site or the nearby road segment / other projects as far as possible in order to minimize the quantity of material to be disposed of;
- Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc will be collected and separated on-site from other waste sources. Collected recyclable material will be re-used for other projects or sold to waste collector for recycling;
- The extent of demolition of existing houses / structures due to the project will be minimized during the design through careful route selection. Major dense populated residential areas will be avoided in order to minimize the demolition;
- Handling of waste generated from on-site treatment facilities (e.g. spent betonies settled by treatment facility, sediment collected by sedimentation process, etc) will be planned during the design. Collected waste will be disposed of properly through licensed waste collector;
- Hazardous waste (or chemical waste) will be properly stored, handled and disposed of in accordance with the local legislative requirements. Hazardous waste will be stored at designed location and warning sign will be posted;
- Specification on waste management will be included in the contract for contractor(s) to follow. The Contractor(s) will be required to adopt operation measures for all aspects from waste avoidance, reduction, recycling, re-use to waste collection and disposal; and
- Good house keeping will be maintained. Domestic waste from site office and canteen will be collected by a licensed waste collector. A designed waste storage area will be provided for the proposed service area and waste will be cleaned on regular basis.

4.6.3 Monitoring and Parameters

Waste management will be monitored through carrying out waste treatment by CSE, and CESC).

The CESC will supervise all aspects of waste management including waste generation, storage, recycling, treatment, transport, and disposal. The work will cover each waste stream and to check all project activities for compliance with appropriate environmental protection and pollution control measures, including those set out in this EIA report and the Contractor's WMP. The results and associated recommendations on improvements to the environmental protection and pollution control works will be discussed among all parties and implemented by the Contractor(s) within an agreed time frame.

4.7 Construction Site Safety

4.7.1 Key Environmental Aspects

Safety considerations must be taken account throughout the construction particularly the

construction sites may be at or near local communities and schools and, because of the nature of the construction, the construction sites cannot be completely fenced off from the public. Based on the project EIA, some key risks associated with construction may include:

- Risk associated with working in enclosed environment such as inadequate ventilation and fire fighting within tunnel / tunnel shaft;
- Seepage of water into tunnel during the tunnel construction;
- Collapse within tunnel when drilling through geologically unstable ground layer and karst areas;
- Risk of falling objects and working on unstable working platform;
- Risk associated with blasting exercise.
- Traffic safety in the construction site.

4.7.2 Mitigation Measures

- Provide construction workers sufficient personal protection equipment (PPE) such as hard hats, earpiece, safety shoes, and others;
- Seminar on safety issues will be provided to local public, particularly school students;
- Where the potential dangers are present, warning signs will be installed;
- Some of the high risk areas, such as deep excavation, areas for blasts, etc. will be temporarily fenced to control public access and should be lighted at night if that is on the regular roads used by the locals.
- There will be construction staff on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the villages to ensure safety.

Measures on blasting

- The transportation, storage, process, package on site, connect, blasting and the disposal of the blasting, the procedure will be in accordance with the Safety Regulations of the Blasting (GB6722-1986)
- The persons will be 200 m away from the blasting point
- Except to detonation, all the power and the light will be turned off, and located 50 m away from the blasting point
- The excavation face is on the same level with the lining of surface, it is commonly more than 30 m, the distance is defined according to the factors of the intensity of the concrete and the character of the wall rock
- The safety examination will be fulfilled after the blasting, identified the left cannon which are not blasted, the procedure will be followed as the Regulation of the Blasting Safety (GB6722-1986), the dreg can not be transfer outside until there is no blasting material.
- According to the real situation, the quantity of blasting materials will be carefully controlled.

Measures on hazardous gas

- If there is the hazardous gas (such as coal gas) in the tunnel, all the construction will be stop, and withdraw out the cave, the Contractor will take efficient actions, the construction could not begin until there is no danger.
- The Contractor will monitor, record, and report the situation of the hazardous gas in the

tunnel, the hazardous gas emission could not exceed the standard

- If the tunnel construction may involve hazardous gas, it is necessary set the on-line-monitoring system including the analysis equipment, the annunciator, the annunciator can provide the vision and sound caution under this plan.
- The Contractor will arrange the safety instrument such as the security light, and some gas emission from the vehicles; it could be defense as the different status.

4.7.3 Monitoring and Parameters

Regular safety walks involving qualified representatives from each party will be organized throughout the construction in order to ensure the implementation of safety measures and to identify areas of concerns for improvement.

4.8 Cultural Aspects

4.8.1 Key Environmental Aspects

Impacts to cultural sites and heritage relics from projects including the main project spoil disposal sites and access roads are a concern and the location of these sites have been identified in the EIA and highlighted in this document. According to the project EIA, potential impacts to the cultural sites include:

- Excavation of Baihuguan and Pingyikou relics due to the project;
- Potential impact of the structure stability of the Xinping Suspended Tombs during construction and operation period of the project.

Pre-construction Stage

The measures to be taken in the protection area of Xinping Suspended Tombs include:

- ◆ The tomb and the surrounding area will be reinforced with physical and chemical methods, including provision of support and spray of reinforcement agent by contractors under the guidance from the archeological institute before the commencement of the surrounding construction work. The archeological institute will institute the instruments to monitor the vibration.
- ◆ The tombs and surrounding area will be investigated with record;
- ◆ Monitoring equipment to monitor the movement of the cliff for long term will be procured and installed at site with specific management procedure in place;
- ◆ Mitigation equipment to reduce the vibration will be installed at site to reduce the impact on the tombs;
- ◆ The noisy equipment operation, such as piling and blasting, will be restricted;

Please refer to the Num 5 of Annex 1.

The measures to be taken in the archaeological excavation to the Baihuguan and Pingyikou

Relics include:

- ◆ The sites will be excavated 3 months prior to the start of the construction under the PMO and supervised by the relevant archeological institute.
- ◆ On excavating stage, they will collect specimens of all kinds of the cultural relic, plot the distribution map, take pictures, and primarily sort;
- ◆ Excavation team transfer the cultural relic into the house, clean up, rehabilitation and evaluation;
- ◆ Prepare the report records the excavation process and cultural relic information, submit to the provincial publication;
- ◆ All cultural relics will be transferred to the local museums for display and presentation.
- ◆ The boundary of construction site should be stringently controlled, and should be remote from the relic's area.

Impacts and mitigation measures for the main cultural relics are summarized in Annex I.

Chance finding procedures

Although the EA has made detailed site investigation and consulted cultural relics authorities and impacts on known cultural relics have been analyzed and mitigation measures developed as presented above, there could still be potential for chance finds of archaeological properties during construction. To minimize adverse impacts or damages to these chance finds, the following procedures have been proposed and will be incorporated into contractors' standard operation procedures:

- When a chance find or potential chance find is uncovered at the construction site, all construction activities at the site will be immediately put on hold.
- Workers and site management are responsible to take necessary measures to protect the chance finds from damages by construction related or other activities such as sliding, flooding, damages by machinery, access by others, stolen, etc.
- Contractors will notice CESC, the Yiba PMO, and cultural relics authority immediately.
- Site investigation by professional archaeologists should be conducted to determine the nature, value, conditions, areas of the find, etc. On this basis, the professional team will recommend on next steps as to preserve the site or not.
- Construction will only resume following the reports of the professional investigation and approval of the cultural relics authority.
- If the site is of high value and site preservation is recommended by the professionals and required by the cultural relics authority, the project owner will need to make necessary design changes to accommodate the request and preserve the site.

All contractors and construction supervision companies will be trained by the professional before the construction starts to understand the procedures and the basics on how to recognize a potential archaeological chance find. The senior experts from the Provincial Relic and Archeological Institution will provide the regularly training during the construction phase.

Legal Binding Force

The requirement of mitigation measures for the three sensitive areas and chance finding procedures will be included in the bidding documents and the contracts between the client and contractors, so as to ensure the legal binding force. The CESC, CSE and client will check the implementation situation.

4.9 Special Construction Site Impact Mitigation

There will be several types of sites which are not at the main expressway alignment but can potentially cause significant environmental impacts during construction according to the project EIA. These sites are access roads, construction camps, spoil soil disposal sites. The mitigation measures at these sites will be:

4.9.1 Spoil disposal sites

The selection and use of spoil disposal site will follow strictly followings:

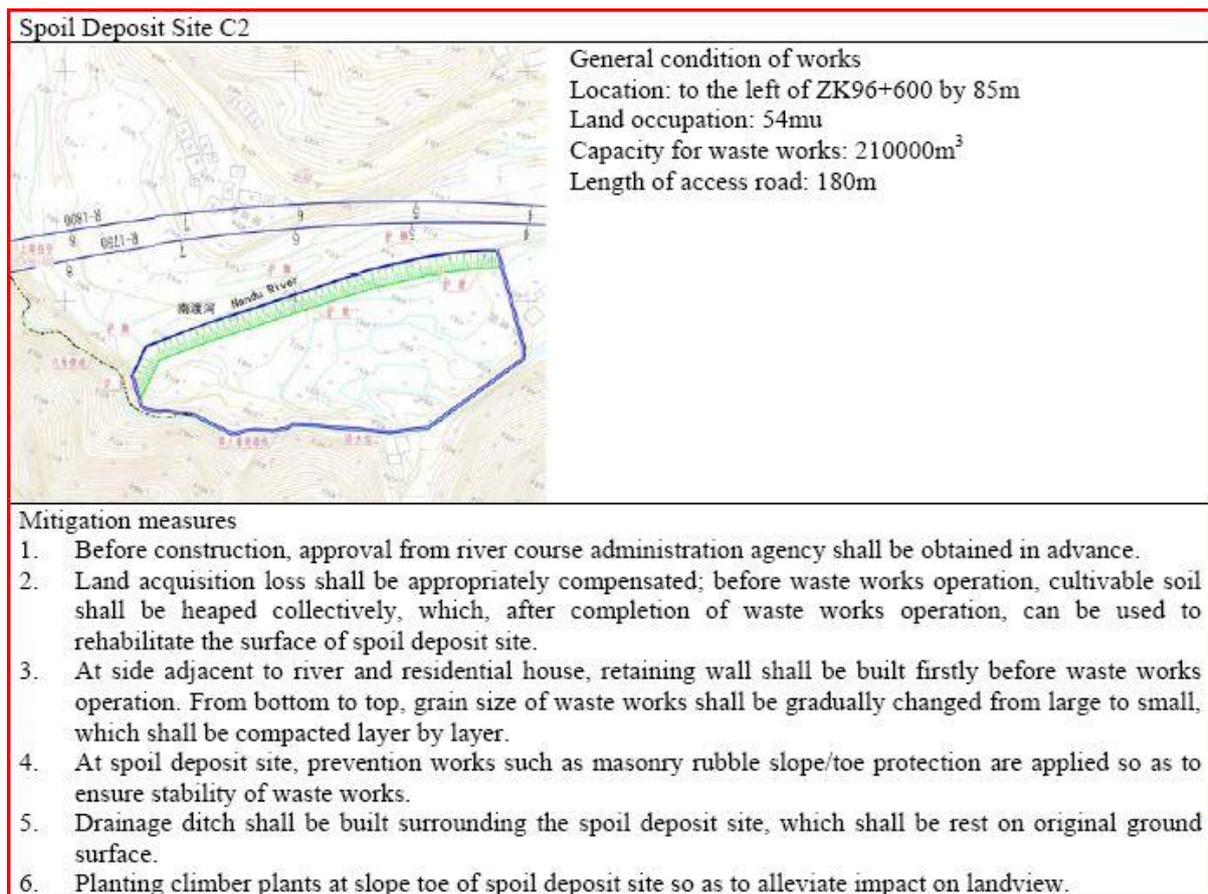
- Ensure all the sites are designed by the design institutes in consultancy with the EA team and finish it on the 1:2000 relief map. The design will include a retaining wall where needed with enough strength, slope protection, drainage facility and service road for construction, the sites lie in the Gaolan scenic spot and Xiaofeng scenic area should consider the landscape effects.
- Ensure the contractor use the designed disposal sites only, no random abandoning of spoil soil.
- If the contractor proposes any new sites as disposal sites in the construction, it will need the approval by the Yiba PMO and CESC from the point of technology and environment, and also approved by the local government.
- If disposal sites are to occupy river bed, it will be agreed by the hydrology management authority.
- For the final use of the site selection should all be agreed by the local government.

For the site which follows the requirements above will also meet the requirements of protection measures below:

- Compensation for the farmland occupation to the land owners;
- Before disposal operation starts, top 30 cm of natural soil will be first removed and stored at the side. This material will reserve and to be used at the end of the disposal operation as cover materials as part of the rehabilitation.
- For the site near the river (refer to A7-A11, B2, B4, B5, B8, B9, C1-C6, C7, C9, C11, C21 of Annex II), the retaining wall and/or interception ditch or settling ponds will be built prior to construction. The surface runoff will be retained and settled first before allowed discharge into the receiving water;
- Ensure the stability of the spoil disposal site, the mortar rubble masonry pavement and grouted rubble toe protection will be adopted to prevent erosion and maintain stability.
- Drainage ditch will be built around the disposal site to control surface runoff;

- For the disposal site near the residents, it is prohibited to construction at night, and watered the sites for dust suppression at the operation time.
- For the disposal site near the residents (refer to A8-A11, B7, C4, C6, C8, C11, C12, C22, C26, C27, D2, D3, D8, D9, D11, D13, D14 of Annex II), it is prohibited to transportation at night, and water the dust at the setting time.
- The disposal sites will be fully rehabilitated as soon as the disposal operation is completed. The rehabilitation will include complete cover of the site with the native soil and fully landscaped. The stability of the sites will be inspected and measures such as retaining walls will be constructed as needed. The rehabilitation will be part of the contractual obligations for all contractors who will not be fully paid and contracts will not be closed until the rehabilitation will be completed as required and to the satisfaction of Yiba PMO, its consultant, and other stakeholders.
- For the disposal site near the area where possess the good plants and well growth vegetations (C3、C5、C13、C18-C22, C24, C25, D2, D4-D6, D10-D12, D14, D15), it should be small-sized construction before the disposal operation in order to drive the wildlife away.

The following one is quite a typical and representative map, which shows the engineering and other detailed relevant information including the pre-during-post mitigation measures:



Specs, impacts and mitigation measures for each disposal site (similar to the above map) are summarized in Annex II. The distribution of spoil soil disposal sites is given in Map

4-2.(Page 25).

4.9.2 Access Road

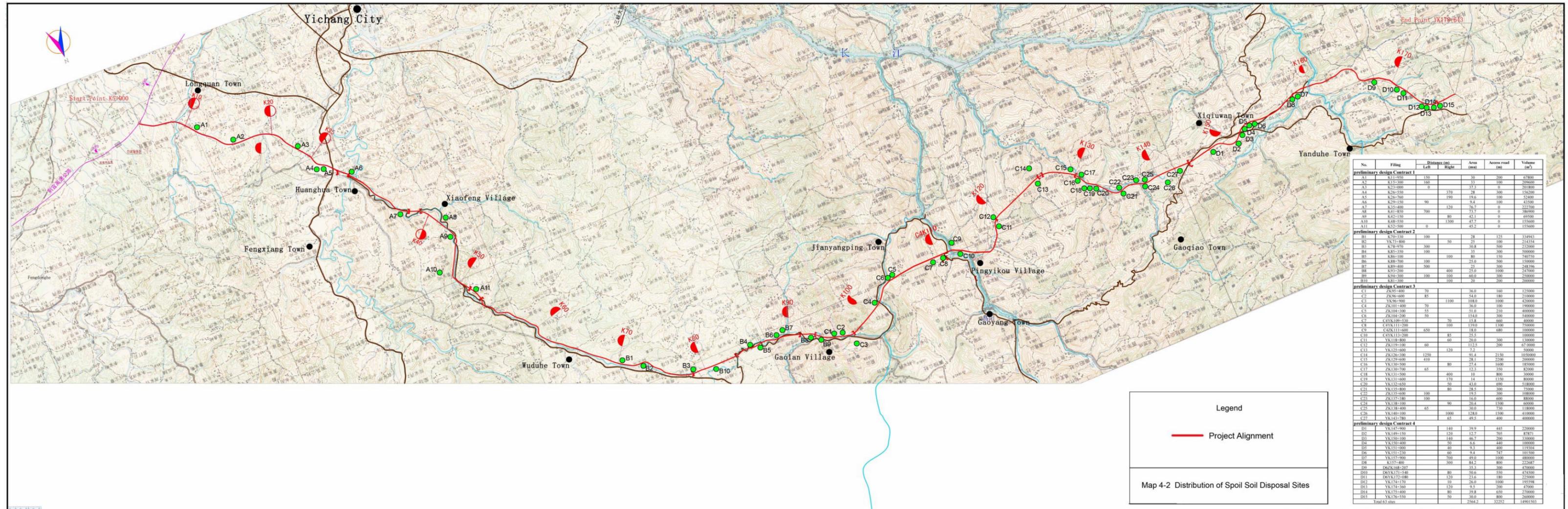
- The temporary access roads will be carefully located to avoid farmland, forest and crops; where possible, the access locations will be selected in such a way that they will be used by the local communities after the construction completion.
- Safety warning signs will be installed and safety considerations and engineering measures will be given full consideration in the access road design.
- Usage of the existing road cooperated by the local government to avoid the traffic jam, especially much more heavy construction vehicles come-and-go, it will lead to the Yixing Road traffic increase. It may destruct the existing roads, impact the local transportation, and increase the risk of the traffic accident. So, it will be enhanced the transportation safety management such as set the transportation caution signs, scientific construction arrangement, minimized the impact to the villagers along the proposed freeway.
- When through village, schools and hospitals, all access roads will be paved from 25 m before approaching these sensitive receptors until 25 m after leaving them.
- When the construction is completed, the access road, if not beneficially used by the local communities, will be fully rehabilitated to its original state and landscaped as needed.

The distribution of access roads is given in Map 4-3. Impacts and mitigation measures for new and upgraded access roads are summarized in Annex III.

Increased Traffic on Existing Roads

- All contractor truck drivers will undertake a safety training prior to the start of construction. This requirement will be included in the contracts and as contractual obligations to all contractors.
- Heavy duty trucks will have a speed limit when passing villages and other sensitive areas along the roads. If necessary, concrete speed bumps will be built near schools, hospital and congested town centers where heavy duty construction trucks are expected to use.
- On dry and windy days, the contractors will be required to water the road sections that are located in the middle of or by townships, villages, schools and hospitals.
- Damaged roads will be repaired immediately upon the construction completion. All roads used by contractors will retain to their current state upon construction completion.

4.9.3 Construction Camps





Map 4-3 Distribution of access roads

Access road length (km)				Access road length (km)				Access road length (km)			
No.	Total	Existing	Upgrade / New	No.	Total	Existing	Upgrade / New	No.	Total	Existing	Upgrade / New
preliminary design Contract 1				preliminary design Contract 2				preliminary design Contract 3			
A1	3.35	12.0	5.35	B1	0.20	0.0	0.20	C1	0.16	0.0	0.16
A2	12.00	12.0	0.0	B2	0.60	0.0	0.60	C2	0.37	0.30	0.07
A3	3.30	3.00	0.30	B3	0.50	0.35	0.15	C3	1.05	1.05	0.00
A4	8.50	5.00	3.50	B4	0.35	0.35	0.00	C4	1.12	1.12	0.00
A5	3.20	3.20	0.00	B5	0.35	0.35	0.00	C5	0.95	0.95	0.00
A6	1.00	0.80	0.20	B6	0.90	0.80	0.10	C6	1.19	0.20	0.99
A7	2.72	2.72	0.00	B7	0.65	0.65	0.00	C7	6.86	5.89	0.97
A8	19.00	19.00	0.00	B8	0.60	0.55	0.05	C8	6.13	6.13	0.00
A9	6.50	6.50	0.00	B9	2.30	2.30	0.00	C9	4.10	4.10	0.00
A10	3.82	3.82	0.00	B10	0.60	0.60	0.00	C10	0.22	0.22	0.00
A11	6.20	2.50	3.70	B11	2.40	1.10	1.30	C11	1.23	1.23	0.00
A12	4.10	3.90	0.20	B12	1.40	1.40	0.00	C12	1.24	1.24	0.00
A13	0.77	0.77	0.00	B13	0.40	0.40	0.00	C13	1.55	1.55	0.00
A14	28.00	28.00	0.00	B14	0.65	0.65	0.00	C14	2.73	2.73	0.00
A15	0.85	0.85	0.00	B15	0.65	0.75	0.40	C15	0.39	0.39	0.00
A16	0.40	0.40	0.00	B16	0.90	0.70	0.20	C16	2.33	2.33	0.00
A17	0.20	0.20	0.00	B17	1.30	1.30	0.00	C17	1.30	1.30	0.00
A18	0.75	0.75	0.00	B18	0.50	0.50	0.00	C18	0.24	0.24	0.00
A19	0.30	0.30	0.00	B19	1.80	1.80	0.00	C19	0.48	0.48	0.00
A20	0.80	0.80	0.00	B20	0.75	0.30	0.45	C20	6.18	6.18	0.00
A21	0.85	0.85	0.00	B21	45.00	45.00	0.00	C21	1.13	1.13	0.00
								C22	1.43	1.43	0.00
								C23	0.69	0.69	0.00
								C24	25.28	25.28	0.00
								C25	1.04	1.04	0.00
								C26	1.29	1.29	0.00
								C27	3.64	3.64	0.00
								C28	3.18	3.18	0.00
								D1	4.235	1.820	2.415
								D2	0.860	0.860	0.00
								D3	2.001	0.767	1.234
								D4	0.328	0.328	0.00
								D5	2.605	0.35	2.255
								D6	3.25	3.25	0.00
								D7	2.521	2.521	0.00
								D8	0.943	0.943	0.00
								D9	5.330	5.330	0.00
								D10	8.810	4.156	4.654
								D11	4.153	2.835	1.318

Site Selection Requirements:

The location of construction camps and construction sites will be selected following the criteria below.

- Construction sites, including concrete mixing stations and asphalt stations as well as construction camps will minimize the land occupation by setting them at the interchange areas where relatively large areas of land will be needed eventually. In particular, at the cultural relics controlled area of the suspended graves (K32 to K35), Shennongxi scenery area (K158+850~K160+850)、Gaolan scenery area (K95+500~K104+400)、Xiaofeng scenery area (K32-K35) , and other key scenery and protected areas as defined by the Yangtze River Three Gorge State Geology Park (Huanghua Ordovician period park, the hanging coffin of Xiaofeng Cambrian period, Baiguoshu scenic area, near the K33+500 hanging coffin, 2500m north of the K38, 500m north of the K29+500, 500m north of K29, 100m west of the BK39), The areas 200 m from both sides of Huanbohe, Xiangxihe and Shennongxi rivers as well as Shujiacao water falls No.1-4, concrete and asphalt stations and construction camps will be strictly banned. The sites also will be away at least 2km from the portals of karst caves.
- Borrow/deposit spots and workers' camp will be located at the barren land and remote from villages, schools and hospitals; be remote from river course to minimize the impact of river blocking;
- After the work is completed, the site will be cleared to removed compacted top soil and reclamation plan will be conducted for vegetative establishment;
- The workers will rent the houses nearby, if possible. If not will be located at the barren land and remote from villages, schools and hospitals; be remote from river course to minimize the impact of river blocking.
- All the site selection plans will be checked by the Hubei Communication Department from the point of technology and environment, and also agreed by the local government.

Environmental Protection Requirements

Construction camps and mixing station often are far away from municipal water and sewage system, and form a temporary independent unit last from 2010 to 2013. When the construction finished, they will break down in principal. Although they are temporary facilities, all construction camps will be well zoned for residential, office, canteen, washrooms, etc. All water supply, drainage, wastewater treatment and solid waste disposal will have the following technical requirements.

Water supply system: drink water will be accorded with the national **Standards for Drinking Water Quality**, and the other municipal water will in accordance with **Standards for Municipal Water Quality** (CJ/T48-1999). The camp can be characterized as a housing estate, and the water quota could refer to **Design Code of Construction Water and Drain System** (GB50015-2003).

Drainage system: rainwater and wastewater separation system will be set. The rainwater will be collected by the ditch and discharge into the adjacent water body, otherwise the waste

water can not be discharge until treated meet the national waste water discharge standards. The maximal flow velocity of rainwater ditch will be designed in accordance with the flood prevention. The sewage system will be designed as unfilled flow, the maximal flow velocity, maximal design fill parameter; minimum flow velocity and minimum design gradient refer to *Design Handbook of Drainage*.

Sewage and construction wastewater: sewage tank will be designed and installed by contractor in accordance with the national design code in the construction camp. All wastewater from canteen will go through an oil screener before allowed discharge. Wastewater produced from the mixing station, material washing, and tunnel construction will be collected into settling tank. In particular, the wastewater from construction camps, even after the settling and oil/water separator treatment will still not be allowed to be discharged to Huangbohe, Xiangxihe and Shennongxi rivers directly. They can be discharged to the ditches, smaller creeks or irrigation channels first before into the above rivers.

At every construction camp, there will be at least one septic tank. The discharge from the tank is not allowed to be discharged directly into the nearby water body, but to be periodically transported away by water tank for concentrated treatment.

Municipal solid waste and construction waste. All solid waste from construction camps will be collected and stored on site. The storage area will have a cover to protect from weather and avoid direct contact with surface runoff. The contractors will be demanded to separate construction waste from municipal waste. Where possible, the construction waste will be recycled for land filling. Periodically, the municipal waste will be transported off site for disposal, by environmental sanitary authority if possible.

In really remote locations where authority pick up is not practical the contractors will be required to be buried the solid waste in a site selected approved by local EPB. Burning of solid waste in open air is strictly banned. If the construction solid waste such as the deposable lubricating oil, mineral oil, organic solvent, acid and alkali, oil paint belong to hazardous waste, it will be in accordance with the environmental standard, regulation and management policies of SEPA. The hazardous waste management, transportation, and disposal will be sent to the qualified operation entity to treatment and disposal in accordance with the relational regulation. Yichang city has several vendors which have the licenses and capability to handle and dispose hazardous waste.

The asphalt melting station will be equipped with flue gas control device, operation of asphalt melting will be in enclosed mode; cement and concrete will be mixed within an enclosed structure.

The construction site will be well planned including control of construction traffic. The roads frequently used by construction trucks, if near villages and other sensitive receptors will be water sprayed twice a day to suppress dust.

For the temporary occupation of land such as construction camps, the contractors will be required in the contracts to promptly reclaim the land and replant trees or shrubs as may be needed to restore its original status. If the land is farmer land before construction, the

contractors will be responsible to promptly restore the conditions suitable to restart agriculture on the site. All temporary facilities as well as waste materials will be dismantled and removed from the site. Any damaged or occupied drainage, irrigation and other agricultural infrastructure will be restored.

4.9.4 Tunnels Safety/ Environment during Construction

Key Environment Impact

- Lots of waste will occur during the construction of tunnels with total length of 61km. It may cause soil erosion and other environment problems(refer to 4.9.1);
- During the blasting for tunnel construction, it cause noise and vibration, which may cause geological problems like landslide, impact to construction workers as well as nearby animals and habitants;
- It will cause dust, emission from the construction equipment like trucks and may meet hazardous gas, which are negative to the health of construction workers;
- Waste water caused during the construction of tunnel may cause pollution to the downstream water body if there is no proper treatment;
- Traffic safety in the tunnel

Mitigation Measures

- Part of the waste will be used as the filling of embankment, so as to try best to meet the balance of filling and borrowing. As for the rest waste, before the construction of tunnels, the design team, client and local government have carefully selected the proper areas for the tunnel's waste, so as to minimize the land occupation and make full use of wasteland. Slope protections like retaining wall and green works are to be used to mitigate the environment impact.
- Small dosage blasting materials and pre-cracking blasting methods will be adopted. Noise insulation cover will be used if necessary. Proper blasting time will be arranged, and night time blasting are forbidden. Construction worker are required to wear masks and earmuffs.
- Proper ventilation system is required to satisfy the requirement of tunnel construction condition. Wet shotcrete is preferred to be used, so as to avoid dust. As for the hazardous gas area, instrument will be used to monitor the density, and relevant emergency plan will be developed by contractors.
- Sedimentation tanks will be installed to collect wastewater from tunnels. Any wastewater is forbidden to be directly discharged into the water body without treatment.
- Traffic signs and temporary traffic regulations should be applied in the tunnels. The movement for worker and equipments like trucks The specific appointed staffs will give guidance to the traffics in the tunnels.
- Trainings on safety and personal security will be provided to the tunnel workers and administration staffs.

4.10 Health and Wellbeing of Communities

4.10.1 Key Environmental Aspects

Based on the project EIA, health and well-being of communities may be affected by:

- Spread of disease due to poor house keeping and accumulation of domestic waste within the construction site;
- Stagnant water may result in mosquitoes breeding;
- Threats of spreading HIV / AIDS, as there will be a large construction force in the relatively remote areas during construction for a significant period time. This force is highly mobile and unsafe sex conduct could bring the HIV/AID risk to the local

communities.

- Affected living standard and income of local residents due to occupation of farmland.
- Traffic Safety

4.10.2 Mitigation Measures

- Provide disease prevention and control training to construction workers, particular epidemic diseases such as HIV and hepatitis
- Posters will be placed in and around the construction sites for disease control, for not only construction workers but also villagers and others in the areas.

HIV/AIDS intervention education program will be implemented under the project. The program is expected to be funded by the Bank. Other mitigation measures are:

- Provide disease prevention and control training to all construction workers, particular epidemic diseases such as HIV and hepatitis B prior to the start of the construction.
- Posters will be placed in and around the construction camps for disease control; additional posters will also be placed to the surrounding communities to show the villagers and others in the areas.
- Adequate protective gear such as condoms will be provided to workers at the construction camps;
- Leaflets, education seminars will be organized, in association with the local government and communities, to increase the awareness and knowledge on the HIV/AIDS.
- Periodical health check will be provided to construction workers to ensure their health and well being.
- At and near construction site, traffic signs will be set. Traffic safety education will be given to the contractors' staffs as well as nearby local people. Maintenance will be provided to the existing local roads.

4.11 Environmental Emergency Procedures

Environmental emergency procedures relate primarily to the event of accidental leaks, spills, emissions and other unforeseen impacts or issues. Events related to adverse weather conditions will be addressed through the Project Activity Safety Plan (PASP) as part of the Contractor's Safety Plan, which will be submitted to the CSE before commencement of project construction works. The Safety Plan will be reviewed on regular basis and updated if necessary. The PASP will include procedures such as the prevention of slope slide / soil erosion during the rainfall season.

In the event that accidental leakage or spillage of diesel/chemicals/chemical wastes takes place, standard response procedures will be followed immediately by the Contractor(s) such as:

- The person who has identified the leakage/spillage will immediately check if anyone is

- injured and will then inform the Contractor(s), CESC and CSE;
- The Contractor(s) will ensure any injured persons are treated and assess what has spilled/leaked;
 - Will the accidents / incidents generate serious environmental pollution or in the option of CSE, has the potential of resulting in serious environmental pollution problems (eg. spillage / leakage of toxic or chemicals, large scale spillage / leakage, or spillage / leakage into the nearby water bodies which are used for irrigation / portable water), the CSE immediate inform EPB;
 - In such cases, the Contractor(s) will take immediate action to stop the spillage / leakage and divert the spilled / leaked liquid to a nearby non-sensitive areas;
 - The Contractor(s) will arrange maintenance staff with appropriate protective clothing to clean up the chemicals/chemical waste. This may be achieved through soaking with sawdust (if the quantity of spillage/leakage is small), or sand bags (if the quantity is large); and/or using a shovel to remove the topsoil (if the spillage/leakage occurs on bare ground); and
 - Depending on the nature and extent of the chemical spill, evacuation of the activity site may be necessary.

Spilled chemicals must not be flushed to local surface drainage systems. Instead, sawdust or sandbags used for clean-up and removed contaminated soil will be disposed of by following the procedures for chemical waste handling and disposal already described.

The possibility exists for environmental emergencies of an unforeseen nature to occur during the course of the construction and operational phases of the project. By definition, the nature of such emergencies cannot be known. Therefore, the Contractor(s) will respond on a case-by-case basis to such emergencies and will initiate event-specific measures in terms of notifications and reactions.

The Contractor(s) will prepare a report on the incident detailing the accident, clean-up actions taken, any pollution problems and suggested measures to prevent similar accidents from happening again in future. The incident report will then be submitted to the CSE, CESC for review and keep in the records. The incident report will also be submitted to EPB, if required.

Most important of all, the Contractor(s) and all their workers working on the construction sites will be provided full and relevant training so that they are fully aware of the various possible emergency situations in construction activities, the danger and potential damages caused by the emergency to the environment and the people, as well as the above emergency response procedures. If needed, drills will be conducted that the emergency procedures will be followed.

4.12 Management of Contractor

It is recognized that contractors working on the project will be a key in environmental management, pollution control and impact mitigation during construction. A number of measures will be taken to ensure that the contractors will be aware of their responsibilities and obligations in environmental protection. These measures include

- The above mitigation measures will be included in the tendering documents for

contractors as qualification and selection criteria and eventually in the construction contracts so that they will be the contractual requirements for contractors working on the project. The main environmental mitigation measures which will be included in the tendering documents for contractors are presented in Annex IV.

- Contractors will be required to monitor their environmental activities and provide a diary on environmental performance on a daily or weekly basis. These records will be subject to supervision and review by the PMO and construction monitoring teams.
- All contractors will be required to provide at least one dedicated full time environmental staff on each section of the project roads. In environmental sensitive sections, the contractors will supply two full time environmental staff. These environmental staff will be trained by the training program first to be qualified for their job. No contracts will be deemed effective and started prior to completion of the environmental training.
- The contractors will be required to communicate and consult the communities where they work. An eye-catching public notice board will be erected in each road section to notice the public of the main construction activities at this particular site and construction duration. At the same time, the board will provide contact names and telephone numbers to the public to express their concerns and complaints about the construction activities.
- All contractors and CSE will be required to participate in a mandatory environmental training program prior to the start of construction onsite. The contents of the environmental training cover:
 - National and local environmental regulations and standard;
 - Technical guideline on environmental protection;
 - The EA documentation;
 - Environmental monitoring method and requirement, as well as the reporting procedure;
 - Mitigation measures;
 - Regulations for evaluation and protection of cultural heritage;
 - Emergency measures;
 - Long-term public consultation and response;
 - Obligation of the contractor to environmental protection.

In addition, the CSE is also responsible for the implementation of the mitigation measures. The requirements for the supervisory company in the environmental management will be included in the bidding document, thus the contract for the supervisory company. At least one full-time staff from the CSE is required to participate in the training in environmental management for contractors.

4.13 Communications and Continued Public Consultation

Communication and public consultation are a continued effort throughout the construction period of the Yiba expressway, through the following measures:

- All project sites will have an eye catching billboard, listing project information including but not limited to brief project description, construction time, main construction activities,

project manager name and telephone number, chief construction supervisor name and telephone number and invitation to the public to communicate to these site management staff on any concern they may have.

- Each contractor will be required to hold public meetings at the villages near their sites at least once a year. At the meetings, the site management will explain the construction activities and learn from the villagers on any concerns they may have and provide responses to their concern.
- PMO will also have a full time safeguard staff whose partial responsibility will receive public complaints on project construction and operation. The PMO staff member's name and contact number will be made know to the local communities through pamphlets and public meetings.
- PMO and contractors may visit from time to from key sensitive receptors such as schools and hospitals to understand any concerns they may have and how they feel about the impact of construction activities to the natural environments and their operations.
- All contractors will be required to conduct safety training to the local communities and local schools once a year.
- In preparation for special and high impact construction activities such as exploration, night time construction, the contractors will be required to visit the potentially affected communities to explain the activities and their impacts (e.g., safety risk, high noise, etc.), listen to the concerns from the communities and take appropriate and responsible measures to address the concerns raised.

5. Site Environmental Supervision

5.1 Compliance with Legal and Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in PRC which the construction activities are required to comply with.

All the works method statements submitted by the Contractor(s) to the CSE for approval will also be sent to the CESC for vetting to see whether sufficient environmental protection and pollution control measures have been included.

The CESC will review the progress and program of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.

The Contractor(s) will regularly copy relevant documents to the CESC so that the checking work can be carried out. The document will at least include the updated Work Progress Reports, the updated Works Program, and the application letters for different license/permits under the environmental protection laws, and all the valid license/permit. The site diary will also be available for the CESC's inspection upon his/her request.

After reviewing the document, the CESC will advise the CSE and the Contractor(s) of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the CESC's review concludes that the current status on license/permit application and any environmental protection and pollution control preparation works may not cope with the works program or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he/she will advise the Contractor(s) and the CSE accordingly.

Upon receipt of the advice, the Contractor(s) will undertake immediate action to remedy the situation. The CSE will follow up to ensure that appropriate action has been taken by the Contractor(s) in order that the environmental protection and pollution control requirements are fulfilled.

5.2 Site Supervision

The CESC will closely supervise the construction activities through site inspections and the CESC will carry out daily site walks and visual inspections to identify areas of potential environmental problems and advise the Contractor(s) to take immediately remedial /

preventive actions. The area of inspection will cover both the construction areas and the environment outside the site area that could be affected, directly or indirectly, by the site activities.

Regular joint environmental site inspections (e.g. weekly) will be organized by the CESC with participation from the CET and the CSE.

The CESC will keep a log-book of each and every circumstance or change of circumstances which may affect the environmental impact assessment non-compliance with the recommendations of the EMP or the project contract. The log-book will be kept readily available for inspection by all persons assisting in supervision of the implementation of the recommendations of the EMP and contract.

The CESC will make reference to the following information / documentations in conducting the inspection:

- The Contractor's environmental performance, EMP program, waste reduction, hazardous waste management and implementation of the required mitigation measures;
- Good practices and general environmental mitigation measures provided in this EMP;
- Compliance with the EMP requirements, contractual specifications and PRC legislation;
- Protection to the sensitive locations and control mechanism of the restricted areas;
- The Contractor's construction methodologies and condition of construction plant;
- Individual works methodology proposals which will include proposal on associated pollution control measures;
- Works progress and program;
- The adequacy and efficiency of the Contractor's pollution control measures / treatment facilities for minimizing environmental impacts,
- Landscaping and soil erosion controls;
- Location, management and pollution control at the waste / material storage areas, borrow pits and access roads; and
- Previous site inspection findings and results.

The Contractor(s) will update all relevant information of the construction contract for the CESC to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works will be timely submitted to the CSE and the Contractor(s) for reference and for taking immediate action.

The CESC will make reference to good practices and environmental mitigation measures in this EMP when completing the inspection report. In the event of non-compliance / discrepancy and / or exceedance of the environmental quality criteria, corrective actions required for the Contractor(s) will be documented. The Contractor(s) will follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the CESC to report on any remedial measures subsequent to the site inspections.

Weekly meeting will be organized after the weekly inspection at which time the Contractor(s) will report the progress of implementation of remedial actions identified during the previous inspections. Findings identified during the current inspection and the required improvements / remedial actions will be discussed. Minutes of meeting will be prepared by the CESC and distributed to all participants. The Contractor(s) will be required to implement the required measures within an agreed time.

5.3 Penalty System

In the compliance framework, if non-compliance with environmental regulations are discovered by CESC during the site supervision, contractors will be given a grace period to repair the violation, for example two weeks. If the contractor performs the repairs within the grace period, no penalty is incurred. However, if the contractor fails to successfully make the necessary repairs within the grace period, they will pay the cost for a third party to repair the damages.

5.4 Environmental Complaints

Complaints will be referred to the CESC for carrying out complaint investigation procedures. The CESC will undertake the following procedures upon receipt of complaint:

- a) log complaint and date of receipt onto the complaint database and inform the CSE immediately;
- b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- c) if a complaint is valid and due to works, identify mitigation measures;
- d) if mitigation measures are required, advise the Contractor(s) accordingly;
- e) review the Contractor's response on the identified mitigation measures, and the updated situation;
- f) if the complaint is transferred from EPB, submit interim report to EPB on status of the complaint investigation and follow-up action within the time frame assigned by EPB;
- g) undertake additional monitoring and verify the situation if necessary as well as review that any valid reason for complaint does not recur;
- h) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPB, the results will be reported within the time frame assigned by EPB); and
- i) Recording the complaint, investigation, the subsequent actions and the results in the monthly EMP reports.

During the complaint investigation work, the Contractor(s) and CSE will cooperate with the CESC in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor(s) will promptly carry out the mitigation. The CSE will ensure that the measures have been carried out by the Contractor(s).

6 Environmental Monitoring

6.1 Introduction

On the proposed project implementation phase, according to the requirement of the project, one environment monitoring consultant(EMC)will be entrusted by the client. The EMC will periodically go to he construction site to collect all the indicators at sensitive receptors (including the water, air, noise, etc). Such indicators will be submitted to the client and CESC as the reference to judge the performance of complying with the environment regulation. It is essential to design the monitoring program and monitoring frequency appropriately to be able to demonstrate both the overall performance of the project works as well as the short-term impact due to peak construction activities.

More specifically, as the integral and critical part of the EMP, the Environment monitoring program has the following objectives:

- Confirm the impacts forecasted in the EIA;
- Determine the actual extent of impact;
- Evaluate the effectiveness of the mitigation measures, implemented on site and
- Identify and justify the additional mitigation measures against unexpected impact as may be necessary during project implementation and operation.

6.2 Impact Monitoring

Impact monitoring during project construction period consists of routine measurements on environmental quality parameters at the designated monitoring locations and the regular site inspections. During the peak construction period or at the request from the client, the EMC will also carry out additional measurements using hand-held equipment in order to monitor short-term impact. Once non-compliance with environmental quality performance criteria is identified, additional monitoring will be carried out.

Details of the monitoring plan are given in Table 6-1 through 6-3 below.

Table 6-1 Monitoring Plan for Ambient Air Quality

Phase	Monitoring point	Parameter	Frequency	Duration	Timing
Construction	Asphalt mixing station and cement mixing station	TSP Asphalt smoke	4 times per station per year, ad hoc	2 days	During construction
	unpaved road, outlet/inlet of tunnels	TSP	4 times /year, ad hoc	2 days	During construction
	In tunnels	TSP, temperature	4 times /year, ad hoc	2 days	In construction

Phase	Monitoring point	Parameter	Frequency	Duration	Timing
	Guanzhuang Primary School, Gaolan Primary School, Yangzhou Zigui Primary School and Xiadengjiafan	TSP	4 times /year, but actual frequency is subject to the project progress	5 days	According to technical specifications
Operation	In tunnels longer than 1km	CO,NO ₂	2 times/year	5 days	According to technical specifications
	Guanzhuang Primary School, Gaolan Primary School, Yangzhou Zigui Primary School and Xiadengjiafan	NO ₂ TSP	2 times/year	5 days	

Table 6-2 Monitoring Plan for Acoustic Quality

Phase	Monitoring Sites	Parameter	Frequency	Lasting time	Sampling time
Construction	Lianghekou, Chiqiping, Yanjiahe, Yuquantan, Huangjiahe, Zaojiaoshu, Qinjiaya, Wangjiayuanzi, Xiadengjiafan, Guanzhuang Primary School	Leq, A	4 times/year, ad hoc	2 days	One time in the morning and in the night
Operation	In tunnels	Leq, A	2 times/year	2 days	One time in the morning and in the night
	Guanzhuang Primary School, Yangjiahe, Xiadengjiafan, Gaolan Primary School, Yangzhouzigui Primary School	Leq, A	2 times/year	2 days	

Table 6-3 Monitoring Plan for Surface Water Quality

Phase	Monitoring point	Parameter	frequency	Duration	Timing
Construction	Huangbo River, Wudu River, Gaolan River, Xiangxi River and Shennongxi River	Permanganate index, SS, oil	4 times/year with each for consecutive during bridge construction	2 days	One each time in morning and afternoon
Operation	WWTW of service zone	COD, NH ₃ -N, SS, oil	2 times/year	2 day	

In addition, contractors and supervision engineers will carry out the monitoring program on the daily or as needed basis:

- Monitoring of the noise level at the sensitive receptor by portable monitoring kit; the monitoring will take place during the heavy construction activities, such as excavation, piling, power generation, material transportation and night time construction, if any and will be conducted near villages, schools, and other sensitive receptors along the project alignment.
- Visual inspection to check the air-borne dust, during demolition, bulk material handling and storage, transportation routes near the villages;

- Visual inspection to check the water quality in the receiving rivers, fish ponds and lakes affected by the construction activity such as turbid, smell, color, fish kills, etc. particular at the receiving areas of the water bodies from the construction sites and construction camps.

The results will be included in formal written reports separately and submitted for review by CESC and PMO on monthly basis. In case of unexpected impact occurs, the construction team will report immediately to the CESC, PMO .

6.3 Monitoring Equipment and Records

The equipment and test methods to be adopted for the monitoring works by construction team and supervision team will comply with the requirements stipulated in the relevant environmental quality standards. The monitoring equipment will be calibrated regularly and calibration of equipment is required prior to the in-site measurement. All the calibration records and monitoring results will be submitting to the CESC. CESC will keep copies of all site records, reports, approvals, statutory documents, certificates, licenses or permits in relation to environmental matters for recording purposes.

Any changes to the monitoring equipment and monitoring methodology will be approved by the CESC, if required, in advance. Records will be kept on site where possible for each project activity for easy access during site supervision or enquiries. Table 6-4 sets out the records that will be maintained by the CESC in each respective activity site office below.

Table 6-4 Typical Environmental Records to Be Maintained in Construction Phase

Category	Record
General	<ul style="list-style-type: none"> • Environmental training records (e.g. attendance records for environmental awareness training, topics covered); • Environmental permits / licenses; • Site diary and site inspection records; • Environmental log-book, complaint log-book and environmental quality limits exceedances notification forms; • Construction program and schedule; • Equipment maintenance / repair records; • Correspondence with concerned parties and other parties in relation to environmental matters; • HIV/AIDS information; • Meeting minutes.
Noise Control	<ul style="list-style-type: none"> • Updated list of Powered Mechanical Equipment currently on-site; • Details of examination periods and the results if any environmental sensitive receivers such as local schools, hospitals, resident villages may be affected.

Category	Record
Water Pollution Control	<ul style="list-style-type: none"> Plans of construction site drainage; Records of quantities of collected spent bentonitic slurries and/or drilling mud for reuse, reconditioning and disposal; Records of maintenance and cleaning schedules for sediment and oil/grease traps; Records of toilet sewage disposal (where connection to existing foul sewer main is not undertaken); Records of the wastewater final discharge quantity and the pollutants concentration.
Waste Management	<ul style="list-style-type: none"> Copies of relevant valid licenses as provided by the employed waste haulers and waste collectors; Records of quantities of reused and recycled waste; Waste disposal records.
Atmosphere	<ul style="list-style-type: none"> Route and the program of the construction material transportation; Mitigation measures on the atmosphere effect such as sprinkling; The monitoring results of the atmosphere quality.
Culture Property	<ul style="list-style-type: none"> Drawings of the identified Culture Property sites; Log of construction near the Culture Property sites.
Land Contamination	<ul style="list-style-type: none"> Preliminary analysis results of materials suspected to be contaminated (if any).
Ecological Resources	<ul style="list-style-type: none"> Records of sensitive ecological resources locations and associated protection plan.
Dangerous Goods (DG) Storage	<ul style="list-style-type: none"> Drawings of DG stores; Log of DG inventories and consumption.
Chemical Storage	<ul style="list-style-type: none"> Drawings of chemical storage facilities; Log of chemical inventories and consumption.
Environmental Emergency	<ul style="list-style-type: none"> Emergency incident reports.
Corrective and Preventive Action	<ul style="list-style-type: none"> Corrective and Preventive Action Request records.

7. Personnel Training

The success of environmental management for the proposed project relies on the knowledge, and experience of the personnel involved in environmental management. As contemporary methodologies and approach towards environmental management for road construction and operation are still new to the agencies in the local department concerned, extensive training will be needed. Oversea and domestic training will plan to stakeholders. International training will be arrangement in the countries which be rich of road construction and operation management experience. Domestic training will conducted by the experts from the universities, research institutes and professional consultants.

Sum up the formal projects experience, it is necessary to improve the environmental protection self-check consciousness of the construction contractor and supervision units. It is also promote the environmental protection consciousness and improve the supervision of the management authorities. It is necessary to provide the training course in order to enhance their self-check.

The personnel training will cover environmental regulations, standards, and responsibilities, etc. The details of the personnel training program are presented in Table 7-1.

Table 7-1 Personnel Training Program

Type	Feature	Description	Staff	Training time	Time	Cost (RMB)
Overs ea	Management	Environment management and related regulations	One each from HPCD, Expressway Company, WBFPMO and design institute	4 person months	2009	192,500
Local	Protection	Once a year for: •EMP •Environmental monitoring and report •Emergency Plan •Cultural property protection •Biodiversity protection	3 persons from contractor at each road section and supervisory department	10 person months	2008-2010	60,000
	Supervision	Site supervision, methodology, procedures, etc. in three sessions 60 people each.	Each 2 people from management sub-center and expressway company	18 person months	2008-2010	108,000
Total				32 person months		360,500

8. Making and Reviewing of Implementation Schedule for Environmental Mitigation Measures

Major environmental issues have been described and impact mitigation measures developed and presented above. The general implementation schedules are also indicated as to the design stage which is the project preparation period, construction stage and operation stage. For those in the design stage, they will be completed by design institutes prior to the start of the construction. The results of the design as may be appropriate will be included into the bid documents for contractors. For construction stage mitigation measures, some will be implemented prior to the start of construction such as training of contractor and construction supervision companies. Contractors will be request to develop a detailed and site specific mitigation implementation schedule at the beginning of the construction. This request will also be included in the contractor tendering document. The main environmental mitigation measures which will be included in the tendering documents for contractors are presented in Annex IV. This schedule will be reviewed by the PMO.

The Contractor(s) will ensure all the mitigation measures required for the project works are fully implemented throughout the project construction period. The CESC will supervise the overall performance of environmental protection of the project, duties and responsibilities performed by the Contractor(s), and CSE, respectively, and report findings to the PMO for necessary actions.

9. Reporting

9.1 Contractor's Project Document Submissions

As discussed in above, the Contractor(s) will need to prepare a number of documentations for the project works. The document submissions generally required by the Contractor(s) include:

- EMP Implementation Plan (including works method statements);
- Waste Management Plan;
- Landscape Implementation Program and Compensatory Planting Plan
- Site Drainage Management Plan

All the submissions from the Contractor(s) will be verified by the CESC as conforming to the project requirements. Approval from the CSE will also be obtained. Any changes to the submitted documents will be reviewed and approved by the CSE and CESC. All the documents will be regularly updated.

9.2 EMP Reports

The results and findings of all EMP works required for the project will be recorded in the monthly EMP reports prepared by the CESC. Simplified weekly reports, especially in case of non compliance issues will also be prepared. CESC will also provide briefings (as requested) to environmental agencies and lending institutions. The EMP report will be endorsed by CSE and submitted within two weeks after the end of each reporting quarter, with the first report due the month after construction commences.

Before submission of the first EMP report, the CESC will liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

The monthly EMP report will include at least the following:

- (a) 1-2 pages executive summary;
 - Breaches of environmental compliance levels
 - Complaints Log
 - Notifications of any summons and successful prosecutions
 - Reporting Changes
 - Future key issues

(b) Basic Project Information

- Project organizations including key personnel contact names and telephone numbers
- Construction program
- Management structure
- Works undertaken during the quarter

(c) Environmental Status

- Work undertaken during the quarter with illustrations (such as location of works and activities)
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring stations

(d) Summary of EMP requirements

- All monitoring parameters
- Environmental compliance levels
- Event-Action Plans
- Environmental mitigation measures, as recommended in the project EIA and EMP report
- Environmental requirements in contract documents

(e) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA and EMP report, summarized in the implementation schedule.

(f) Monitoring Results

To provide monitoring results together with the following information:

- Monitoring methodology
- Name of laboratory and types of equipment used and calibration details
- Parameters monitored
- Monitoring locations (and depth)
- Monitoring date, time, frequency, and duration.
- Weather conditions during the period.
- Any other factors which might affect the monitoring results.
- QA/QC results and detection limits

(g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all noncompliance (exceedances) of the environmental quality performance limits (AL / LL Levels).
- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary.
- Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary.

- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures.
 - Description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance.
- (h) Others
- An account of the future key issues as reviewed from the works program and works method statements.
 - Advice on the solid and liquid waste management status.

9.3 Data Keeping

The site document such as the raw monitoring field records, laboratory analysis records, videos, photos etc. are generally not required to be included in the quarterly EMP reports for submission. However, the document will be well kept by the CESC and be ready for inspection upon request. All relevant information will be clearly and systematically recorded in the document.

The monitoring data will also be recorded electronically if possible, and the software copy can be available upon request. All the documents and data will be kept throughout the project construction and maintenance periods, and will be made available to the Project Proponent upon request within one year after the completion of the project.

10.EMP Budget

The cost estimated for environment management covers both the capital cost and recurring cost, including monitoring cost, for environmental facilities. All of the cost has been included in the overall budget of the project.

10.1 Cost Estimate for Environmental Protection

The detailed budget is shown in Table 10-1 below.

Table 10-1 Cost Estimate for Environmental Protection

Item	Mitigation Measures		Quantity	Cost (10 ⁴ RMB)	Remark
Noise	Construction phase	Ventilated noise insulation window	309 households and 1 school	166.5	Guanchong, Sunjiawan, Lianghekou, Chiqiping, Yuquantan, Nanbiandadui, Shibazi, Qinjiaya, Yangjiahe, Dengjiaping, Zaojiaoshu, Sigou, Heba, Najiyahe, Wanlitan, Songshubao, Wangjiayuanzi, Shijiaba, Shujiachao, Lijiachao, Houbaisi, Gaolan school
		Noise insulation corridor	1 school	16.0	Yangzhou-Zigui school
	Operation phase	Noise barrier	5950m	1941.5	Guanzhuang school, Longwangdong, Xiping, Yanjiahe, Huangjiahe, Qinjiaya, Xiadengjiagan, Shangdengjiafan
		Planting trees	1 set	3.0	Qinjiaba
Surface water	Septic tanks in construction site		-	20	Construction sites
	Secondary wastewater treatment in service zone		2 sets	140	2 service zones
	Secondary wastewater treatment in parking zone		2 sets	80	2 parking zones
	Secondary wastewater treatment in management zone		1 set	30	Huanghua Management Center with toll
	Septic tank in toll station		6 sets	30	6 toll station
	Surface run-off collection device on bridge deck over Huangbo River, Xiangxi River and Shennongxi River		3 sets	240	Analogue cost
	Rails enhancement and speedlimit signs on bridge deck over		1160 m	174	1500 RMB/m

Item	Mitigation Measures	Quantity	Cost (10 ⁴ RMB)	Remark
	Huangbo River, Xiangxi River and Shennongxi River			
	Emergency measures	1 set	66.3	Analogue cost
Air	Water spray vehicle	-	-	By contractor
Eco-environment	Soil conservation measures in excavation area, filling area, tunnel and bridge sites, spoil tipping area, and temporary works site	-	9729.84	Subject to soil conservation plan
	Temporary ditch, retaining wall land settling tank	-		
	Materials to be used in rain season	—		
	Greening works design	-	4977.65	
geological park	All the protection both in construction and operation stages	-	316.445	the Feasibility Study Report of Three Gorges National Geological Park
Cultural property	Discovery and relocation of underground cultural relics	-	193	Cultural relics report
Environmental management	Implementation of EMP in construction phase	4.5 years	100	
	Environmental supervision in construction phase	4.5 years	195.7	
Environment monitoring	Implementation of monitoring plan in construction phase	4.5 years	180	400,000 RMB/year
	Implementation of monitoring plan in operation phase	-	-	Included in the operating cost of the expressway company
Personnel training			36.05	
acceptance	Inspection and acceptance of mitigation measures	—	80	
Other	Contingency	—	200	
Total			18915.985	

10.2 Environmental facility annual operation cost

In the operation stage, regularly environmental activities operation cost estimated is shown in table 10-2.

Table 10-2 Environmental facility annual operation cost estimation

No.	Item	Cost (10 ⁴ RMB)	Remark
1	Monitoring cost in operation stage	40.0	
2	Staff training cost	2.0	
3	Energy and medical consumption	8.0	
4	Environmental facilities operation, maintain and update	20.0	Wastewater treatment facilities

5	Staff salary of environmental facilities operation and maintain	3.6	
6	Vegetation plant maintain	20.0	
Sub-total		93.6	
Total (3 years)		280.8	

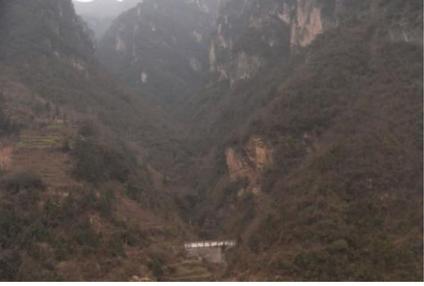
The total cost of the proposed project is 15.13926 billion. The total estimated cost for the mitigation and environmental management is RMB 191.96785 million, the mitigation and environmental management cost will be about 1.27% of the total.

Annex I Key Environmental Alignment Sheet for the Yiba Project

NO.	Location	Problem	Mitigation Measures	Included in	Implementing Organizations	Responsible Organizations	Schedule
1	K10+250 Baihuguan relics 	Sites age was the Neolithic age, the conservation area of the relic is 3000 square meters, the project concerned area is 5000 square meters, the road will go through the middle of the site, the construction will destroy the integrity of the relic	Archaeological excavation for the Baihuguan site: 3 months before the construction , go to the excavation site and make the preparation work , carry on the field excavation. During the excavation period, first to collect all the relic samples , onsite drawing ,photographing and classification on the construction site, second, bring the relic into the indoor , and carry on the cleaning, repair and identification; third, make the report of the excavation process and the relic information, and send it to publish on the provincial publication or above standard. Finally, send the relic to the local museum for exhibition.	EIA, Culture relic protection report	Hubei institute of cultural property and archaeology	World Bank PMO of HPCD	before the construction
2	K19+700 40m south of the K19+700 Guanzhuang primary school 	Noise made by main line bridge construction will affect the primary school; A9 service road(using the existing road) going pass the school gate, the noise and dust made by the vehicle and construction will also affect the school's environment, and to the safety of the students.	No proposed or planned abandoned dreg site and casting yard around the school Set the loudness barrier on the south of K19+600~K19+770 with the length of 170m, height of 3.5m, it is predicted to reduce 7dB	EIA, Design document	Design unit and contractor	World Bank PMO of HPCD	Design stage
		Affected by the traffic noise of the proposed project, 1 layer and 2 layer will not exceed the standard in the short, middle and long term due to they were in the sound shadow region, 3, 4, 5 layer will exceed the standard, the maximum is 6.6dB.	No casting yard ,mixing plant and storage yard for construction materials around the school. Water the service road, and set the warning board near the school for the students' safety. Strengthen the construction management, prohibit loudness noise construction at night, no piling operation. Try best to use low-noise machines, maintenance of the machine.	EIA	contractor	World Bank PMO of HPCD	construction stage
3	K30+050 Huangbai River 	Proposed project will go across the Huangbai River by the Extra long bridge, Huangbai River is drinking water source-second protection zone, bridge construction may affect the water quality Transportation of hazardous good on the bridge may cause accident.	When design the bridge, it should be increase the caution sign remind the driver be cautious to drive, and set the monitoring equipment, enhance crashworthy design on the both sides of the bridge, improve the runoff collection system, adopt the special pipeline to collect the road runoff into the tank on the both side of the bridge. The spoil disposal sites and the prefabrication sites are prohibit to be set in the area of 200m on the both sides of the Huangbo River.	EIA, Design document	Design unit and contractor	World Bank PMO of HPCD	Design stage
			Within 200m around both sides of the Huangbai River, it is prohibited to set mixing plant, storage yard for construction and workers' camp Strengthen the construction management, no littering of the dreg, no destroy of the plants, temporary retaining wall should be set along the river side	EIA	contractor	World Bank PMO of HPCD	construction stage
4	K33-K33+500 Xiaofeng tour area Baren hanging coffin scape 	After the implement of the reinforce protection plan proposed by the relic report , the stability of the cliff body can be guaranteed, thus the Baren Hanging Coffin landscape can not be destroyed. Proposed project construction will not affect the travelers go up the mountains for hanging coffin touring, however will keep out part of the sight from the bottom of the mountains. There are two sites of hanging coffin in Xiaofeng, the big guanmu cliff can take the place of the small guanmu cliff. The temporary storage yard, construction service road and construction camp , the workers' trash may affect the environment of the scenic area.	Through the optimization of part of the line, we take the form of bridge to go through the Xiaoguanmu cliff instead of tunnel crossing it, thus will reduce the vibration effect during the construction. Landscape design for the bridge and mitigate the effect made by it. No newly built service road, no planned abandoned dreg site and casting yard with the scenic area.	EIA, Design document	Design institute	World Bank PMO of HPCD	Design stage
			No mixing plant, storage yard for construction materials and workers' camp within the scenic area. Strengthen the construction management, no destroy of the plants, no littering, set the retaining wall along the river side, the construction site should build the retaining wall fence and beautify it.	EIA	Contractor	World Bank PMO of HPCD	Construction stage

NO.	Location	Problem	Mitigation Measures	Included in	Implementing Organizations	Responsible Organizations	Schedule
5	K33+050 195m south of the K34+200 Xinping Suspended Tombs 	Provincial relic protection unit; the distance from recommended line middle line of the bridge to Xiaoguanmu hanging coffin is 195m, line K32+050~K34+050 go through the relic conservation area, K31+550 ~ K34+550 go through the defined construction control zone. The construction and operation of the project may affect the stability of the hanging coffin.	Through the optimization of part of the line, we take the form of bridge to go through the Xiaoguanmu cliff instead of tunnel crossing it, thus wil reduce the vibration effect during the construction. Hubei institute of cultural property and archaeology compiled <Shanghai-Chengdu high way Hubei Yichang-Badong area Xinping Suspended Tombs ancient tombs conservation plan > in April,2006.	EIA, Culture relic protection report, Design document	Hubei institute of cultural property and archaeology, design units	World Bank PMO of HPCD	Design stage
			Reinforce treatment for the cliff tomb itself and around area, the treatments are divided into physical and chemical, the physical treatment includes support slope construction, the chemical treatment includes wipe the reinforce reagent on the crack area of the cliff. Make scientific investigation of the cliff tomb and around, collect the concerned information. Adding equipment for monitoring of cliff tomb variations, and make specific monitoring management system.	EIA, Culture relic protection report, Design document	Hubei institute of cultural property and archaeology	World Bank PMO of HPCD	Before construction
			Direct damage should be avoided during the construction, avoid bursting, heavy vibrating pile driver which may cause huge vibration and sound wave , in order to prevent hanging coffin fall down due to the unsteady of the cliff body.	EIA	Contractor	World Bank PMO of HPCD	Construction stage
6	K51+000~K54+400 Yeren valley drift scape 	In the high water season of Wudu river, the drifting by rubber raft can be played there. The proposed project will affect the Yeren valley drift development to some extent. The proposed project is in the K51+000~K54+400 beyond the Wudu River, and it may stop the drift in this area.	The proposed project K51-K53 takes the tunnel plan of detouring the key area of the Yeren valley –Qili Gorge which will make 70% of the drift area will not be affected. No abandoned dreg site, casting yard within the scenic area.	EIA, Design document	Design institute	World Bank PMO of HPCD	Design stage
			No mixing plant, storage yard for construction materials and workers' camp within the scenic area. Strengthen the construction management, no destroy of the plants, no littering, set the retaining wall along the river side, the construction site should build the retaining wall fence and beautify it.	EIA	Contractor	World Bank PMO of HPCD	Construction stage
7	K30-K65 Wudu River 	The proposed project will go through Wudu River many times, some parts of the road will go by bridge, due to the bridges construction near the river, the bridge pier foundation construction will disturb the river bottom which will add the suspended substances, especially the drilling dregs during the construction will cause silting of the lower reaches of the river, and pollution to the water area as well.	The construction camp or site should keep away from the water body and set the retaining wall, if the site is have to near the water body, the domestic wastewater and construction wastewater(the washing water of sand etc) produced is prohibited to discharge directly into the water body. No construction site set in the river way, and material piling up as well. Strengthen the construction management, no littering of construction materials into the water body. The domestic waste and construction material waste should be classified collected, the waste material should be recycled during the construction, other waste should pile up centralized, and contact the sanitary department to clean and transportation.	EIA	Contractor	World Bank PMO of HPCD	Construction stage

NO.	Location	Problem	Mitigation Measures	Included in	Implementing Organizations	Responsible Organizations	Schedule
8	K75-K85 Ecological sensitive area 	<p>The proposed section located in the good ecological environment, and the wildlife around this area is relatively more than other areas. It is potential distributing the <i>Mivus korschun lineatus</i>, <i>Falco tinnunculus</i>, which belong to the list of CITES, but no species belongs to the IUCN Red List of Threatened Species.</p> <p>The proposed project adopted the tunnels and the bridges, it is almost have no effect on the habitat the <i>Mivus korschun lineatus</i>, <i>Falco tinnunculus</i> But the noise and the vibration from the tunnel construction will have effect on the protective wild animal above-mentioned. The effect area will be 500 m- 1000 m away from the middle line of the proposed project route.</p>	<p>In the design document, it is try the best to reduce the woodland acquisition, the bridges and the tunnels are preferred to be used. The access road, spoil disposal sites should be near the main road.</p>	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
		<p>It should be strict construction management , prohibit dispose the spoil unbending, destroy vegetation, temporary protective wall will be set on the side of the river. The construction schedule should be optimized avoiding the wild animal activities peak period. During the construction at the sections of K75-K85, blasting operation will be avoided from early morning(before 6:00AM) and late night(after 8:00PM). It is noticed that the nature vegetation on the outlet of the tunnel should be protected, and plant some local arbor in order to reduce the human activities impact, and recover the nature environment as soon as possible.</p>	EIA	Contractor	World Bank PMO of HPCD	Construction stage	
9	K84-K97 Nandu River 	<p>The proposed project will go through Nandu River many times, some parts of the road will go by bridge, due to the bridges construction near the river, the bridge pier foundation construction will disturb the river bottom which will add the suspended substances, especially the drilling dregs during the construction will cause silting of the lower reaches of the river, and pollution to the water area as well.</p>	<p>The under-water construction of the bridge should in the period of low-level or middle level of the water.</p> <p>The construction camp or site should keep away from the water body and set the retaining wall, if the site is have to near the water body, the domestic wastewater and construction wastewater (the washing water of sand etc) produced is prohibited to discharge directly into the water body. No construction site set in the river way, and material piling up as well.</p> <p>Strengthen the construction management, no littering of construction materials into the water body.</p> <p>The domestic waste and construction material waste should be classified collected, the waste material should be recycled during the construction, the waste should be piled up centralized, and contact the sanitary department to clean and transportation.</p>	EIA	Contractor	World Bank PMO of HPCD	Construction stage
10	K95+500-K97 Gaolan Scenic Spot Wofu Mountain Scenic Spot 	<p>The existing scenic spot located in the existing Yixing Road, and the vision angle is more than 30 °. The proposed project located higher than the line of sight, and the vision angel is 6 °, it will have slight effect on the Wofu Mountain Scenic Spot.</p> <p>On the construction phase, the temporary material pile sites, access road, construction camp and solid from the construction staff will have effect on the landscape.</p>	<p>In the design document, the proposed section should be away from Yixing Road, and reduce the elevation.</p> <p>This section includes the Gaolan interchange, the landscape should be optimized designed.</p>	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
		<p>The mixture stations, construction material pile sites and the construction camps are prohibited to be set in the scenical area.</p> <p>It should be strict construction management , prohibit dispose the spoil unbending, destroy vegetation. The temporary protective wall will be set and beautified on the side of the river and in the construction camps.</p>	EIA	Contractor	World Bank PMO of HPCD	Construction stage	

NO.	Location	Problem	Mitigation Measures	Included in	Implementing Organizations	Responsible Organizations	Schedule
11	K96 + 000 north 80m Gaolan elementary school 	The noise from the main road section, the interchange and the ramp will have some effect on the school. The blasting from Gaolan Tunnel will have effect on the school. The access road which is updated from the existing road of the section C2 will across the school gate. The noise will effect on the student and their safety. The main road section, inter change and the ramp of the proposed project are effected by the transportation noise. The maximal noise exceed the standard by 8.4dB, and the noise in the daytime is in accordance the standard.	The spoil disposal sites, prefabrication sites are prohibited designed around the schools. The aeration sound insulation windows will set in the teaching building, and the noise reduction is expected achieve 15dB.	EIA, Design document	Contractor	World Bank PMO of HPCD	Design stage
			The mixture station, construction material pile sites are prohibited designed around the schools. The access road will be water spraying regularly, the caution sign will be set near the school. Enhancing the construction management, the construction of high noise, especially the piling is prohibited in the night. The low noise equipment will be adopted, and the equipment should be maintained well. The prefabrication sites, mixture station, construction material pile sites are prohibited set around the school.	EIA	Contractor	World Bank PMO of HPCD	Construction stage
12	K97-K101+600 Ecological Sensitivity Area 	The proposed section located in the good ecological environment, and the wildlife around this area is relatively more then other areas. It is potential distributing the <i>Mivus korschun lineatus</i> , <i>Falco tinnunculus</i> , which belong to the list of CITES, but no species belongs to the IUCN Red List of Threatened Species. The proposed project adopted the tunnels and the bridges, it is almost have no effect on the habitat the <i>Mivus korschun lineatus</i> , <i>Falco tinnunculus</i> But the noise and the vibration from the tunnel construction will have effect on the protective wild animal above-mentioned. The effect area will be 500 m- 1000 m away from the middle line of the proposed project route.	In the design document, it is try the best to reduce the woodland acquisition, the bridges and the tunnels are preferred to be used. The access road, spoil disposal sites should be near the main road.	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
			It should be strict construction management , prohibit dispose the spoil unbending, destroy vegetation, temporary protective wall will be set on the side of the river. The construction schedule should be optimized avoiding the wild animal activities peak period. During the construction at the sections of K97-K101+600, blasting operation will be avoided from early morning(before 6:00AM) and late night(after 8:00PM). It is noticed that the nature vegetation on the outlet of the tunnel should be protected, and plant some local arbor in order to reduce the human activities impact, and recover the nature environment as soon as possible.	EIA	Contractor	World Bank PMO of HPCD	Construction stage
13	C4K113+400 Xiangxi River 	The proposed project cross the Xiangxi river which classified as Class II via the super bridge, the bridge construction will have some impact on the water quality. There is the potential risk when transport the hazardous goods on the operation stage.	When design the bridge, it should be increase the caution sign remind the driver be cautious to drive, and set the monitoring equipment, enhance crashworthy design on the both sides of the bridge, improve the runoff collection system, adopt the special pipeline to collect the road runoff into the tank on the both side of the bridge. The spoil disposal sites and the prefabrication sites are prohibit to be set in the area of 200m on the both sides of the Xiangxi River.	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
			The mixture stations, construction material pile sites and the construction camps are prohibited set in the 200 m area around the Xingxi River, except the necessary bridge construction. It is should be strict construction management, prohibit dispose the spoil unbending, destroy vegetation, and the temporary protective wall should be set on the river bank.	EIA	Contractor	World Bank PMO of HPCD	Construction stage
14	C4K113+700 Pingyikou Tombs 	It is the cultural relic from the end of the Dynasty Donghan. The Tombs is general protected, the area is 3000 m ² . The original K alignment cross the Tombs in north, the pile number is K113+700. The C4 alignment is cross the Tombs.	The proposed C4 alignment avoiding the Pingyikou Tombs.	EIA, Design document, Culture relic protection report	Design Institute	World Bank PMO of HPCD	Design stage

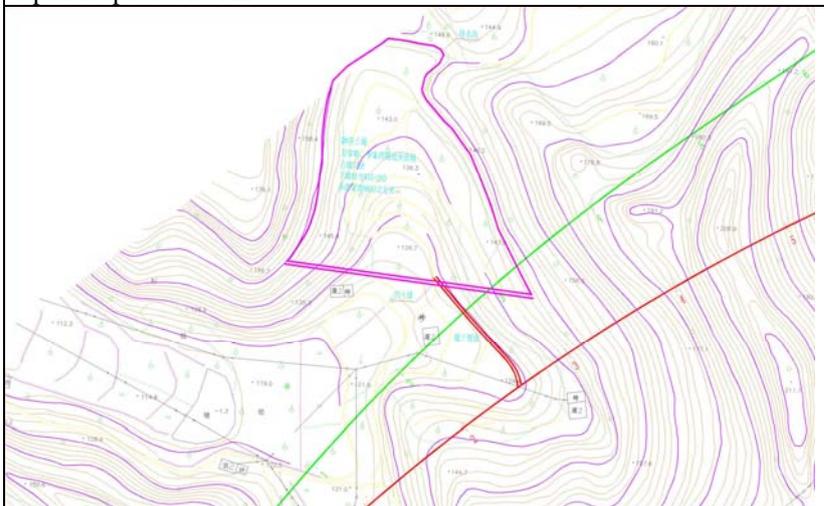
NO.	Location	Problem	Mitigation Measures	Included in	Implementing Organizations	Responsible Organizations	Schedule
15	K118+100west 80m Zigui Yangzhou primary school 	<p>The noise from the main road section, the interchange and the ramp will have some effect on the school. The access road which is updated from the existing road of the section C7 will across the school gate. The noise and dust pollution will effect on the student and their safety.</p>	<p>The spoil disposal sites, prefabrication sites are prohibited set around the school. The noise barrier with the height of 3.5m will be set in the south of the section from K19+600 to K19+770, the total length is 170m. It is expected to reduce 7dB noise.</p>	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
		<p>The first and second floors will be effect by the transportation noise from the proposed project. In the initial stages of operation, it will be satisfied the standard, but in the middle of operation, it is predicted exceed the standard.</p> <p>The noise on the 3rd and 4th floors of the teaching building is predicted exceed the standard. The maximal noise on the 4th floor is predicted exceed the standard by 7.4dB.</p>	<p>The mixture station, construction material pile sites are prohibited designed around the schools. The access road will be water spraying regularly, the caution sign will be set near the school.</p> <p>Enhancing the construction management, the construction of high noise, especially the piling is prohibited in the night. The low noise equipment will be adopted, and the equipment should be maintained well. The prefabrication sites, mixture station, construction material pile sites are prohibited set around the school.</p>	EIA	Contractor	World Bank PMO of HPCD	Construction stage
16	K120-K144 Ecological Sensitivity Area 	<p>The proposed section located in the good ecological environment, and the wildlife around this area is relatively more then other areas. It is potential distributing the <i>Mivus korschun lineatus</i>, <i>Falco tinnunculus</i>, which belong to the list of CITES, but no species belongs to the IUCN Red List of Threatened Species.</p>	<p>In the design document, it is try the best to reduce the woodland acquisition, the bridges and the tunnels are preferred to be used. The access road, spoil disposal sites should be near the main road.</p>	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
		<p>The proposed project adopted the tunnels and the bridges, it is almost have no effect on the habitat the <i>Mivus korschun lineatus</i>, <i>Falco tinnunculus</i>. But the noise and the vibration from the tunnel construction will have effect on the protective wild animal above-mentioned. The effect area will be 500 m- 1000 m away from the middle line of the proposed project route.</p>	<p>It should be strict construction management , prohibit dispose the spoil unbending, destroy vegetation, temporary protective wall will be set on the side of the river. The construction schedule should be optimized avoiding the wild animal activities peak period. During the construction at the sections of K120-K144, blasting operation will be avoided from early morning(before 6:00AM) and late night(after 8:00PM). It is noticed that the nature vegetation on the outlet of the tunnel should be protected, and plant some local arbor in order to reduce the human activities impact, and recover the nature environment as soon as possible.</p>	EIA	Contractor	World Bank PMO of HPCD	Construction stage
17	K159+500~K161+500 Shennongxi Scenic Spot 	<p>On the construction phase, the temporary material pile sites, access road, construction camp and solid waste from the construction staff will have some effect on the landscape.</p>	<p>The adverse impact on the scenical area should be minimize when the exact route ascertain. The viaduct will be used when the proposed road cross the scenical area. The style of the bridge will be designed harmonious with the scenical spot, and optimizing the landscape design, make it as a new artificial landscape.</p> <p>It is prohibited to construct the new access road, and the spoil disposal sites, prefabrication sites are prohibited to set in the scenical area.</p>	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
		<p>The proposed project will have no effect on the landscape of the Shennongxi scenic spot, otherwise it will be a new artificial landscape.</p>	<p>The mixture stations, construction material pile sites and the construction camps are prohibited to set in the scenical area.</p> <p>It should be strict construction management, prohibit dispose the spoil unbending, destroy vegetation, temporary protective wall will be set and beautified on the side of the river and the construction camps.</p>	EIA	Contractor	World Bank PMO of HPCD	Construction stage

NO.	Location	Problem	Mitigation Measures	Included in	Implementing Organizations	Responsible Organizations	Schedule
18	K160+500 Shennongxi 	The proposed project cross the Shennongxi which classified as Class II via the super bridge, the bridge construction will have some impact on the water quality. There is the potential risk when transport the hazardous goods on the operation stage.	When design the bridge, it should be increase the caution sign remind the driver be cautious to drive, and set the monitoring equipment, enhance crashworthy design on the both sides of the bridge, improve the runoff collection system, adopt the special pipeline to collect the road runoff into the tank on the both side of the bridge. The spoil disposal sites and the prefabrication sites are prohibit to be set in the area of 200m on the both sides of the Shennongxi.	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
			The mixture station, construction material pile sites and the construction camps can not be set in the area of 200m on the both sides of the Shenlongxi. It is should be strict construction management, prohibit dispose the spoil unbending, destroy vegetation, and the temporary protective wall will be set on the side of the river.	EIA	Contractor	World Bank PMO of HPCD	Construction stage
19	K162+390 section left 200m, Shujiacao No.1 sinkhole 	The proposed project is near with the sinkhole, if the construction is not strict management, spoil and the wastewater will into the sinkhole, and damage the hole environment, and have adverse impact on the biology diversity.	The main road section and the access road can not occupy the sinkhole. The spoil disposal and the prefabrication sites are prohibit to be set in the area of 300m around the sinkhole.	EIA, Design document	Design Institute	World Bank PMO of HPCD	Design stage
			The mixture station, construction material pile site and the construction camps are prohibit to be set in the area of 300m around the sinkhole. It is should be strict construction management, prohibit dispose the spoil unbending, destroy vegetation, the construction staff can not be into the cave.	EIA	Contractor	World Bank PMO of HPCD	Construction stage

Annex I : Environmental Impact Assessment of Planned Spoil Deposit Site

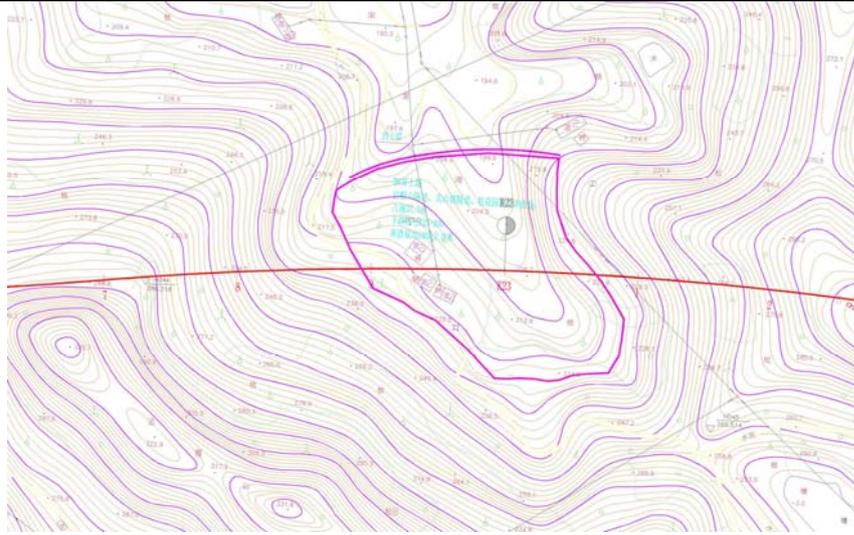
<p>Spoil Deposit Site A1</p> 	<p>General condition of works Location: to the left of K11+950 by 150m Land occupation: 30mu Capacity for waste works: 67800m³ Length of access road: 200m</p>
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<p>Mitigation measures</p> <ol style="list-style-type: none"> 1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site, and orange tree garden shall also be rehabilitated. 2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer. 3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works. 4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
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<p>Spoil Deposit Site A2</p> 	<p>General condition of works Location: to the left of K15+300 by 160m Land occupation: 33mu Capacity for waste works: 209600m³ Length of access road: 100m</p>
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<p>Mitigation measures</p> <ol style="list-style-type: none"> 1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site, and orange tree garden shall also be rehabilitated. 2. 2 households at downstream of spoil deposit site shall be resettled with appropriate compensation. 3. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer. 4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works. 5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site A3

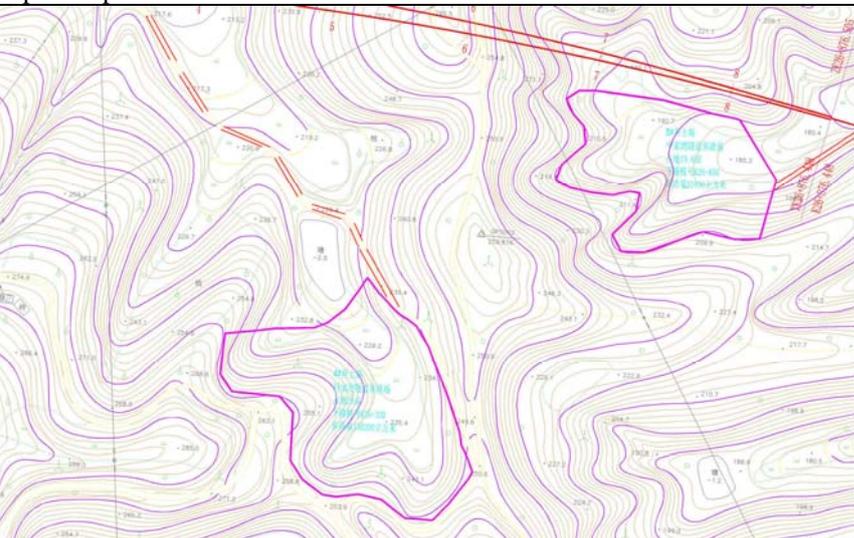


General condition of works
Location: at K23+000
Land occupation: 37.3mu
Capacity for waste works:
201800m³
Length of access road: 0m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site, and orange tree garden shall also be rehabilitated.
2. 3 households within spoil deposit site shall be resettled with appropriate compensation.
3. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site A4 and A5

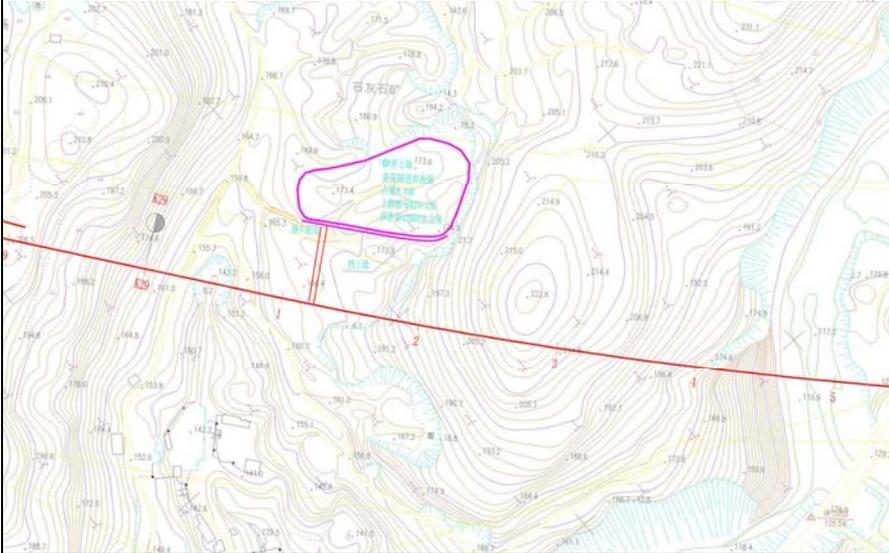


General condition of works
A4
Location: to the right of
K26+550 by 370m;
Land occupation: 28mu;
Capacity for waste works:
156200m³
Length of access road: 300m
(realigned)
A5
Location: to the right of
K26+760 by 190m
Land occupation: 19.6mu
Capacity for waste works:
52400 m³
Length of access road: 100m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site A6



General condition of works
 Location: to the left of K29+150 by 90m
 Land occupation: 9.4mu
 Capacity for waste works: 43500m³
 Length of access road: 100m

Mitigation measures

1. Before waste works operation, topsoil soil shall be heaped collectively, which, after completion of waste works operation, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site A7

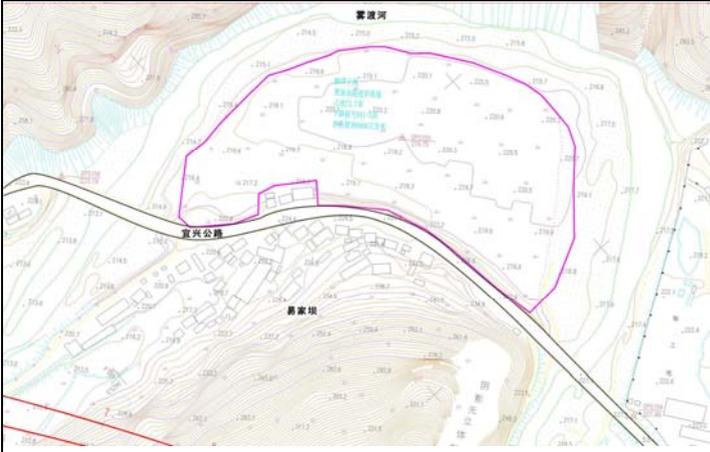


General condition of works
 Location: to the right of K35+400 by 120m
 Land occupation: 76.7mu
 Capacity for waste works: 222700m³
 Length of access road: 0m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site A8



General condition of works
Location: to the left of K41+850 by 700m
Land occupation: 73.7mu
Capacity for waste works: 386900m³
Length of access road: 0m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. Setting up speed limitation sign on Yixing road adjacent to Yijiaba village, and construction at night shall be prohibited.
4. Timely watering on Yixing road and disposal area adjacent to Yijiaba village, so as to control dust.
5. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
6. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
7. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site A9

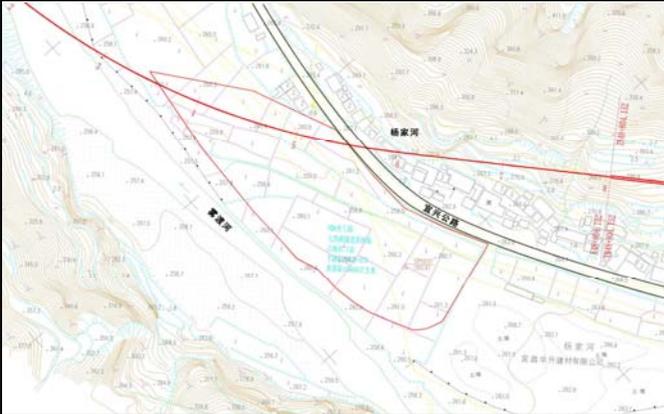


General condition of works
Location: to the right of K42+150 by 80m
Land occupation: 42.1mu
Capacity for waste works: 69500m³
Length of access road: 0m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Construction at night shall be prohibited.
3. Timely watering at spoil deposit site so as to control dust.
4. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
5. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
6. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site A10

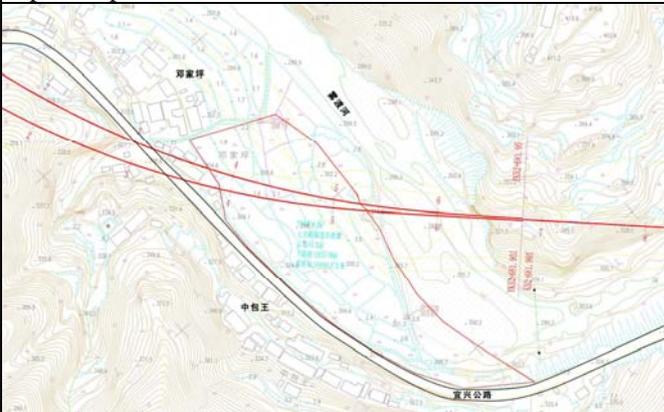


General condition of works
 Location: at K48+550
 Land occupation: 47.7mu
 Capacity for waste works: 155600m³
 Length of access road: 0m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. Setting up speed limitation sign on Yixing road adjacent to Yangjiahe village, and construction at night shall be prohibited.
4. Timely watering on Yixing road and disposal area adjacent to Yangjiahe village, so as to control dust.
5. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
6. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
7. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site A11



General condition of works
 Location: at K52+500
 Land occupation: 45.2mu
 Capacity for waste works: 155600m³
 Length of access road: 0m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. Setting up speed limitation sign on Yixing road adjacent to Dengjiaping village and Zhongbaowang village, and construction at night shall be prohibited.
4. Timely watering on Yixing road and disposal area adjacent to Dengjiaping village and Zhongbaowang village, so as to control dust.
5. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
6. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
7. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site B1

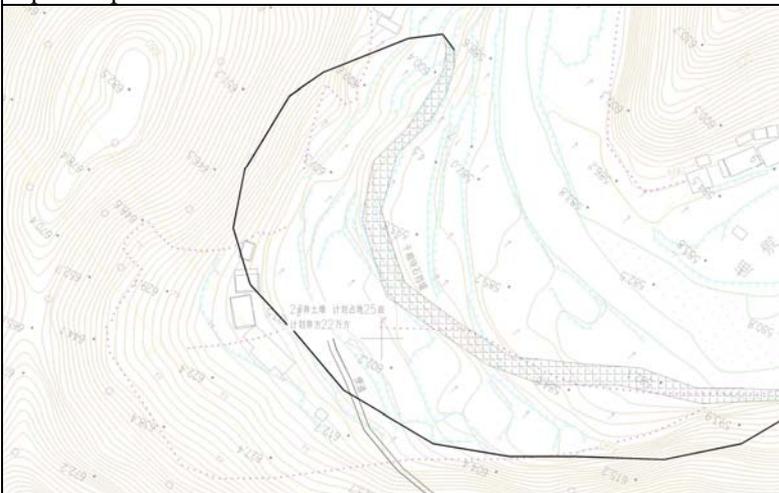


General condition of works
Location: to the left of K70+330 by 100m
Land occupation: 28mu
Capacity for waste works: 334943m³
Length of access road: 125m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
3. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site B2



General condition of works
Location: to the right of K73+800 by 50m
Land occupation: 25mu
Capacity for waste works: 214354m³
Length of access road: 100m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. 3 households adjacent to spoil deposit site shall be resettled with appropriate compensation.
3. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
5. Drainage ditch shall be built surrounding spoil deposit site.

Spoil Deposit Site B3

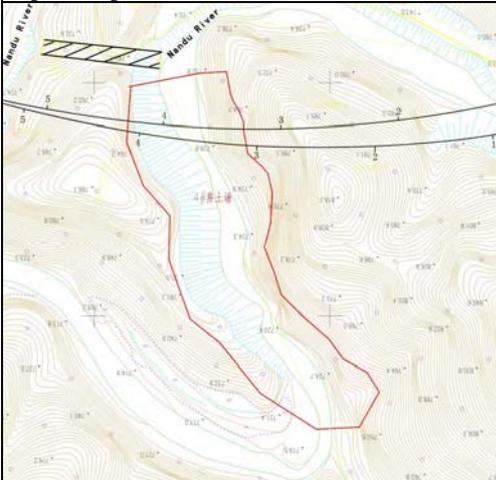


General condition of works
Location: to the left of K78+970 by 300m
Land occupation: 30.8mu
Capacity for waste works: 232000m³
Length of access road: 500m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
3. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site B4



General condition of works
Location: at K85+350
Land occupation: 35mu
Capacity for waste works: 500000m³
Length of access road: 300m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Before waste works operation, cultivable soil shall be heaped aside collectively, which, after completion, can be used in surface greening at disposal area.
3. Before waste works operation, river course shall be dredged, and diversion tunnel design shall meet criterion of rainstorm discharge.
4. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.
5. At side adjacent to new river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
6. Waste disposal area shall be protected with rubble masonry retaining wall so as to ensure the stability of waste works.
7. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site B5

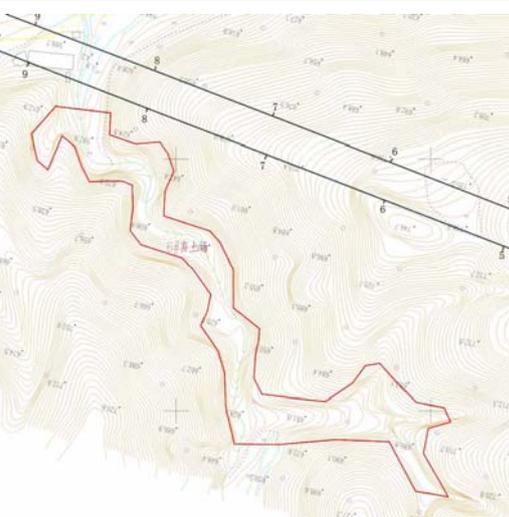


General condition of works
Location: to the right of K86+100 by 100m
Land occupation: 80mu
Capacity for waste works: 740750m³
Length of access road: 150m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Before waste works operation, cultivable soil shall be heaped aside collectively, which, after completion, can be used in surface greening at disposal area.
3. Before waste works operation, river course shall be dredged, and diversion tunnel design shall meet criterion of rainstorm discharge.
4. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.
5. At side adjacent to new river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
6. Waste disposal area shall be protected with rubble masonry retaining wall so as to ensure the stability of waste works.
7. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site B6

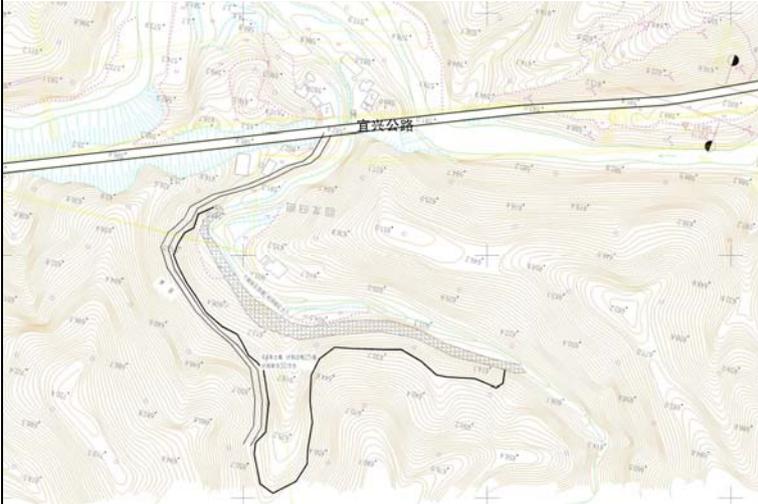


General condition of works
Location: to the left of K88+700 by 100m
Land occupation: 25mu
Capacity for waste works: 150000m³
Length of access road: 500m

Mitigation measures

1. Before waste works operation, cultivable soil shall be heaped aside collectively, which, after completion, can be used in surface greening at disposal area.
2. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
5. Trapezoid drainage ditch shall be built surrounding spoil deposit site.

Spoil Deposit Site B7



General condition of works
Location: to the left of K89+400 by 500m
Land occupation: 25mu
Capacity for waste works: 248396m³
Length of access road: 300m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Construction at night shall be prohibited, and watering on access road and disposal area shall be timely conducted so as to control dust.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
5. Trapezoid drainage ditch shall be built surrounding spoil deposit site.

Spoil Deposit Site B8



General condition of works
Location: to the right of K93+200 by 400m
Land occupation: 25mu
Capacity for waste works: 247000m³
Length of access road: 1000m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site B9

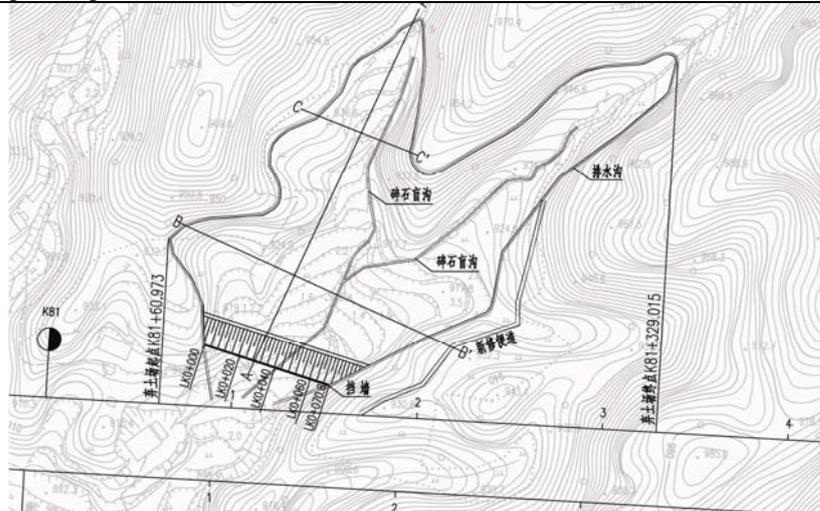


General condition of works
 Location: to the left of K94+300 by 100m
 Land occupation: 60mu
 Capacity for waste works: 250000m³
 Length of access road: 300m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer, and leveled before transferring to local government.
3. coordinate with local government so as to appropriately compensate the loss of sand collection right owners.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.

Spoil Deposit Site B10

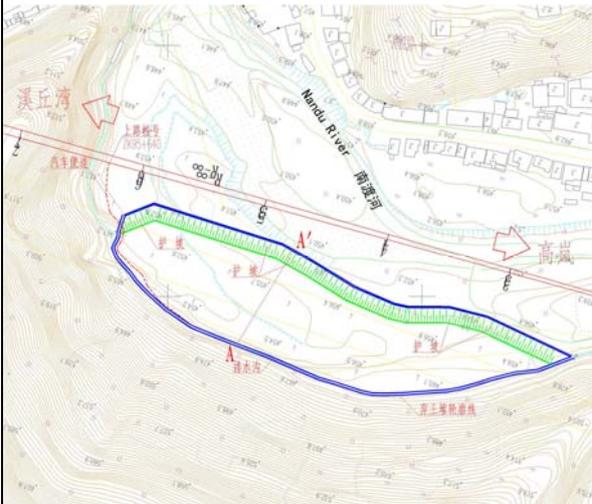


General condition of works
 Location: to the left of K81+100 by 100m
 Land occupation: 20mu
 Capacity for waste works: 200000m³
 Length of access road: 200m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
3. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site C1



General condition of works

Location: to the left of ZK95+400 by 70m

Land occupation: 36mu

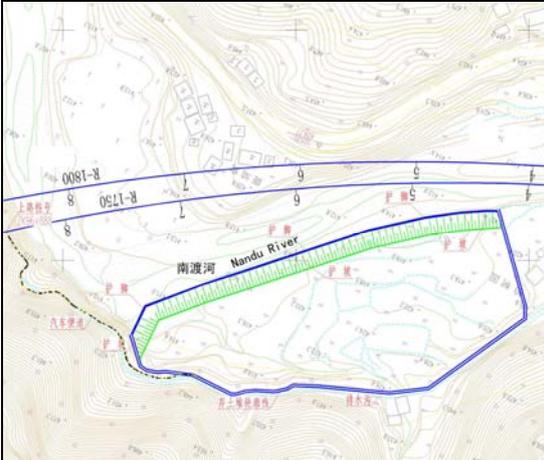
Capacity for waste works: 125000m³

Length of access road: 160m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. Planting climber plants at slope toe of spoil deposit site so as to alleviate impact on landview.

Spoil Deposit Site C2



General condition of works

Location: to the left of ZK96+600 by 85m

Land occupation: 54mu

Capacity for waste works: 210000m³

Length of access road: 180m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. At side adjacent to river and residential house, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. Planting climber plants at slope toe of spoil deposit site so as to alleviate impact on landview.

Spoil Deposit Site C3



General condition of works

Location: to the right of ZK96+900 by 1100m

Land occupation: 108mu

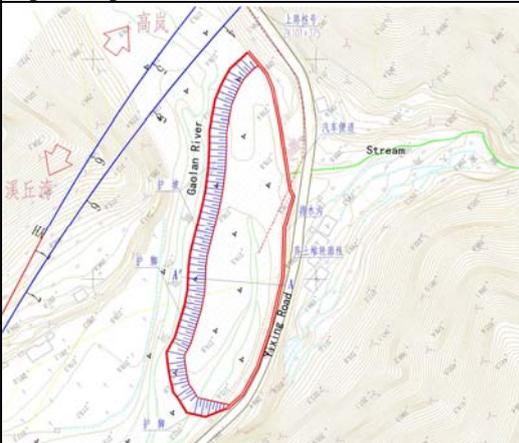
Capacity for waste works: 420000m³

Length of access road: 1000m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
3. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Pile culvert or blind drain shall be planned to connect the small stream and Nandu river, so as to prevent rainstorm from scouring the waste works.
6. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
7. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
8. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.
9. Planting climber plants at slope toe of spoil deposit site so as to alleviate impact on landview.

Spoil Deposit Site C4



General condition of works

Location: to the left of ZK101+400 by 70m

Land occupation: 36mu

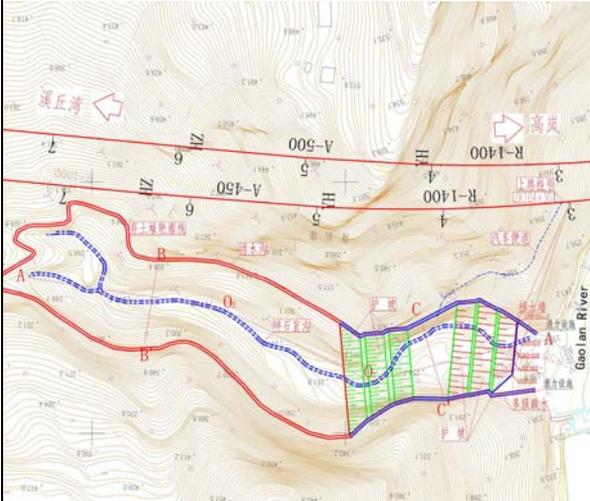
Capacity for waste works: 190000m³

Length of access road: 100m

Mitigation measures

1. Before construction, approval from river course administration agency shall be obtained in advance.
2. Prevention measure shall be applied for farmland at the other side of river, rubble masonry slope protection shall also be adopted.
3. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Pile culvert or blind drain shall be planned to connect the small stream and Gaolan river, so as to prevent rainstorm from scouring the waste works.
6. Drainage ditch shall be built surrounding the spoil deposit site.
7. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site C5

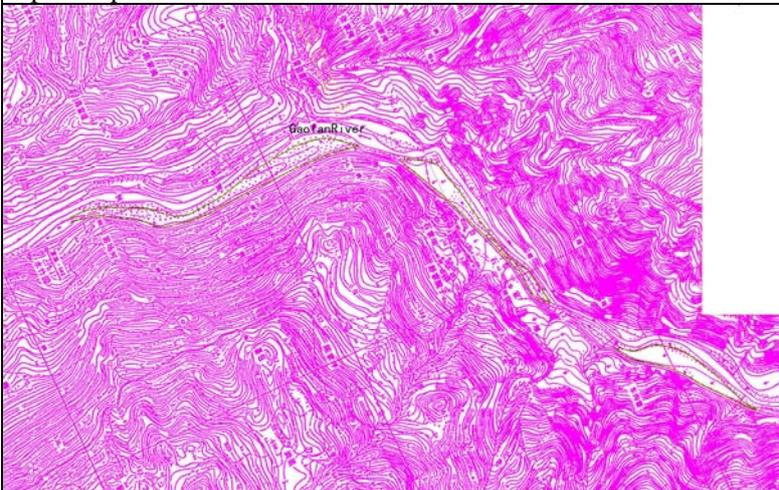


General condition of works
Location: to the left of ZK104+300 by 55m
Land occupation: 51mu
Capacity for waste works: 400000m³
Length of access road: 210m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Pile culvert or blind drain shall be planned to connect the small stream and Gaolan river, so as to prevent rainstorm from scouring the waste works.
5. Drainage ditch shall be planned surrounding disposal area, which shall be rest on original ground surface.
6. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.
7. Planting climber plants at slope toe of spoil deposit site so as to alleviate impact on landview.

Spoil Deposit Site C6

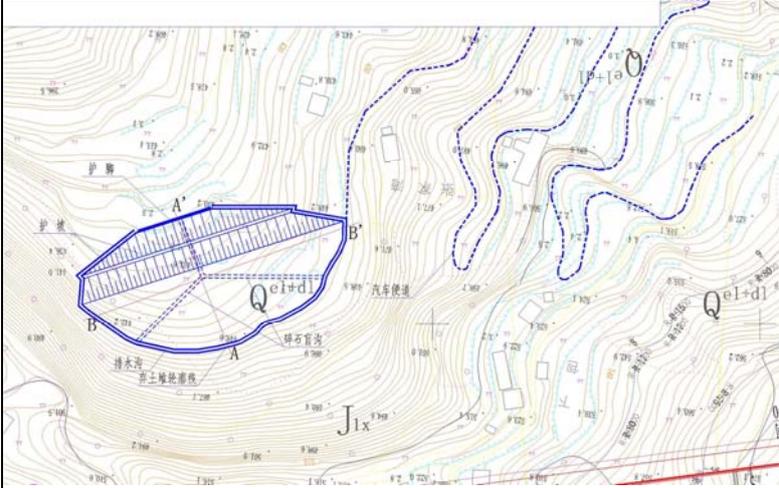


General condition of works
Location: to the left of ZK104+200 by 50m
Land occupation: 154mu
Capacity for waste works: 540000m³
Length of access road: 300m

Mitigation measures

1. Specific disposal site shall take into account the rainstorm water level, and approval from river course administration agency shall be obtained in advance.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site.
5. Construction at night shall be prohibited, and watering on Yixing road adjacent to Shijiaba village and on disposal area shall be timely conducted so as to control dust.
6. Planting climber plants at slope toe of spoil deposit site so as to alleviate impact on landview.

Spoil Deposit Site C7

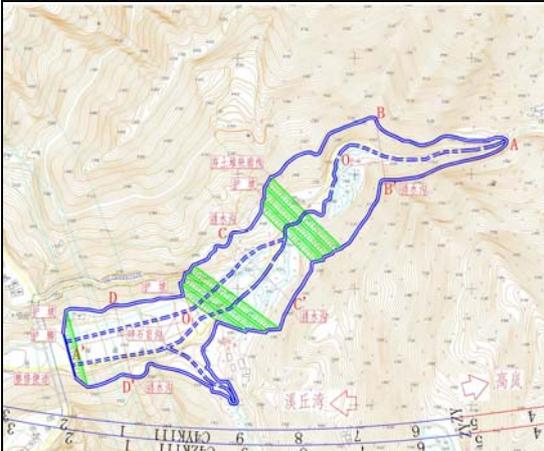


General condition of works
 Location: to the right of C4YK109+530 by 70m
 Land occupation: 15.8mu
 Capacity for waste works: 40000m³
 Length of access road: 660m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built before waste works operation, and from bottom to top, grain size of waste works shall be changed from large to small, which shall be compacted layer by layer.
3. Waste disposal area shall be protected with hand-placed masonry retaining wall so as to ensure the stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site C8

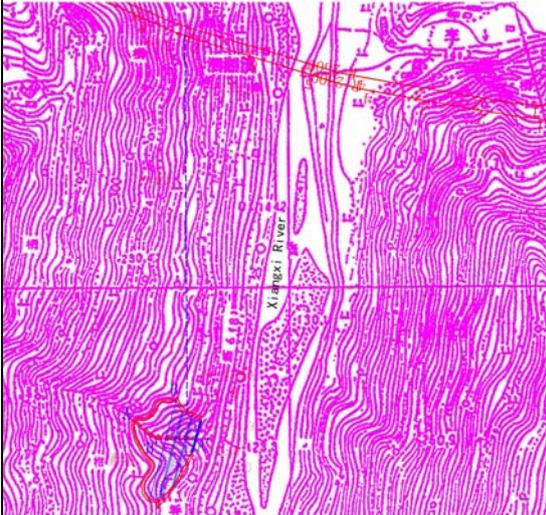


General condition of works
 Location: to the right of C4YK111+200 by 100m
 Land occupation: 139mu
 Capacity for waste works: 750000m³
 Length of access road: 1300m

Mitigation measures

1. Re-designing, cancelling the highest stage adjacent to gulch opening.
2. Appropriately compensating land acquisition loss; before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
3. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Pile culvert or blind drain shall be planned to connect the small stream and Xiangxi river, so as to prevent rainstorm from scouring the waste works.
6. Drainage ditch shall be planned surrounding disposal area, which shall be rest on original ground surface.
7. Construction at night shall be prohibited, and timely watering on access road shall be conducted so as to control dust.
8. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C9



General condition of works

Location: to the left of C4ZK111+600 by 650m

Land occupation: 18mu

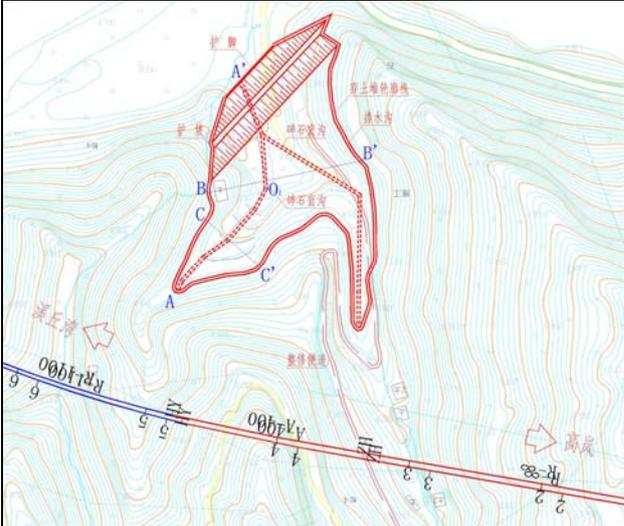
Capacity for waste works: 100000m³

Length of access road: 680m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C10



General condition of works

Location: to the left of C4YK113+200 by 85m

Land occupation: 25.5mu

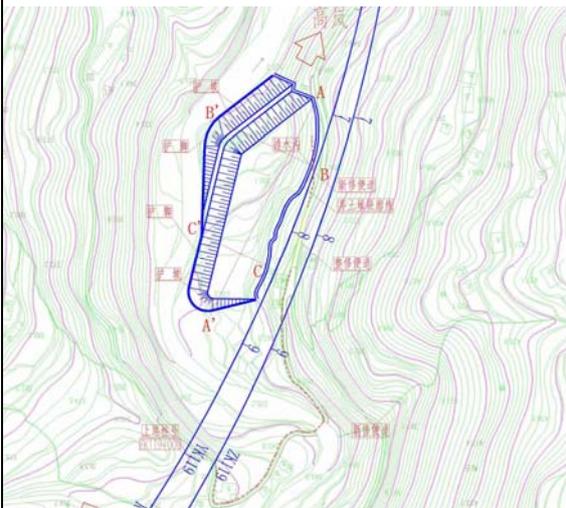
Capacity for waste works: 100000m³

Length of access road: 670m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site C11



General condition of works

Location: to the right of YK118+800 by 60m

Land occupation: 20mu

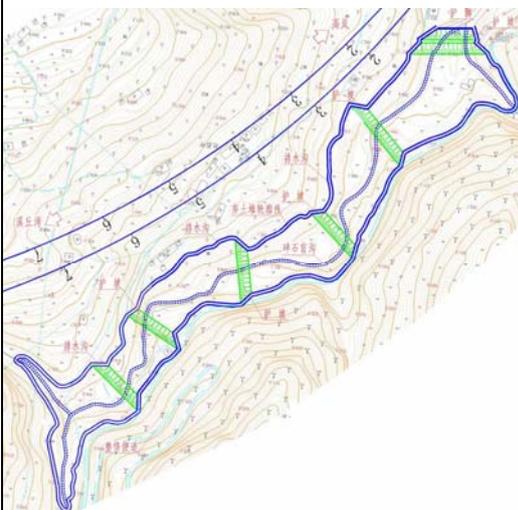
Capacity for waste works: 130000m³

Length of access road: 300m

Mitigation measures

1. Before waste works operation, cultivable soil can be heaped aside collectively, which, after operation, can be used to rehabilitate the surface of spoil deposit site.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site.
5. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site C12



General condition of works

Location: to the left of ZK119+100 by 60m

Land occupation: 112.5mu

Capacity for waste works: 670000m³

Length of access road: 200m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site C13

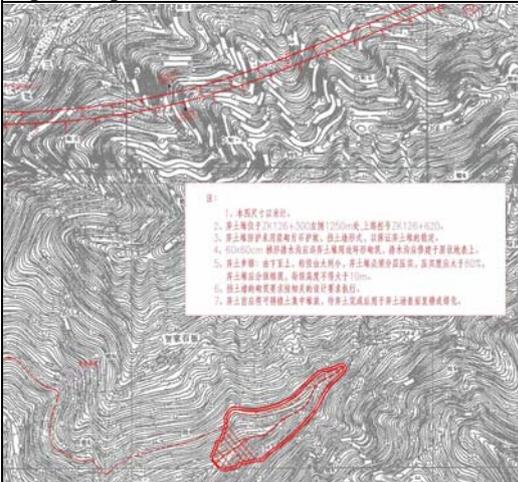


General condition of works
 Location: to the right of K125+600 by 120m
 Land occupation: 7.2mu
 Capacity for waste works: 50000m³
 Length of access road: 350m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C14



General condition of works
 Location: to the left of ZK126+300 by 1250m
 Land occupation: 91.4mu
 Capacity for waste works: 1050000m³
 Length of access road: 2150m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C15

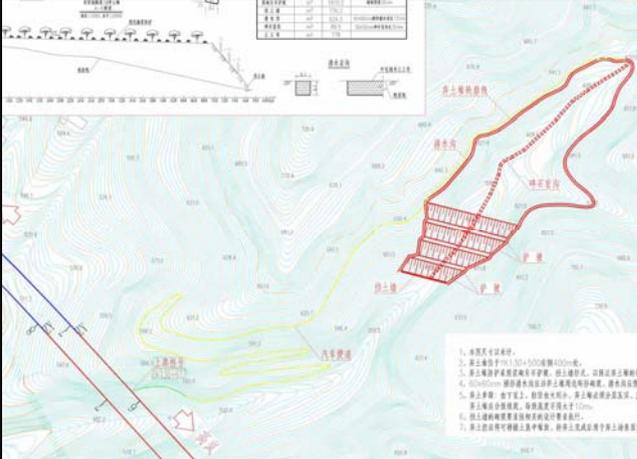


General condition of works
Location: to the left of ZK129+600 by 410m
Land occupation: 28.1mu
Capacity for waste works: 200000m³
Length of access road: 2200m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C16

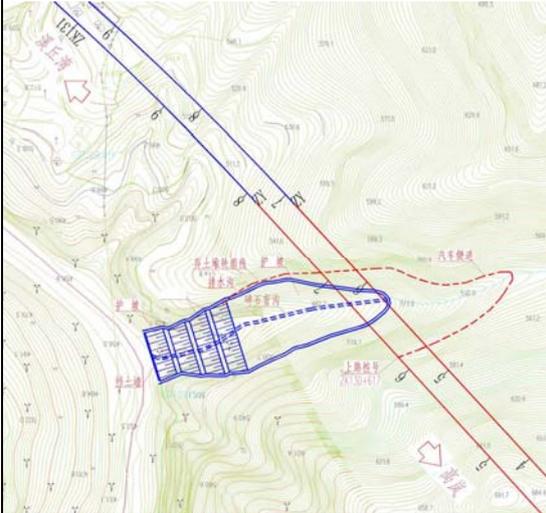


General condition of works
Location: to the right of YK130+500 by 400m
Land occupation: 27.4mu
Capacity for waste works: 185000m³
Length of access road: 1600m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C17



General condition of works
Location: to the left of ZK130+700 by 65m
Land occupation: 12.3mu
Capacity for waste works: 82000m³
Length of access road: 350m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site C18



General condition of works
Location: to the right of YK131+500 by 400m
Land occupation: 10mu
Capacity for waste works: 30000m³
Length of access road: 800m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. appropriately compensating the 4 households at downstream of disposal area.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
5. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
6. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
7. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
8. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C19



General condition of works

Location: to the right of YK131+600 by 170m

Land occupation: 14mu

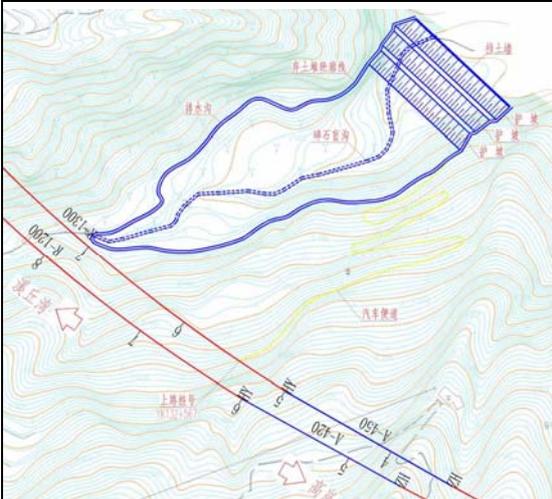
Capacity for waste works: 80000m³

Length of access road: 1350m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pile culvert or blind drain shall be planned to connect the small stream and Liangtai river, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C20



General condition of works

Location: to the right of YK132+650 by 50m

Land occupation: 43mu

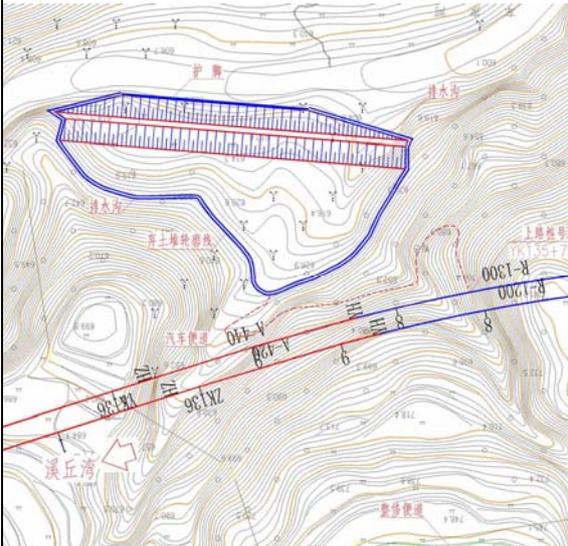
Capacity for waste works: 518000m³

Length of access road: 690m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pile culvert or blind drain shall be planned to connect the small stream and Liangtai river, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C21



General condition of works

Location: to the right of YK135+800 by 80m

Land occupation: 28.5mu

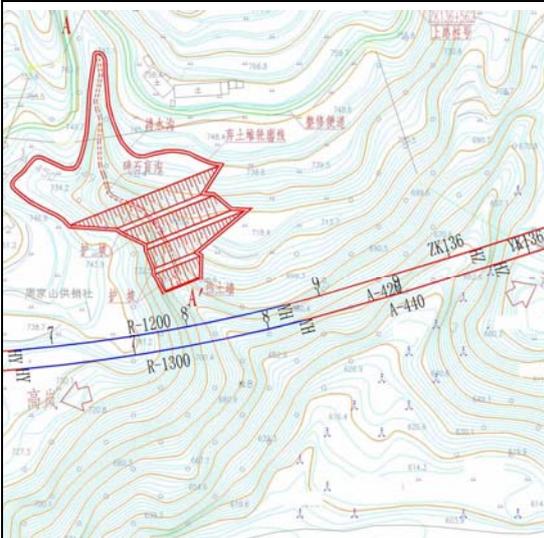
Capacity for waste works: 75000m³

Length of access road: 300m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C22



General condition of works

Location: to the left of ZK135+600 by 100m

Land occupation: 19.5mu

Capacity for waste works: 108000m³

Length of access road: 300m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. Construction at night shall be prohibited, and timely watering on access road shall be conducted so as to control dust.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C23

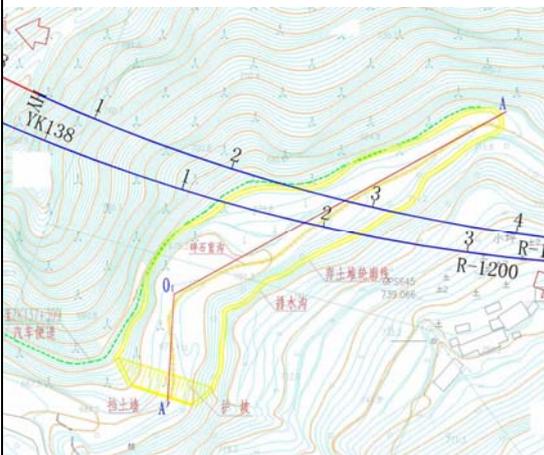


General condition of works
Location: to the left of ZK137+380 by 100m
Land occupation: 16mu
Capacity for waste works: 88000m³
Length of access road: 600m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C24

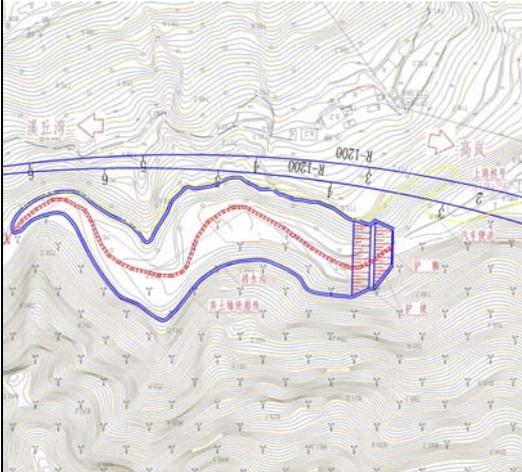


General condition of works
Location: at YK138+100
Land occupation: 20.4mu
Capacity for waste works: 60000m³
Length of access road: 1500m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C25

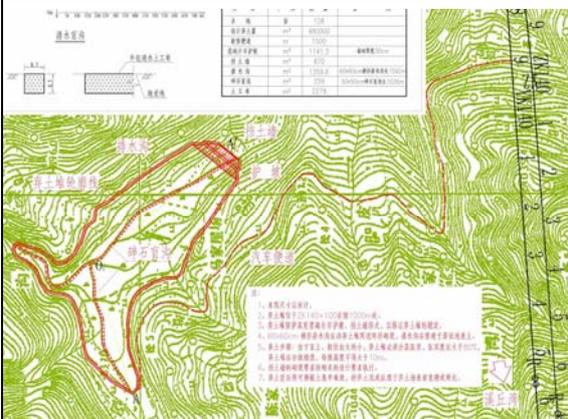


General condition of works
 Location: to the left of ZK138+400 by 65m
 Land occupation: 30mu
 Capacity for waste works: 118000m³
 Length of access road: 730m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site C26

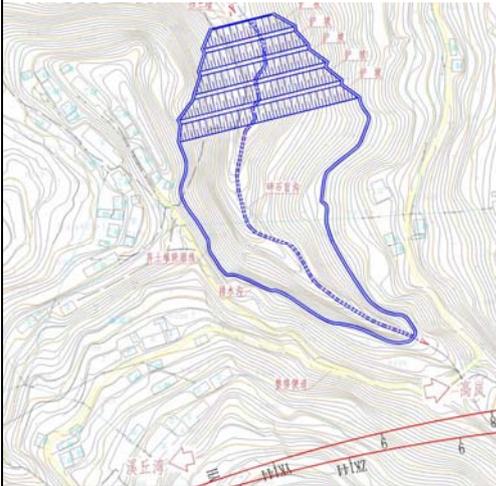


General condition of works
 Location: to the left of YK140+100 by 1000m
 Land occupation: 128mu
 Capacity for waste works: 410000m³
 Length of access road: 1500m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.
7. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site C27

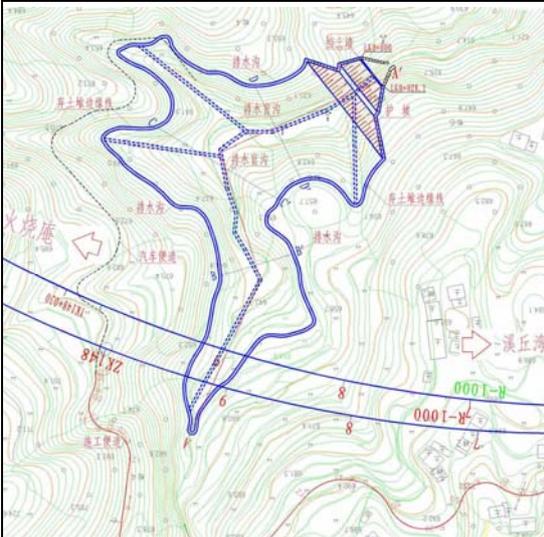


General condition of works
Location: to the right of YK143+700 by 65m
Land occupation: 49.5mu
Capacity for waste works: 400000m³
Length of access road: 400m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
6. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site D1

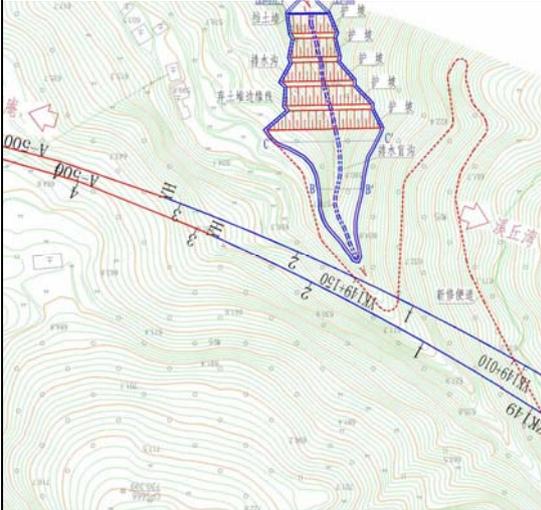


General condition of works
Location: to the right of YK147+900 by 140m
Land occupation: 39.9mu
Capacity for waste works: 220000m³
Length of access road: 445m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Pile culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.

Spoil Deposit Site D2

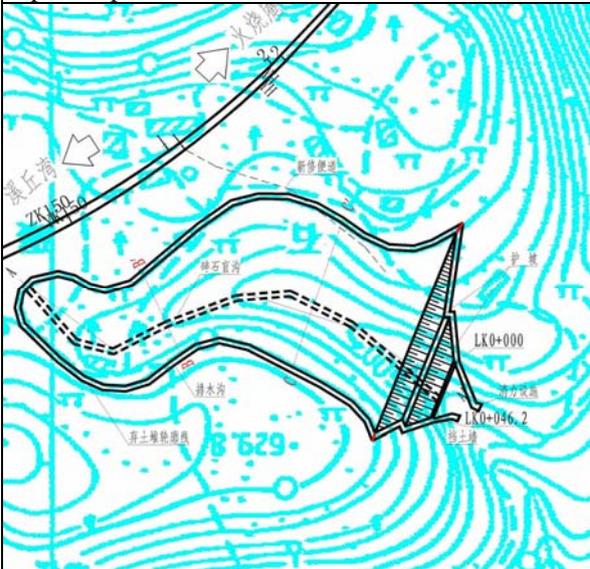


General condition of works
 Location: to the right of YK149+150 by 120m
 Land occupation: 12.2mu
 Capacity for waste works: 87871m³
 Length of access road: 705m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.
6. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D3



General condition of works
 Location: to the right of YK150+100 by 140m
 Land occupation: 46.7mu
 Capacity for waste works: 330000m³
 Length of access road: 200m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site D4

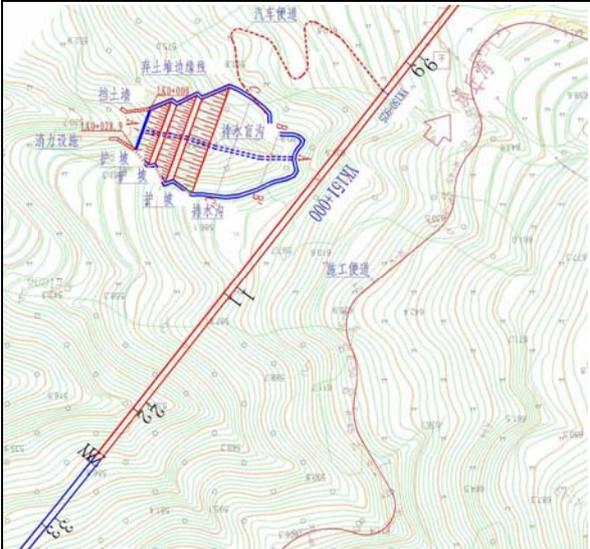


General condition of works
Location: to the right of YK150+400 by 50m
Land occupation: 6.6mu
Capacity for waste works: 100000m³
Length of access road: 440m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D5

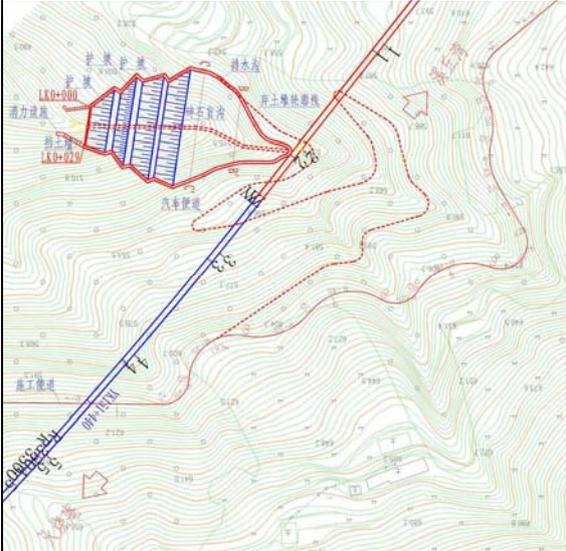


General condition of works
Location: to the right of YK151+800 by 40m
Land occupation: 8.3mu
Capacity for waste works: 119304m³
Length of access road: 400m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D6

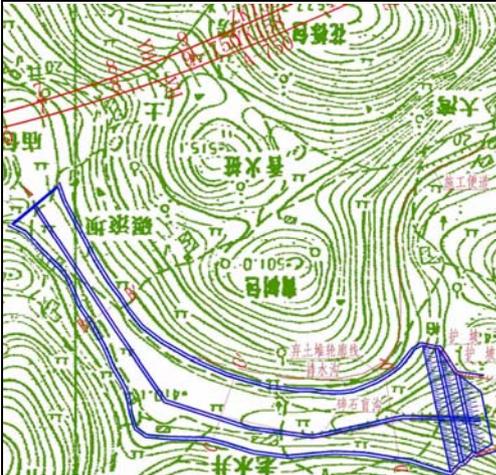


General condition of works
Location: to the right of YK151+ 00 by 60m
Land occupation: 8.7mu
Capacity for waste works: 101500m³
Length of access road: 747m

Mitigation measures

1. Before waste works operation, cultivable soil can be heaped aside collectively, which, after operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site D7

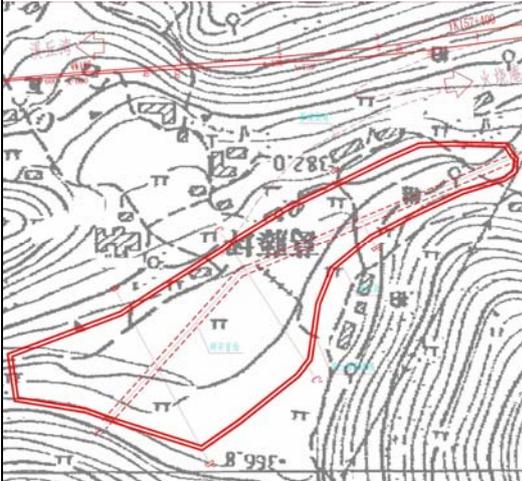


General condition of works
Location: to the right of YK157+900 by 700m
Land occupation: 87.5mu
Capacity for waste works: 480000m³
Length of access road: 1000m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Appropriately compensating the 3 households within disposal area.
3. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site D8

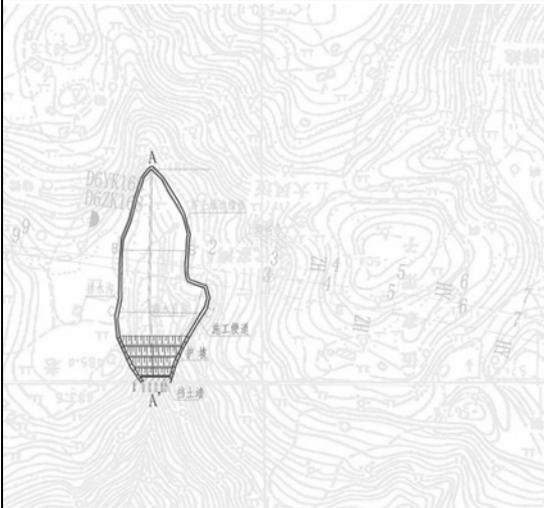


General condition of works
Location: to the right of YK157+400 by 300m
Land occupation: 84.2mu
Capacity for waste works: 222687m³
Length of access road: 800m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site.
5. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.

Spoil Deposit Site D9

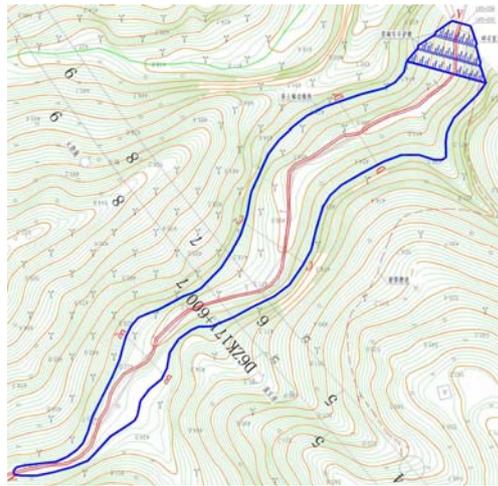


General condition of works
Location: at D6ZK168+207
Land occupation: 40.6mu
Capacity for waste works: 470000m³
Length of access road: 300m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
4. Drainage ditch shall be built surrounding the spoil deposit site, which shall be rest on original ground surface.
5. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site D10

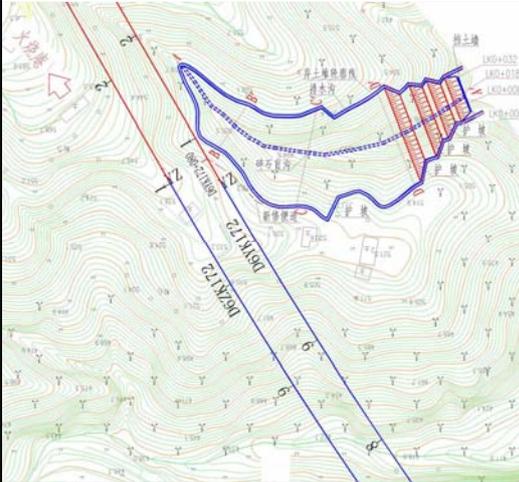


General condition of works
Location: to the right of D6YK171+540 by 80m
Land occupation: 47.6mu
Capacity for waste works: 474500m³
Length of access road: 550m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pipe culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D11

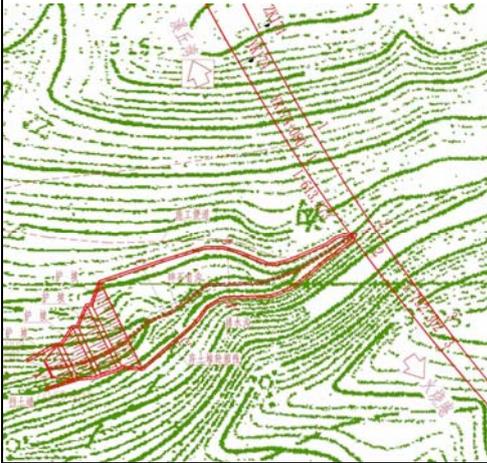


General condition of works
Location: to the right of D6YK172+080 by 120m
Land occupation: 23.6mu
Capacity for waste works: 225000m³
Length of access road: 180m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pipe culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D12

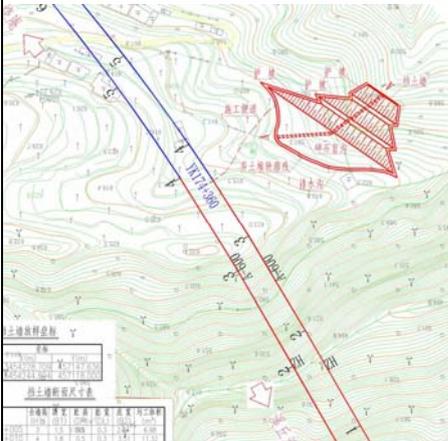


General condition of works
Location: to the right of YK174+170 by 10m
Land occupation: 19.6mu
Capacity for waste works: 195598m³
Length of access road: 1000m

Mitigation measures

1. Before waste works operation, cultivable soil can be put aside collectively, which, after construction, can be used in surface greening at spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pipe culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D13

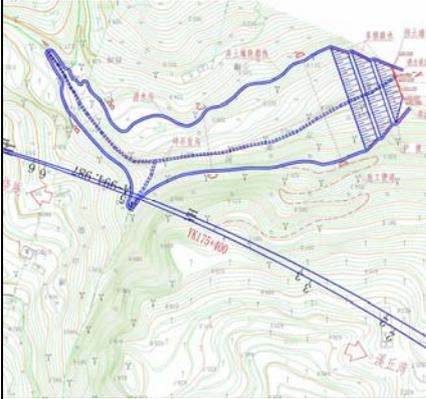


General condition of works
Location: to the right of YK174+360 by 120m
Land occupation: 9.5mu
Capacity for waste works: 47000m³
Length of access road: 200m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. At the side adjacent to river course, retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pipe culvert or blind drain shall be planned to connect the small stream, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.

Spoil Deposit Site D14

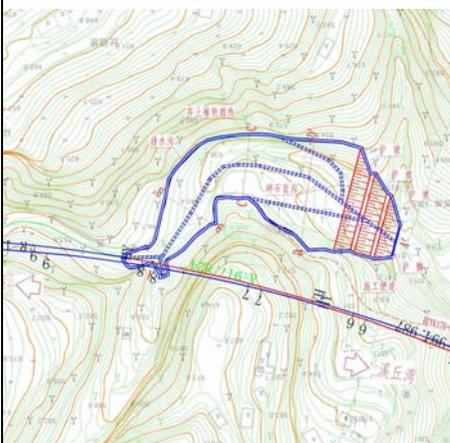


General condition of works
Location: to the right of YK175+400 by 80m
Land occupation: 38.4mu
Capacity for waste works: 270000m³
Length of access road: 650m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pipe culvert or blind drain shall be planned to connect Wanji river, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. Construction at night shall be prohibited, and watering at spoil deposit site shall be timely conducted so as to control dust.
7. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
8. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Spoil Deposit Site D15



General condition of works
Location: to the right of YK176+550 by 50m
Land occupation: 27.5mu
Capacity for waste works: 260000m³
Length of access road: 800m

Mitigation measures

1. Land acquisition loss shall be appropriately compensated; before waste works operation, cultivable soil shall be heaped collectively, which, after completion of waste works operation, can be used to rehabilitate the surface of spoil deposit site.
2. Retaining wall shall be built firstly before waste works operation. From bottom to top, grain size of waste works shall be gradually changed from large to small, which shall be compacted layer by layer.
3. Pipe culvert or blind drain shall be planned to connect Wanji river, so as to prevent rainstorm from scouring the waste works.
4. At spoil deposit site, prevention works such as masonry rubble slope/toe protection are applied so as to ensure stability of waste works.
5. Drainage ditch shall be built surrounding the spoil deposit site.
6. On the prerequisite that engineering request be met, scale of access road shall be put under strict control. After construction, grass is planted to rehabilitate plant coverage.
7. Before waste works operation, small scale construction shall be applied so as to drive away wild animals.

Annex III : Mitigation measures for Each of the New and Upgraded Access Roads

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
Preliminary design Contract 1				
A1	K5+000-K8+300	existing road 5.35km	<ul style="list-style-type: none"> ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Guanchongya village and Qinglongwan village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A2	K9+000	existing road 12km	<ul style="list-style-type: none"> ● Strengthening road maintenance, improving damaged road after completion and transferring road to local government. 	<ul style="list-style-type: none"> ● Existing road, i.e. the Tuxia road (county road), and road condition is good.
A3	K12+000	realigned road 3km, new road 0.3km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wujiawan village and Hujiaxiang village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A4	K14+300	existing road 5km, realigned road 3km, new road 0.5km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Longquan town, Guojiazui village, Caijiawan village, Longyanbian village and Wanjia village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A5	K13+500	realigned road 3.2km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Dujiazui village and Wanjiawuchang village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A6	K15+300	realigned road 0.8km, new road 0.2km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A7	K16+800	realigned road 2.72km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wanjiawan village and Zhoujia village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A8	Road beyond alignment	existing road 19km	<ul style="list-style-type: none"> ● Strengthening road maintenance, improving damaged road after completion and transferring road to local government. 	<ul style="list-style-type: none"> ● Existing provincial road
A9	K18+800	existing road 6.5km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Zhangjiataizi village, Longjiahe village and Guanzhuang village, including Guanzhuang middle school and Guanzhuang primary school until 25 m after leaving them so as to control dust. ● Erecting alarm sign at place adjacent to Guanzhuang middle school and Guanzhuang primary school. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
A10	K22+000	realigned road 3.82km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Xijia village and Ganxidong village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A11	K24+500	existing road 2.5km, realigned road 3.7km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Fujiachong village and Gaojiayan village, including Fujiachong primary school until 25 m after leaving them so as to control dust. ● Erecting alarm sign at place adjacent to Fujiachong primary school. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A12	K23+500	realigned road 3.9km, new road 0.25km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A13	K26+300	realigned road 0.77km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
A14	K28~K55	existing road 28km	<ul style="list-style-type: none"> ● Strengthening road maintenance, improving damaged road after completion and transferring road to local government. 	<ul style="list-style-type: none"> ● Existing provincial road
A15	K37+564	new road 0.85km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
A16	K38+760	new road 0.4km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
A17	K38+918	new road 0.2km	<ul style="list-style-type: none"> ● strengthening construction management, and in access road construction, applying temporary traffic control on Yixing road. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
A18	K41+104	new road 0.75km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
A19	K42+010	realigned road 0.3km, new road 0.2km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil on newly built access road after completion, spreading grass seed so as to rehabilitating plant coverage; ● Realigned access road will be improved after completion and transferred to local government.
A20	K50+065	new road 0.8km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage or farmland.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
A21	K51+870	new road 0.85km	<ul style="list-style-type: none"> Strengthening construction management, prohibiting random waste-works disposal. Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. Appropriately compensating economic loss of land owner. Prohibiting material transportation at night; access road will be paved from 25 m before approaching Dengjiaping village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage or farmland.
Preliminary design Contract 2				
B1	K55+870	new road 0.2km	<ul style="list-style-type: none"> Strictly controlling access road width, appropriately compensating economic loss of land owner. Prohibiting material transportation at night; access road will be paved from 25 m before approaching Bengtukan village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> Loosening soil and rehabilitation after completion of construction.
B2	K58+430	realigned road 0.1km, new road 0.5km	<ul style="list-style-type: none"> Strictly controlling access road width, appropriately compensating economic loss of land owner. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government, which can provide access for residents at Qinjiaya village.
B3	K60+600	realigned road 0.35km, new road 0.15km	<ul style="list-style-type: none"> Strictly controlling access road width, appropriately compensating economic loss of land owner. Prohibiting material transportation at night; access road will be paved from 25 m before approaching Yinjiaping village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government, which can provide access for residents at Wachangbao village.
B4	K61+800	realigned road 0.35km	<ul style="list-style-type: none"> existing road, no impact 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government.
B5	K63+200	new road 0.35km	<ul style="list-style-type: none"> Strictly controlling access road width, appropriately compensating economic loss of land owner. Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wuduhe town until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government, which can provide access for residents at Wangjiayuanzi village.
B6	K65+400	realigned road 0.8km, new road 0.1km	<ul style="list-style-type: none"> Strictly controlling access road width, appropriately compensating economic loss of land owner. Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wuduhe town, Shangdengjiafan village and Shabao village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government, which can provide access for residents at Dengjiapan village and Shabao village.
B7	K66+600	realigned road 0.65km	<ul style="list-style-type: none"> Prohibiting material transportation at night; access road will be paved from 25 m before approaching Huawu village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government.
B8	K67+540	realigned road 0.55km, new road 0.05km	<ul style="list-style-type: none"> Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wanrengou village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government.
B9	K69+550	realigned road 2.3km	<ul style="list-style-type: none"> Prohibiting material transportation at night; access road will be paved from 25 m before approaching Xiaomiao village, Yangjiajianlou village and Zhaojia village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> Access road will be improved after completion and transferred to local government.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
B10	K70+400	realigned road 0.4km, new road 0.2km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Shibaziwuchang village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
B11	K73+050	realigned road 1.1km, new road 1.3km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Lijiawuchang village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
B12	K74+580	new road 1.4km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage or farmland.
B13	K75+440	new road 0.4km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage or farmland.
B14	K77+230	realigned road 0.65km	<ul style="list-style-type: none"> ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Yangjiawan village and Anjiagou until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
B15	K78+200	realigned road 0.25km, new road 0.4km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Setting up enclosure fence and sign surrounding ancient trees. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage or farmland.
B16	K81+000	upgrade road 0.7km, new road 0.2km	<ul style="list-style-type: none"> ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Maliangping village 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
B17	K88+000	new road 1.3km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Qinglingzhai village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government, which can provide access for residents at Qinglongzhai village.
B18	K88+780	new road 0.5km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
B19	K93+800	new road 1.9km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wangjiaping village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government, which can provide access for residents at Wangjiaping village.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
B20	K95+470	realigned road 0.3km, new road 0.45km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Xiayangmiao village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
B21	K55~K100	Making use of existing road 45.0km	<ul style="list-style-type: none"> ● Strengthening road maintenance, improving damaged road after completion and transferring road to local government. 	<ul style="list-style-type: none"> ● Existing provincial road
Preliminary design Contract 3				
C1	YK95+647	new road 0.16km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
C2	YK95+785	realigned road 0.2km, new road 0.17km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Gaolan primary school and Xincun village until 25 m after leaving them so as to control dust. ● erecting alarm sign at place adjacent to Gaolan primary school. 	<ul style="list-style-type: none"> ● Loosening soil and rehabilitation on newly built access road after completion of construction; ● Realigned access road will be improved after completion and transferred to local government.
C3	YK96+888	new road 1.05km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road; ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Baojiuwo village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
C4	YK101+330	new road 0.78km	<ul style="list-style-type: none"> ● strengthening construction management, and in access road construction, applying temporary traffic control on Yixing road. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching several house until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
C5	YK104+290	new road 0.95km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road; ● Strengthening construction management, prohibiting random waste-works disposal. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Shijiaba village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
C6	C4YK110+300	realigned road 0.2km, new road 0.99km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Lijiagou village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Loosening soil and rehabilitation on newly built access road after completion of construction; ● Realigned access road will be improved after completion and transferred to local government.
C7	K119+000	realigned road 5.89km, new road 0.97km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Zhoumushu village and Yangzhou-ziguish school until 25 m after leaving them so as to control dust. ● erecting alarm sign at place adjacent to Hope primary school at Zigui county donated by Yangzhou city. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C8	C4YK111+697	new road 6.13km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C9	YK126+690	new road 4.1km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Huopaoling village and Wangjiawan village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C10	YK126+585	new road 0.22km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C11	YK130+525	new road 1.23km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C12	YK131+100	new road 1.24km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
C13	YK131+775	new road 1.55km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C14	YK132+512	new road 2.73km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C15	YK132+715	new road 0.39km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C16	YK133+725	new road 2.33km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Houwan village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C17	YK135+335	new road 1.30 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C18	YK136+480	new road 0.24 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C19	YK137+167	new road 0.48 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
C20	YK137+315	new road 0.18 km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
C21	YK138+075	new road 1.13 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C22	YK139+655	new road 1.43 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C23	YK143+670	new road 0.69 km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wangjiawan village and Chenjiawan village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C24	YK126+690	realigned road 25.28 km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching villages and primary school until 25 m after leaving them so as to control dust. ● erecting alarm sign at place adjacent to primary school. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C25	YK136+800	realigned road 1.04 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C26	C4ZK109+300	new road 1.29 km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C27	YK120+680	new road 3.64 km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
C28	YK125+250	new road 3.18 km	<ul style="list-style-type: none"> ● Strengthening construction management, prohibiting random waste-works disposal. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
Preliminary design Contract 4				
D1	K145+000-K148+000	realigned road 1.82km, new road 2.145km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Zhoujiaping village, Wujiawuchang village and Wangjiawuchang village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D2	Access road D1	realigned road 0.86km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching residential houses until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D3	K150+000	realigned road 0.767km, new road 1.234km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Songjiawuchang village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D4	K150+500	new road 0.328km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. 	<ul style="list-style-type: none"> ● Loosening soil after completion, spreading grass seed so as to rehabilitating plant coverage.
D5	K152+300	realigned road 0.35km, new road 2.255km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching sparse residential houses until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D6	K159+000	realigned road 3.25km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Wenjiawan village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D7	K160+700-K162+700	realigned road 2.321km	<ul style="list-style-type: none"> ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Tongshuzikou village and Chujiacao village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.

No.	Terminal stake of main alignment	Scale of works	Mitigation measures	Utilization after construction
D8	K167+000	realigned road 0.943km	<ul style="list-style-type: none"> ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Nanjiaya village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D9	K167+000- K171+200	realigned road 5.33km	<ul style="list-style-type: none"> ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Nanjiaya village, Houbosi village, Zhangjiaping village and Qujialiang village until 25 m after leaving them so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D10	K174+000	realigned road 4.156km, new road 4.654km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching XingzishuLiangzi village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.
D11	K172+200	realigned road 2.835km, new road 1.318km	<ul style="list-style-type: none"> ● Strictly controlling access road width, appropriately compensating economic loss of land owner. ● Strictly controlling access road width so as to alleviate damage on plant coverage; planning drainage ditch at sides of access road. ● Prohibiting material transportation at night; access road will be paved from 25 m before approaching Laowawu village until 25 m after leaving it so as to control dust. 	<ul style="list-style-type: none"> ● Access road will be improved after completion and transferred to local government.

Annex IV: Mitigation Measures Which to be Included in the Tendering Document for Contractors

Issue	Mitigation Measures	Implementing Organizations	Responsible Organizations	In Tendering Document
Ecology and Soil and Water Conservation	<ol style="list-style-type: none"> (1) Provide training to all workers before start of construction, for wildlife and plant protection with clear responsibility; (2) Minimize to the largest extent possible the damages to the trees and other vegetation and hurts of wildlife; Restrict all construction activities within the redline and approved areas (3) Spoil soil will not be allowed to dispose randomly and all will be trucked to pre-selected, approved and controlled sites for disposal. (4) Temporary settling ponds will be installed in road bed and other steep or otherwise erosion vulnerable areas or as instructed by CESC. The ponds will be 0.5 m deep with an area determined based on the collection area and the topography. (5) Canvas or berms may be used for surface runoff from the site before entering into receiving water, or as instructed by CESC. (6) Road side slopes and other excavated slopes will be paved or landscaped as soon as the engineering work is completed. (7) Before the rain seasons, erosion vulnerable areas, if not applied for the permanent erosion control measures will be covered with straw mats for temporary protection; (8) For temporary occupied land, existing top soil (about 15-30 cm) will be collected and stored on the side for use during reclamation after the construction. Temporary erosion control will be applied such as straw mats or landscaping. (9) Immediately reclaim the borrow pits and disposal sites after the work in these areas, not wait until the construction completion; (10) Maintain the area drainage system at all time; (11) Avoid construction during raining season in the unstable geology sections. 	Contractor	Yiba MPO	TBD
Water quality and hydrology works	<ol style="list-style-type: none"> (1) Asphalt, fuels, paints and other chemicals will not be allowed to store near rivers, ponds, lakes, wells, or other surface water. The storage will need to have weather protection. (2) No direct discharges will be allowed to Huangbohe, Xiangxihe and Shennognxi rivers during bridge construction over these rivers, by collecting and treating the wastewater from the construction of these bridges (3) Reclaim or reconstruct construction damaged irrigation and drainage systems as soon as the construction is complete. (4) No dumping of spoil soil, construction waste or other materials into rivers, irrigation ditches and 	Contractor	Yiba MPO	

Issue	Mitigation Measures	Implementing Organizations	Responsible Organizations	In Tendering Document
	<p>other drainage system;</p> <p>(5) If occupying any irrigation, contractor will need to build temporary irrigation system such as pipes until the permanent one is reclaimed or rebuilt;</p> <p>(6) Culverts will have sufficient cross sections for the flow and water level will not be lower than the existing water flow.</p>			
Noise	<p>(1) Where possible, the construction activities will be at least 150 m away from villages and other sensitive receptors;</p> <p>(2) Strictly ban night time construction (22:00 to 6:00 next day), particularly the piling and other high noise activities;</p> <p>(3) Arrange construction time in weekends, vacation, etc. when near schools and avoid the most sensitive timing such as exams in school</p> <p>(4) Monitor the noise levels using hand hold noise meter at one meter from the classroom windows. If monitored noise is higher than the applicable standards, as may be determined by CESC, install temporary noise barriers;</p> <p>(5) Maintain construction machines to their best working conditions to keep the noise levels low;</p> <p>(6) Buy hand hold noise meters and attend the pre construction training for environmental monitoring</p>	Contractor	Yiba MPO	
Air Quality	<p>(1) Maintain a certain number of water trucks or truck loaded water for water spray in temporary access roads, mixing stations, storage piles, etc. at sections through and near schools and villages. Do the spray in drying and windy days, twice a day once in the morning and once in the afternoon. Upon requested or as determined necessary by CESC, spray four times a day in particularly winding days;</p> <p>(2) Cover or wind control soil or powder material storage to minimize airborne dust;</p> <p>(3) Cover trucks loaded with cement, sand, lime and other powder materials.</p> <p>(4) Tunnels environment: the dust from the tunnel construction need be managed appropriately; the wet boring machine should be used; water spray before the wind blow when the boring; water spray after the blasting; the wind speed in the tunnel will be adjusted in order to eliminate the dust.</p>	Contractor	Yiba MPO	
Waste Management	<p>(1) The amount of surplus excavated material for each road segment will be estimated during the design phase. Excavated material will be re-used on-site or the nearby road segment / other projects as far as possible in order to minimize the quantity of material to be disposed of;</p> <p>(2) Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site</p>	Contractor	Yiba MPO	

Issue	Mitigation Measures	Implementing Organizations	Responsible Organizations	In Tendering Document
	<p>holding, packaging material, etc will be collected and separated on-site from other waste sources. Collected recyclable material will be re-used for other projects or sold to waste collector for recycling;</p> <p>(3) The extent of demolition of existing houses / structures due to the project will be minimized during the design through careful route selection. Major dense populated residential areas will be avoided in order to minimize the demolition;</p> <p>(4) Handling of waste generated from on-site treatment facilities (e.g. spent betonies settled by treatment facility, sediment collected by sedimentation process, etc) will be planned during the design. Collected waste will be disposed of properly through licensed waste collector;</p> <p>(5) Hazardous waste (or chemical waste) will be properly stored, handled and disposed of in accordance with the local legislative requirements. Hazardous waste will be stored at designed location and warning sign will be posted;</p>			
Scenery and visual impacts	<p>(1) At the highly sensitive scenery zones (e.g., Shenongxi, Gaolan and Xiaofeng scenery zones) the construction may be scheduled where possible at the low tourist seasons. The construction trucks will operate at night where possible and kept clean and covered when shipping bulk materials.</p> <p>(2) The construction sites may be surrounded with fence if located at the scenery zones to avoid direct visual sights of the construction sites.</p> <p>(3) There will be no construction camps in the three scenery zones and use local village houses for workers working in these areas.</p> <p>(4) Municipal solid waste from construction workers will be collected timely and disposed in the dedicated areas. Strictly ban random disposal of solid waste.</p> <p>(5) All mixing stations will not be located near the rivers. No such stations in the three scenery zones. The stockpiles will be located in hidden areas with outside of the sight from tourists. Avoid occupy the green areas if possible.</p> <p>(6) Use the existing roads as access road if possible to minimize the need for new access roads which lead to damage the existing land form and/or greens. If must be built, the access roads may select areas which are away from major scenery and may be used as village roads once construction completes.</p>	Contractor	Yiba MPO	
Cultural relics protection	<p>(1) Archaeological excavation for the Baihuguan site: 3 months before the construction, go to the excavation site and make the preparation work, carry on the field excavation.</p> <p>(2) Protection of Xinping Suspended Tombs: Before the construction, the tomb and the surrounding area will be reinforced with physical and chemical methods, including provision of support and</p>	Hubei institute of cultural property and archaeology	Yiba MPO	

Issue	Mitigation Measures	Implementing Organizations	Responsible Organizations	In Tendering Document
	<p>spray of reinforcement agent; the tombs and surrounding area will be investigated with record; monitoring equipment to monitor the movement of the cliff for long term will be procured and installed at site with specific management procedure in place; mitigation equipment to reduce the vibration will be installed at site to reduce the impact on the tombs. The noisy equipment operation, such as piling and blasting, will be restricted.</p> <p>(3) Conduct a training to all construction personnel before the start of construction on cultural relics identification, protection procedures and reporting procedures;</p> <p>(4) Stop the construction and report immediately the cultural authority if an archaeological site or suspended site is found during excavation. Protect the finds and wait until the experts' arrival. Resume the construction only after being instructed so by the cultural experts and cultural authority.</p>	Contractor		
Public disturbance	<p>(1) Ensure not damage public utilities along the existing roads;</p> <p>(2) Install its own power, water, telephone etc. after agreement with the local corresponding authorities;</p> <p>(3) Consult the local government and traffic police regarding construction materials transportation on the existing roads to avoid traffic jam particularly on provincial road S312;</p> <p>(4) Erect billboard at each construction site, listing contractor and CSE contract names and telephone numbers, construction period and other brief construction information for public notice. Also list the local EPB hotline or contract number for public complaints.</p>	Contractor	Yiba MPO	
Public health and safety	<p>(1) Conduct training to all construction personnel on disease control and prevention particularly epidemics such as hepatitis, HIV/AIDS, etc.;</p> <p>(2) Provide construction workers sufficient personal protection equipment (PPE) such as hard hats, earpiece, safety shoes, and others;</p> <p>(3) In deep cuts near the existing roads or other public accessible areas, erect fence for access control, Lit the pit or deep cuts at night as needed or instructed by CESC;</p> <p>(4) carefully store and handle explosives and strictly control the access to the storage area and work area using explosives;</p> <p>(5) Investigate a radius of 500 m from the explosive work area including all houses. Strengthen the houses if needed. Alert the public in the area of the explosion operations with regard to timing, potential impact and safety measures.</p> <p>(6) Conduct construction safety educations to local villages particularly schools. Explain the potential</p>	Contractor	Yiba MPO	

Issue	Mitigation Measures	Implementing Organizations	Responsible Organizations	In Tendering Document
	danger and provide safety measures and tips.			
Disposal sites	<ol style="list-style-type: none"> (1) Before disposal operation starts, top 30 cm of natural soil will be first removed and stored at the side. This material will reserve and to be used at the end of the disposal operation as cover materials as part of the rehabilitation. (2) For the site near the river, the retaining wall and/or interception ditch or settling ponds will be built prior to construction. The surface runoff will be retained and settled first before allowed discharge into the receiving water; (3) Ensure the stability of the spoil disposal site, the mortar rubble masonry pavement and grouted rubble toe protection will be adopted to prevent erosion and maintain stability. (4) Drainage ditch will be built around the disposal site to control surface runoff; (5) For the disposal site near the residents, it is prohibited to construction at night, and water the sites for dust suppression at the operation time. (6) For the disposal site near the residents, it is prohibited to transportation at night, and water the dust at the setting time. (7) The disposal sites will be fully rehabilitated as soon as the disposal operation is completed. The rehabilitation will include complete cover of the site with the native soil and fully landscaped. The stability of the sites will be inspected and measures such as retaining walls will be constructed as needed. The rehabilitation will be part of the contractual obligations for all contractors who will not be fully paid and contracts will not be closed until the rehabilitation will be completed as required and to the satisfaction of Yiba PMO, its consultant, and other stakeholders. (8) For the area where possess the good plants and well growth vegetations, it should be small-sized construction before the disposal operation in order to drive the wildlife away. 	Contractor	Yiba MPO	
Access roads	<ol style="list-style-type: none"> (1) The temporary access roads will be carefully located to avoid farmland, forest and crops; where possible, the access locations will be selected in such a way that they will be used by the local communities after the construction completion. (2) Safety warning signs will be installed and safety considerations and engineering measures will be given full consideration in the access road design. (3) Usage the existing road cooperated by the local government to avoid the traffic jam, especially much more heavy construction vehicles come-and-go, it will lead to the Yixing Road traffic increase. It is may destruct the existing roads, impact the local transportation, and increase the risk of the traffic accident. So, it will be enhance the transportation safety management such as set the transportation caution signs, scientific construction arrangement, minimized the impact to the 	Contractor	Yiba MPO	

Issue	Mitigation Measures	Implementing Organizations	Responsible Organizations	In Tendering Document
	<p>villagers along the proposed freeway.</p> <p>(4) When through village, schools and hospitals, all access roads will be hardened from 25 m before approaching these sensitive receptors until 25 m after leaving them.</p> <p>(5) When the construction is completed, the access road, if not beneficially used by the local communities, will be fully rehabilitated to its original state and landscaped as needed.</p>			
Construction Camps	<p>(1) Sufficient measures will be taken in the construction camps, i.e. provision of garbage tanks and sanitation facilities. All camps will have septic tanks for domestic waste storage and treatment. Waste in septic tanks will be cleared periodically;</p> <p>(2) Drinking water quality will meet national standard or alternatively, the camps will use bottled water for drinking and cooking;</p> <p>(3) Garbage will be collected in tanks or containers on site which will be covered for weather protection. The collected garbage will be of off site in a landfill if available nearby or bury into the ground in appropriate locations. ;</p> <p>(4) Special attention will be paid to the sanitary condition and personal hygiene of camps.</p> <p>(5) Construction workers will be given full training for control and prevention of epidemic diseases such as hepatitis and HIV/AIDS and workers will be provided health check periodically.</p> <p>(6) All machineries and construction vehicles, as well as fuel storage, will be on paved ground and under a canopy for weather protection. The pavement will prevent oil leaks and drips from infiltrate into the ground directly. If there are any major spills of fuel or other hazardous materials, the emergency procedure will be triggered as described above.</p> <p>(7) All camps will be located away to Huangbo River, Xiangxi River and Shennongxi River, each camp has septic tanks for domestic waste storage and treatment. The direct discharge of sanitary wastewater into the rivers and other receiving water bodies will be strictly prohibited. They can be discharged to the ditches, smaller creeks or irrigation channels first before into the above rivers.</p>	Contractor	Yiba MPO	
Environmental Personnel	<p>(1) Staff each construction package at least one full time environmental personnel, responsible for EMP implementation, environmental monitoring and other management measures in this package;</p> <p>(2) Attend the mandatory environmental training before the start of construction with at least one senior and one environmental staff attending.</p>	Contractor	Yiba MPO	