LONGHAI BAISHUI BRIDGE

The Other Highway Project
Fujian Provincial Highway Project II
Tongjiang-Sanya
National Highway Trunk Line
People’s Republic of China

Environmental Action Plan

Fujian Provincial Communications Department
Fuzhou, China
April, 1999
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Content

1. Main Items of Environmental Protection 1

2. Formulation, Implementation and Supervision of EAP 2
2.1 Laws and regulations associated with environmental action plan 2
2.2 Executive unit 2
2.3 Supervision organ 2

3. Environmental Protection Actions 4
3.1 Design period 4
3.2 Construction period 5
3.3 Operation period 7

4. Cost Estimation and Implementation of Environmental Protection Measures 8
4.1 Cost estimation 8
4.2 Time schedule of implementation of environmental protection measures 8

5. Environmental Management Organ and Responsibility 8
5.1 Environmental management organization 8
5.2 Organs to implement the environmental action plan 10

6. Environmental Monitoring plan 12
6.1 Purpose and principles 12
6.2 Monitoring target and item for each period 12
6.3 Environmental monitoring plan 12

7. Appendix table 13
Environmental Action Plan for
Longhai Baishui Bridge
The Other Highway Project of Fujian Provincial Highway Project II

This environmental action plan (EAP) is based on the “Environmental Impact Assessment Statement for Longhai Baishui Bridge, The Other Highway Project of Fujian Provincial Highway Project II”, with contents including the action plan of environmental management and environmental monitoring for environmental protection work.

The environmental protection work for this bridge project shall follow the guideline of “overall planning, reasonable layout, integrated utilization, turning harm into good, relying on general public, everyone participating, to protect environment, and to bring benefit to people”, and to adhere the principles of “prevention first, prevention combined with treatment, strengthening management, to promote treatment, and whoever causes the pollution should be responsible for treatment”. This environmental action plan is made on the basis of the engineering design and environmental protection measures, to ensure effective measures to be taken in the stages of design, construction and operation to mitigate or compensate the negative impacts arising from the bridge project.

1. Main Items of Environmental Protection
   (1) Noise
   Non-continuous noise arising from construction work in road construction period and unstable noise from road traffic in road operation period.

   (2) Air
   Dusts and TSP arising from construction work site activities such as operation of transport vehicles and mixing plant, in road construction period, and the pollutants of vehicle emissions from traffic in road operation period.

   (3) Water and soil retention
   Soil erosion may occur in bridge construction period. Particularly in the rainy season (from May to June), attention should be paid to effective measures to be taken to reduce the soil erosion, although soil erosion in this area is not serious.

   (4) Water environment
   The bridge will cross Nanxi river and some of the pools, irrigation channel and small streams.

   (4) Land use
   To reduce permanent land acquisition and temporary land occupation as much as possible, to reduce temporary land occupation time period, and to recover cover plant or back to original use in time.
2. Formulation, Implementation and Supervision of EAP

The purpose of this environmental action plan is to set forth concrete implementation method for environmental protection measures, and to outline the requirements for the management activities of the supervision work in the project implementation period (design, construction), and of the environmental monitoring work in the road operation period.

2.1 Laws and regulations associated with environmental action plan
(1) “Law of Environmental Protection of the People’s Republic of China”;
(2) “Law of Water and Soil Retention of the People’s Republic of China”;
(3) “Law of the People’s Republic of China for the Prevention and Treatment of Water Pollution”;
(4) “Law of the People’s Republic of China for the Prevention and Treatment of Noise Pollution”;
(5) “Law of the People’s Republic of China for the Prevention and Treatment of Air Pollution”;
(6) “Land Administration Law of the People’s Republic of China”;
(7) “Law of Cultural Relics Protection of the People’s Republic of China”;
(8) “Regulations Concerning with the Environmental Protection and Management of Capital Construction Project”, State Council Ordinance No.253;
(9) “Measures Concerning the Environmental Protection and Management for Communications Construction Project” Ministry of Communications (MOC);
(10) “Environmental Protection Design Specifications for Highway” (JTJ/T006-98, MOC).

2.2 Executive unit
Organization of the implementation of the environmental action plan for the Longhai Baishui Bridge will be the responsibility of the Fujian Provincial Communications Department (PCD). Fujian Provincial Expressway Construction Headquarters (PECH) and the Provincial Expressway Co. Ltd. are responsible for implementation of environmental protection measures in design, construction and operation period for the bridge project respectively.

2.3 Supervision organ
Fujian Provincial Environmental Protection Bureau (PEPB), the competent authority for environmental protection under the Fujian Provincial People’s Government, is responsible for overall supervision of the implementation of environmental protection work in the province.

The Municipal Environmental Protection Bureau (MEPB) is the competent authority of the local people’s government for environmental protection in the area under its jurisdiction, responsible for the area’s environmental quality taking necessary measures to improve the environmental quality. An environmental
monitoring center station is set by the PEPB, and environmental monitoring stations are set at local (municipal/county) level, for routine environmental monitoring work.

The organization of the environmental protection supervision organ and the supervision system organization are shown in Figure 1. The environmental monitoring for the bridge project in the construction and operation period shall be implemented by the PECH, the Provincial Expressway Co. Ltd. and the local EPB respectively. Table 1 shows the summary of the environmental supervision plan.

![Diagram of Environmental Protection Supervision Organ](image)

**Figure 1: Environmental protection supervision organ**

**Table 1: Environmental supervision plan**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Agency</th>
<th>Work content</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility study</td>
<td>MOC(EPO)</td>
<td>1. Examine the EIA 1. To ensure possible serious issues for the project</td>
<td>1. To ensure possible serious issues for the project to be addressed properly</td>
</tr>
<tr>
<td></td>
<td>World Bank</td>
<td>2. Examine the draft of EAP 2. To ensure there is feasible action plan to deal with possible major and potential issues.</td>
<td>2. To ensure there is feasible action plan to deal with possible major and potential issues.</td>
</tr>
<tr>
<td></td>
<td>PEPB</td>
<td>3. To check material handling, mixing etc. 4. To check dust &amp; noise control measures &amp; work time schedule 5. To check sewage discharge and wastes treatment at work site.</td>
<td>4. To reduce the impact &amp; implement regulations 5. To ensure water resource not being polluted</td>
</tr>
<tr>
<td>Design &amp; construction period</td>
<td>WB, PEPB</td>
<td>1. Examine preliminary design for environment protection &amp; EAP 1. To carry out the “three simultaneousness” &amp; EAP</td>
<td>1. To carry out the “three simultaneousness” &amp; EAP</td>
</tr>
<tr>
<td></td>
<td>EPOMOC</td>
<td>2. To examine if there is investment for environment protection 2. To make sure the investment being made</td>
<td>2. To make sure the investment being made</td>
</tr>
<tr>
<td></td>
<td>WB, PEPB</td>
<td>3. To check construction site: material handling, mixing etc. 4. To check dust &amp; noise control measures &amp; work time schedule 5. To check sewage discharge and wastes treatment at work site.</td>
<td>3. To make sure the work site to meet the requirements of environment protection 4. To reduce the impact &amp; implement regulations 5. To ensure water resource not being polluted</td>
</tr>
<tr>
<td></td>
<td>EPB</td>
<td>6. Earth borrowing &amp; spoil disposal area arrangement &amp; treatment 7. To check the implementation of the “three simultaneousness” &amp; to determine the final time schedule</td>
<td>6. To ensure no damage to landscape and land resources 7. To make sure the implementation of the “three simultaneousness”</td>
</tr>
<tr>
<td></td>
<td>EPOMOC</td>
<td>8. To examine if the environment protection facilities in conformity with the standards</td>
<td>8. To check and accept the environment protection facilities</td>
</tr>
<tr>
<td></td>
<td>PEPB</td>
<td>1. Examine EAP implementation 2. Examine the implementation of environment monitor plan 3. Check further measures be taken (for unforeseen issues)</td>
<td>1. To carry out EAP 2. To carry out environment monitor plan 3. To strengthen environmental management &amp; to protect people’s health</td>
</tr>
<tr>
<td>Operation period</td>
<td>PEPB</td>
<td>4. Sensitive spot environment quality 5. No surface drainage directly into drinking water source</td>
<td>4. Environmental management for public health 5. Ensure drinking water not being polluted</td>
</tr>
<tr>
<td></td>
<td>Zhangzhou</td>
<td>6. Be prepared for traffic incidents &amp; accidents</td>
<td>6. To remove hidden danger and to avoid serious pollution accident, and to reduce accident loss.</td>
</tr>
<tr>
<td></td>
<td>Longhai</td>
<td>7. Ensure drinking water not being polluted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MEPB</td>
<td>8. To ensure no damage to landscape and land resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire fighting</td>
<td>9. To make sure the implementation of the “three simultaneousness”</td>
<td></td>
</tr>
</tbody>
</table>

Zhangzhou MEPB
3. Environmental Protection Actions

3.1 Design period

(1) Reduce land occupation

The bridge project is located in the east of Zhangzhou, over the Nanxi river a tributary of Jiulongjiang river, with landforms characteristic of marine alluvial plain. Some of the road section will have deep filling, and some of the farm land will have to be used with total land acquisition of 59.4 mu. Since the area has less land and more people, it has been considered in the design to reduce land occupation as much as possible, particularly for the farm land.

(2) River system and soil erosion

The agriculture along the road bridge area is quite developed, with crisscross water irrigation system, which has been taken into consideration in design period not to change the existing pattern of the system to ensure integrity and function of the system. All these factors have been considered in the design.

Along the whole road area plantation, it has been arranged to cover the side slope with plants, intercept ditches and earth retaining wall to be set up to prevent or reduce soil erosion.

(3) Water pollution

Deposit pool has been decided to be set at labour camp to prevent sewage being directly discharged into water body of the Nanxi river.

(4) Noise pollution

Within 50m from the road side there will be noise pollution caused by the road traffic, so in the road side area, buildings for sensitive receivers such as resident house, school, hospital, etc., should not be built.

(5) Air pollution

To prevent dust flying impact, it will be considered in the design to select quarry, earth borrowing and spoils disposal areas 300 away from the resident area.

(6) Land acquisition and resettlement

It has been stressed in the feasibility study report the principles to be followed for the road alignment to be away from towns and villages as far as possible, to reduce farm land occupation and resettlement work to the minimum. Total land acquisition is 59.4 mu. Resettlement office is to be established by the owner of the road project to ensure accomplishment of the resettlement work before commencement of the engineering construction, to supervise implementation of the associated compensation and resettlement work for the benefit of the affected people, with the details as seen in resettlement action plan (RAP).

(7) Reasonable selection of alignment
The alignment of the road bridge has been selected based on the comparison of different alternative schemes, taking into account of the local government department's opinions and suggestions, with densely populated areas have been avoided and it is consistent with local township development program.

(8) Flood control
The main rivers crossed by the road project are Jiulongjiang river and its tributaries. The river bed is stable, with conspicuous river channel and with little undulations of the river bottom. Most land on both sides of the river are paddy, woods and barrens with soil erosion being serious. The river channel has water all the year round. One large bridge, one medium bridge will be built taking into consideration of flood discharge capacity, as well as 5 culverts to ensure flood to be discharged smoothly in rainy season.

3.2 Construction period
(1) Air pollution
Dust is the major pollutant for air pollution in construction period. The main sources of the dust come from lime and earth mixing, material transport, and road construction machine operation, and some may be produced from cement concrete mixing and loading and unloading of the construction materials. To mitigate the work site air pollution for the benefit of the workers' and local residents' health, following measures shall be taken.

(i) Airtight device will be provided for the mixing equipment with two-stage dust removing system. Labour protection will be provided for the workers. The mixing plant will be set at place there is no sensitive points such as resident areas, schools, and etc., within 300 m in the leeward direction.

(ii) The truck will be covered when used for bulk material transport to prevent spillage and the storage area will also be covered and sprinkled.

(iii) To sprinkle over the construction work site of the mixing plant and the area along the road for construction material transport.

(2) Noise pollution
The noises in the construction period mainly come from road construction machinery and transport vehicle. To protect the workers' health, and the sensitive receivers, such as those in near-by resident area, school, etc., it will be necessary to take the following measures.

(i) To keep the construction machines well maintained in optimal operation conditions, and reasonable working shift shall be arranged, to reduce the time for the workers to be exposed to the noise, or by changing work shift so as to have time to recover his/her hearing ability. For workers close to the machines ear plug will be
provided and work time be shortened.

(ii) In case there is resident area within 50 m from the work site, night time (22:00 ~ 6:00) machine operation shall not be arranged. The main transport corridor (temporarily set) will also be selected away from the resident area as far as possible.

(3) Soil erosion and water pollution
   (i) Earth borrowing area will be selected carefully, to use low high land with little cover plant as much as possible. After earth borrowing work it is imperative to follow the requirements as specified in the “Law of Water and Soil Retention of the People’s Republic of China” and those set forth by the SEPA, to restore the area with cover plant, to reduce soil erosion.

   (ii) It has been considered to avoid rainy season avoid for subgrade construction as much as possible; and during the construction paving will be combined with compaction section by section also pass by pass to reduce soil erosion.

   (iii) Attention will be paid to the navigation and irrigation system, when bridge foundation and culvert are built, to avoid damage to the systems. No wastes should be discharged into the river.

   (iv) Septic tank will be provided in the labour camp, sewage will be discharged in designated area, with regularly cleaning treatment; and some wastes may be used for farm land as fertilizer.

(4) Protection of land and wood land resources
   (i) To have overall planning of the land acquired for the project, to reduce temporarily used land or not borrow earth from farm land as much as possible, and to reduce land occupation time as much as possible, once the work is completed the land should be returned back immediately for original or planed land use.

   (ii) To strengthen education and personnel training to protect the wood land, and to ban indiscriminate cutting and to prevent fires.

(5) Transport
   To avoid traffic congestion and prevent traffic accident, it will be necessary to maintain the road traffic conditions and to ensure mobility of the road the river traffic.

(6) Culture relics protection
   To make publicity of the laws and regulations concerning cultural relics protection, in the education and personnel training for the construction workers, and to set forth rewards and penalties system. if there is any underground cultural relics to be discovered during the process of the construction, it shall be reported immediately to the cultural relics protection department by the contractor and the construction work
shall stop and not proceed until proper treatment having been done by the archaeological professionals organized by the cultural relics protection department.

3.3 Operation period

(1) Control of traffic noise

(i) To strengthen management of road traffic and road maintenance, and to ban vehicles with noise exceeding the standard limit onto the road. In accordance with "Law of the People's Republic of China for the Prevention and Treatment of Noise Pollution", motor vehicles shall be equipped with muffler and the horn to meet the standard requirements, and shall have good technical conditions to meet the noise level and emission standard requirements, otherwise, no certificate shall be issued to the vehicle; and should not be allowed to operate on road. So enforcement shall be strengthened in the operation period.

(ii) According to the forecast, within the assessment area, 20m away from both sides of the approach road, the traffic noise by day and by night will not exceed the Class IV standard (GB3096-93) (70 dB(A) by day, 55dB(A) by night) in the operation period, even by the year of 2016.

(iii) Environmental protection measures and recommendations for operation period

A. The traffic noise forecast shows that within the assessment area, the traffic noise by day and by night will have slight impact on the environmental quality; however, in the long run, it is recommended to the land use planning department that no such environmental sensitive buildings as resident houses, schools and hospital should be allowed to be built in the area in 50 m from the road side.

B. To strengthen management of road maintenance and traffic control, to keep the road in good conditions and mobility of the traffic.

C. The resident area in Neijiayang is close to the connecting point of the bridge approach and the Nanxi road; and the connecting site may have some changes, so noise monitoring at the site shall be done if it is necessary.

(2) Ambient air pollution control

According to the forecast, under the meteorological conditions of type D stability, the concentrations of CO and NOx in the area 10m away from both sides of the approach road in the long term of operation period will be up to Class II standard, which indicates that the impact of traffic emission on ambient air is slight.

(3) Greening plantation and water pollution

(i) To strengthen plantation of greening engineering for the road to recover the cover plant damaged in the construction period as early as possible, to reduce soil erosion, to improve landscape of the road and bridge area, to protect the road subgrade to promote a harmonized ecological system. During the process of greening plantation, attention should be paid to the consistency with the township development program.

(ii) During the construction period, water quality shall be monitored regularly to supervise the environmental protection measures taken and to prevent water pollution.
(4) Transport and trucking traffic management
To strengthen management of truck traffic particularly dangerous goods transport and bulk dusty materials transport, to prevent spillage over the road pavement and the bridge deck.

4. Cost Estimation and Implementation of Environmental Protection Measures
4.1 Cost estimation
The environmental protection measures cost estimation based on the features of the bridge project is shown in Table 4-1.

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
<th>Quantity</th>
<th>Unit cost</th>
<th>Sub total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP at construction stage</td>
<td>sprinkle, garbage spoils &amp; mud disposal &amp; transport</td>
<td>2 years</td>
<td>9/month</td>
<td>216</td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td>construction period: noise, TSP, water quality, operation period: noise, water quality*</td>
<td>2 years</td>
<td>20/year</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 years</td>
<td>10/year</td>
<td>150</td>
</tr>
<tr>
<td>EP training</td>
<td>take part in the Zhang-Zhao expressway construction period of 1999 environmental protection (EP) training</td>
<td>once</td>
<td>2/person</td>
<td>10</td>
</tr>
<tr>
<td>Green beautification</td>
<td>on both sides of the approach road planting trees, flowers etc.</td>
<td>4 places</td>
<td>5/place</td>
<td>20</td>
</tr>
<tr>
<td>Unforeseen cost</td>
<td></td>
<td>20% of total</td>
<td></td>
<td>87.2</td>
</tr>
</tbody>
</table>

* Water quality monitoring in operation period will be done for both Xinmu extra-large bridge and Baishui bridge, with the monitoring costs for Baishui bridge to be paid once per year.

4.2 Time schedule of implementation of environmental protection measures
Based on the construction engineering work progress schedule, the personnel training for environmental management may be arranged together with that for the Zhang-Zhao expressway in 1999; the environmental monitoring should be arranged over the period of October, 1999 - September, 2001 in construction period, and over 2000 - 2016 in operation period; and the greening plantation should be arranged over 2000 - 2002.

5. Environmental Management Organ and Responsibility
5.1 Environmental management organization
Figure 5-1 shows the organization chart for environmental management.

The followings will be stressed for the environmental management for the project.

(1) Design period: the design institute for the bridge project have taken into account of the measures set forth in the EIA statement to be included in the design, and the owner of the bridge project will be responsible for check the design scheme that if the environmental protection measures have been included in the design;

(2) Bidding period: The contractor shall include environmental protection measures in his bidding document, including the costs for the measures;
(3) In construction period the project owner shall arrange one person (full or part
time) for management and supervision of environmental protection work in the light
of the requirements set in the design document, with emphasis on water quality;

(4) In construction period each contractor shall arrange one person responsible for
management and supervision of implementation of the environmental protection
measures.

(5) In operation period the environmental management and monitoring shall be
implemented by the Provincial Expressway Co., Ltd.

Figure 5.1 Baishui bridge environmental protection organization
5.2 Organs to implement the environmental action plan

The Fujian Provincial Expressway Construction Headquarters is responsible for overall management of environmental protection for Baishui bridge in construction period. The Fujian Expressway Co. Ltd. is responsible for the management of environmental protection for the project in operation period. Figure 5-2 and Figure 5-3 show the management organization system in the construction and operation period. Table 5-1 shows the environmental action plan.

![Figure 5-2 Environmental management organs in construction period](image1)

![Figure 5-3 Environmental management organs in operation period](image2)
Table 5-1 Summary of the environmental management action plan for the road project

<table>
<thead>
<tr>
<th>EA factor</th>
<th>Environmental protection measures</th>
<th>Action</th>
<th>In charge</th>
<th>Paragraph No</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Design stage</td>
<td>Land occupation as less as possible; away from sensitive points as far as possible such as school and resident area; avoid poor geological area and culture relics as far as possible; public promotion of the road project.</td>
<td>Design unit, Contractor</td>
<td>PECH</td>
<td>3.1 (1)</td>
</tr>
<tr>
<td>1. Route selection</td>
<td>Land occupation as less as possible; away from sensitive points as far as possible such as school and resident area; avoid poor geological area and culture relics as far as possible; public promotion of the road project.</td>
<td>Contractor, Municipality</td>
<td>Longhai</td>
<td>3.1 (4)</td>
</tr>
<tr>
<td>2. Soil erosion</td>
<td>Complete design of plantation for the road area; proper selection of quarry, earth borrowing, spoil disposal area; proper drainage design; to avoid high filling and cutting as much as possible.</td>
<td>Contractor, Municipality</td>
<td>Longhai</td>
<td>3.1 (2)</td>
</tr>
<tr>
<td>3. Land acquisition &amp; resettlement</td>
<td>Proper arrangement of the resettlement; fair compensation for the resettlement</td>
<td>Contractor, Municipality</td>
<td>Longhai</td>
<td>3.1 (6)</td>
</tr>
<tr>
<td>4. Bridge design</td>
<td>To meet flood control requirements, without compromising of the local irrigation system</td>
<td>Contractor, Municipality</td>
<td>Longhai</td>
<td>3.1 (8)</td>
</tr>
<tr>
<td>B. Construction stage</td>
<td>Stop machine work at night when there is resident area nearby; proper arrangement of construction work, personnel training for machine; abide by the industrial noise standard, to take protection measures for worker.</td>
<td>Contractor, Supervision company, Construction</td>
<td>PECH</td>
<td>3.2 (2) (i)</td>
</tr>
<tr>
<td>1. Noise pollution</td>
<td>Proper arrangement of mixing plant 300m from sensitive points; to use stationary mixing plant as much as possible, with dust remove device; proper arrangement of material storage area; sprinkle over work site and unpaved road surface to reduce dust.</td>
<td>Contractor, Supervision company, Construction</td>
<td>PECH</td>
<td>3.2 (2) (i)</td>
</tr>
<tr>
<td>2. Air pollution</td>
<td>Proper planning of temporary land use, timely back to original use; proper planning of earth and stone work to reduce damage to cover plant as much as possible, timely plantation of damaged cover plant; proper arrangement of bridge construction, ensure farm land irrigation and flood control; proper treatment of worksite wastes; to meet design requirement for subgrade drainage, treatment of poor geological areas, and the protection engineering work.</td>
<td>Contractor, Road design, Municipal administration</td>
<td>Longhai, PSB,</td>
<td>3.2 (2) (i)</td>
</tr>
<tr>
<td>3. Ecological environment</td>
<td>Proper planning of temporary land use, timely back to original use; proper planning of earth and stone work to reduce damage to cover plant as much as possible, timely plantation of damaged cover plant; proper arrangement of bridge construction, ensure farm land irrigation and flood control; proper treatment of worksite wastes; to meet design requirement for subgrade drainage, treatment of poor geological areas, and the protection engineering work.</td>
<td>Contractor, Road design, Municipal administration</td>
<td>Longhai, PSB,</td>
<td>3.2 (2) (i)</td>
</tr>
<tr>
<td>4. Others</td>
<td>Set up temporary communication system; public health and medical care for the workers; timely report and inform of discovered underground cultural relics, with proper measures to protect the site; strengthen traffic management in construction period for safety and mobility; personnel training of safety knowledge.</td>
<td>Contractor, Supervision company, Construction</td>
<td>PECH</td>
<td>3.2 (6)</td>
</tr>
<tr>
<td>C. Operation stage</td>
<td>For areas within 50m from both sides of the road, no environmental sensitive buildings shall be arranged.</td>
<td>Land use planning dept, Land Bureau</td>
<td>Longhai Cons. Land Bureau</td>
<td>3.2 (5)</td>
</tr>
<tr>
<td>1. Land use planning</td>
<td>For areas within 50m from both sides of the road, no environmental sensitive buildings shall be arranged.</td>
<td>Land use planning dept, Land Bureau</td>
<td>Longhai Cons. Land Bureau</td>
<td>3.2 (5)</td>
</tr>
<tr>
<td>2. Traffic control &amp; road maintenance</td>
<td>Strengthen traffic management and road maintenance.</td>
<td>Zhangzhou, Longhai, PSB,</td>
<td>Local PSB, Longhai, PSB,</td>
<td>3.3 (1) (i)</td>
</tr>
<tr>
<td>3. Dangerous goods transport</td>
<td>Implementation and enforcement of dangerous goods transport regulations</td>
<td>MCB</td>
<td>Local PSB, Longhai, PSB,</td>
<td>3.3 (1) (iv)</td>
</tr>
<tr>
<td>4. Environmental monitoring</td>
<td>In accordance with the environmental monitoring plan to carry out the environmental monitoring work.</td>
<td>ZMEMS, PECH</td>
<td>3.3 (3) (i)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.3 (3) (ii)</td>
</tr>
</tbody>
</table>
6. Environmental Monitoring plan

6.1 Purpose and principles

The purpose of the environmental monitor plan is to supervise implementation of each of the measures in EAP for environmental protection, to timely adjust the environmental action plan making it more effective and efficient, and to provide basis for formulation of time schedule and scheme for the action plan, as well as for post assessment of the project. The principle of monitor plan formulation is based on the major impacts in each of the forecast periods and the indicators actually measured with emphasis on each of the sensitive points.

6.2 Monitoring target and item for each period

(1) In construction period, TSP, noise, and the water quality (pH, COD, oil, and SS) 50m downstream the bridge shall be monitored.

(2) In operation period noise shall be monitored.

6.3 Environmental monitoring plan

The environmental monitoring work for the bridge project is to be conducted by the Zhangzhou Municipal Environmental Monitoring Station (ZMEMS) in accordance with the monitoring plan (as shown in Table 6-1) entrusted by the project owner, who will sign a contract with the monitoring station for the monitoring work. The cost of the monitoring work is estimated about CNY 190,000, of which CNY40,000 for construction period and CNY150,000 for operation period.

<table>
<thead>
<tr>
<th>Item</th>
<th>Period</th>
<th>Location</th>
<th>Frequency</th>
<th>Action organ</th>
<th>Supervising organ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Construction</td>
<td>1 point for the first raw building close to road at Neijiayang resident area, borrowing area, quarry, resident area along the road for construction transport</td>
<td>construction stage: once/month, 1 day by day and night</td>
<td>Zhangzhou Municipal Monitor Station (ZMEMS)</td>
<td>Zhang-Zhuo Expressway Headquarters (ZZEH)</td>
</tr>
<tr>
<td></td>
<td>Operation</td>
<td>1 point for the first raw building close to road at Neijiayang resident area</td>
<td>Operation: 2001 - 2016, once/year, 1 day, by day and night</td>
<td>ZMEMS</td>
<td>Zhang-Zhuo Expressway Co., Ltd. (ZZECL)</td>
</tr>
<tr>
<td>Ambient air TSP</td>
<td>Construction</td>
<td>Unpaved road, mixing plant work site, temporary road on work site, resident area at Neijiayang</td>
<td>random as required</td>
<td>ZMEMS</td>
<td>ZZEH, Zhangzhou EPB</td>
</tr>
<tr>
<td>Water quality</td>
<td>Operation</td>
<td>downstream of Jiulongjiang Nanxi Xinyuhe section (monitor for both Xinyu extra-large bridge and Baishui bridge)</td>
<td>once per 3 months, 2 days each time, 1 morning, 1 afternoon</td>
<td>ZMEMS</td>
<td>ZZECL, Zhangzhou EPB</td>
</tr>
<tr>
<td>(garbage, soil, mud)</td>
<td>Construction</td>
<td>construction site, pre-fabrication work site</td>
<td>random as required</td>
<td>ZMEMS</td>
<td>ZZEH, Zhangzhou EPB</td>
</tr>
</tbody>
</table>
7. Appendix table

Table 7-1 Surface water quality standard (Class III summary) (Unit: mg/L, except for pH)

<table>
<thead>
<tr>
<th>Item</th>
<th>PH</th>
<th>Permanganate index</th>
<th>CODcr</th>
<th>DO</th>
<th>Total Lead</th>
<th>Oil</th>
<th>SS *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard value</td>
<td>6.5 - 8.5</td>
<td>≤ 6</td>
<td>20</td>
<td>≥ 5</td>
<td>≤ 0.05</td>
<td>0.05</td>
<td>≤ 150</td>
</tr>
</tbody>
</table>

* water quality standard for agricultural irrigation water

Table 7-2 Summary of Marine Water Quality Standard (Unit: mg/L, except for pH)

<table>
<thead>
<tr>
<th>Class</th>
<th>pH</th>
<th>SS</th>
<th>COD</th>
<th>DO</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>7.5 - 8.5</td>
<td>man made increment ≤ 10</td>
<td>≤ 2</td>
<td>&gt; 6</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>II</td>
<td>7.5 - 8.5</td>
<td>man made increment ≤ 10</td>
<td>≤ 3</td>
<td>&gt; 5</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>III</td>
<td>6.8 - 8.8</td>
<td>man made increment ≤ 100</td>
<td>≤ 4</td>
<td>&gt; 4</td>
<td>≤ 3.0</td>
</tr>
</tbody>
</table>

Table 7-3 Standard noise limit for construction site (GB12523-90)

<table>
<thead>
<tr>
<th>Construction stage</th>
<th>Main sources of noise</th>
<th>Noise limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Daytime</td>
</tr>
<tr>
<td>Earth &amp; stone work</td>
<td>Bulldozer, excavator, loader, etc.</td>
<td>75</td>
</tr>
<tr>
<td>Piling</td>
<td>Various piling machine</td>
<td>85</td>
</tr>
<tr>
<td>Structure work</td>
<td>Concrete mixer, vibrator etc.</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 7-4 Ambient noise standard (GB3096-93) $L_{Aeq}$: dB

<table>
<thead>
<tr>
<th>Classification</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Class II</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Class IV</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

Table 7-5 Ambient air quality standard $mg/m^3$

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>TSP</th>
<th>NOx</th>
<th>CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration</td>
<td>daily average</td>
<td>0.30</td>
<td>0.10</td>
</tr>
<tr>
<td>Limit</td>
<td>one hour average</td>
<td>—</td>
<td>0.15</td>
</tr>
</tbody>
</table>