Harbin-Jiamusi Railway Project

Environmental Management Plan

China Railway Third Survey and Design Institute Company

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1. INTRODUCTION

1.1 Project Background

The proposed Harbin-Jiamusi Railway Project is a new 343.0km double track railway line (utilizing 1.242km of Harbin Station reconstruction project, reconstructing 4.987km long riverside line and newly building 336.8km long line). The line starts at Harbin Station (BJCK0+000) and ends at Jiamusi Station (CK340+188.9). Construction period is planned to be 4.5 years. The whole line is expected to start construction in January 2014 and completed and open to traffic in the end of June 2018, with total construction period of 4.5 years.

In accordance with environmental assessment laws and regulations of China and provisions in Operational Policy 4.01 Environmental Assessment of World Bank, a full environmental impact assessment (EIA) report has been prepared based on the scale of potential environmental and social impact and sensitiveness and requirement of the project area. The proposed project is of category A.

This Environmental Management Plan (EMP) is prepared based on conclusions and recommendations of the EIA report. It specifies following items: project activities, potential impact, mitigation measures, executive entity, monitoring entity, budget estimate, monitoring indicators, setting of environmental management and supervision system as well as capability building training plan.

This EMP will be incorporated into contract document and used by contractors and supervision engineers. Mitigation measures specified in the EMP will be integrated into preliminary design and detailed design and will be comprehensively implemented by contractors according to contract obligations.

According to the Environmental Impact Assessment Law of China, the environmental impact assessment based on feasibility study (FS) will not be changed after approval, unless engineering scope is involved in great changes. This EIA is made on the basis of Feasibility Study on Engineering Modification to Newly-built Harbin-Jiamusi Railway, and the detail numbers are subject to adjustments during the finalization of the project detailed design, thus the specific numbers in this EMP may also be subject to adjustment with fine-tuning of project design.

1.2 Project Description

The proposed Harbin-Jiamusi Railway is located within the mid-east region of Heilongjiang Province and situated in Harbin City and Jiamusi City at the south bank of the Songhua River. The line starts at Harbin Station, goes by Binxi, Binxian, Fangzheng, Demoli, Gaoleng, Dalianhe and Yilan, and lastly ends at Jiamusi Station in Jiamusi City. The whole line passes through three counties in the two cities and has a total length of 343.0 km.

The HaJia Freight Train Line utilizes Chengbin Line, the existing local railway of Binxi, to lead in the hub and uses Binsui Line, Sunxin Line and Wangsun Line to connect Harbin South Station. The project includes newly building 9.141km long Binxi East Freight Train connection line (single track), 2.334km long Binxi West Freight Train connection line, and 4.915km long Chenggaozi connection line. The project utilizes and electrifies the existing local Chengbin Line and also the existing railway from Chenggaozi Station to Harbin South Station (line length of 20.357km).
- Line length: 343.0km
- Railway classification: I;
- Number of main track: double track;
- Designed running speed of passenger train: 200km/h;
- Minimum radius of curve: generally 3,500m and 2,800m for difficult locations;
- Maximum gradient: 13‰;
- Distance between centers of tracks: 4.4m;
- Types of traction: electric
- Classification of locomotive: CRH; SS9 for passenger train and SS4 for freight train;
- Effective length of arrival-departure track: 1,080m
- Block system: automatic blocking.

For items and scale of the project, please refer to Table 1-1.

| Table 1-1   Project Contents and Scale |
|-------------|---------------------------------------|
| **Project Name** | **Unit** | **Quantities** |
| Line Length | Km for main track | 343.0 |
| Permanent land occupation | hm² | 1548.17 |
| Temporary land occupation | hm² | 571.57 |
| Station | Main track | New station | number | 12 |
| | | Existing station | number | 4 |
| | Freight line | New station | number | 2 |
| | | Existing station | number | 5 |
| Subgrade engineering | Filling | $10^4m^3$ | 1170.9963 |
| | Excavation | $10^4m^3$ | 2040.5830 |
| | Auxiliary engineering | Mortar rubble | $10^4m^3$ | 246626 |
| | | Geogrid | m² | 5028924 |
| Bridge | Specially long span bridge | m/number | 142528.21/72 |
| | Large and middle bridge | m/number | 16475.2/68 |
| | Frame-shaped bridge (rigid frame bridge) | m/number | 17026/51 |
| | Highway bridge | m²/number | 5600/1 |
| | Culvert | number | 450 |
| | Total bridge length | km | 159.003 |
| Tunnel | Double-track tunnel | Linear meter/set | 9845/6 |
| | Traction substation | number | 10 |
## 1.3 Applicable Standards

Applicable environmental standards are shown as below in accordance with “Reply to Applicable Standard on Environmental Impact Assessment for Newly-built Harbin-Jiamusi Railway Project” of Heilongjiang Environmental Protection Department, Harbin Environmental Protection Bureau and Jiamusi Environmental Protection Bureau.

### 1.3.1 Evaluation Standards

According to the official reply of Heilongjiang Environmental Protection Department, Harbin Environmental Protection Bureau and Jiamusi Environmental Protection Bureau to resubmittal of executive standards on environmental impact assessment for newly-built Harbin-Jiamusi Railway, the evaluation standards are implemented as below:

1. **Acoustic Environment**

   (1) Evaluating special sensitive architectures like schools and hospitals (sanatoriums and senior houses) within the scope and executing category-2 region standard in *Acoustic Environment Quality Standard* (GB3096-2008), namely 60dB(A) at day and 50dB(A) at night.

   (2) Evaluating sensitive architectures like residences within the scope and executing *Acoustic Environment Quality Standard* (GB3096-2008).

      ① For sensitive points that are located at the two sides of existing and new railways and at a certain distance outside the land for railway, executing category-4b region standard in *Acoustic Environment Quality Standard* (GB3096-2008), namely 70dB(A) at day and 60dB(A) at night.

      ② For division of “a certain distance outside the land for railway”, implementing provisions in 8.3.1.2 of *Technical Regulations on Division of Urban Environmental Noise Applicable Regions* (GBT15190-94): if the adjacent areas are up to standard on category 1, the applicable region will be “75m away from the land for railway to the center line of outside track”; if the adjacent areas are up to standard on category 2, the applicable region will be “60m away from the land for railway to the center line of outside track”.

      ③ For sensitive points beyond “a certain distance outside land for railway”, urban noise function zone division will be implemented for areas with noise function zone division and standard on category-2 in *Acoustic Environment Quality Standard* (GB3096-2008) according to 7.2 b of *Acoustic Environment Quality Standard* (GB3096-2008) and for those without noise function zone division

2. **Vibration Standard**

   For sensitive architectures along the railway like residences, schools and hospitals, implementing standard limiting value of “both sides of trunk railway” in *Standard on Environmental Vibration in
Urban Areas (GB10070-88), namely 80dB at day and 80dB at night.

3. Surface Water Environment Standard


4. Air Environment Quality Standard


1.3.2 Pollution Discharge Standard

1. Noise

(1) For boundary noise from new railways, implementing limiting value in Table 2 in Limiting Value for Boundary Noise and Measurement Method (GB12525-90), namely 70dB(A) at day and 60dB(A) at night at 30m away from center line of the outer rail.

For boundary noise from existing railways, implementing limiting value in Table 1 in Limiting Value for Boundary Noise and Measurement Method (GB12525-90), namely 70dB(A) at day and 70dB(A) at night at 30m away from center line of the outer rail.

(2) For construction field, implementing Environment Noise Standard for Construction Site Boundary (GB12523-2011), i.e. 70dB(A) at day and 55dB(A) at night.

2. Air


3. Wastewater

(1) Harbin

1) Newly increased domestic sewage from 2 existing stations: Binjiang Station and Taipingqiao Station is treated in septic-tank first and then discharged to municipal pipe network and finally to sewage treatment works. Implementing category-III discharge standard in Integrated Wastewater Discharge Standard GB8978-1996.

2) Domestic sewage of Binxí North Station, Binzhou Station, Fangzheng Station and Yilan Station is treated in septic-tank first and then discharged to local sewage treatment works. Implementing category-III discharge standard in Integrated Wastewater Discharge Standard.

3) Domestic sewage of Binxí East Station, Shengli Station, Shuanglonghu, Demoli Station,
Gaoleng Station, Dalianhe Station and Hongkeli Station is treated in SBR sewage treatment plant and then discharged to nearby channels. Implementing category-I discharge standard in *Integrated Wastewater Discharge Standard (GB8978-1996)*.

4) Domestic sewage of Binxi Station is discharged to nearby channels. Implementing category-I discharge standard in *Integrated Wastewater Discharge Standard (GB8978-1996)*.

5) Domestic sewage of Qianhuojiatun Station, Hougoutun Station and Lujiaogou Line is firstly treated in septic-tank and then discharged their own one 100m³ sewage storage pool, and then be delivered to sewage treatment works by fecal suction trucks at regular intervals. Implementing category-III discharge standard in *Integrated Wastewater Discharge Standard (GB8978-1996)*.

6) Xinxiangfang Station and Chenggaozi Station have no water supply and sewerage works this time. The two stations add SBR sewage treatment equipment by “old and new equipment combined”. Existing sewage of the two is firstly treated with SBR sewage treatment equipment and then discharged into nearby channels. Implementing category-I discharge standard in *Integrated Wastewater Discharge Standard (GB8978-1996)*.

2) Jiamusi

Domestic sewage of Ping’an Station is discharged into nearby channels after treatment. Implementing category-I discharge standard in *Integrated Wastewater Discharge Standard (GB8978-96)*.

Newly generated domestic sewage and production waste drainage from CRH storage yard, Jiamusi Station and Jiamusi Locomotive Depot are treated respectively and then discharged into municipal drainage pipeline, finally discharged to local urban sewage treatment works. Implementing category-III discharge standard in *Integrated Wastewater Discharge Standard (GB8978-1996)*.

4. Electromagnetic Environment

(1) GB/T6113-1995 *Specification for Radio Interference and Noise Immunity Measurement Equipment*

(2) GB/T15708-1995 *Measurement Method for Radio Interference Generated in Operation of AC Electrified Locomotive*

(3) HJ/T10.3-1996 *Guide Rules for Protection and Management of Radiation Environment and Environmental Impact Assessment for Electromagnetic Radiation and Assessment Standard*

(4) GB8702-88 *Provisions on Protection against Electromagnetic Radiation*

The impact of electrified railways on quality of images received by TV will be assessed by 5-level scale of marks for damage system recommended by CCIR. It is evaluated on the basis that S/N (Signal to Noise Ratio) will not be lower than 35dB when TV signal strength reaches specified values.

1.4 Main Environmental Sensitive Regions

During the preparation of environmental impact assessment, several main environmental sensitive regions have been determined. These regions may be directly influenced by project construction and operation. Table 1-2 summarizes these sensitive points.
<table>
<thead>
<tr>
<th>Environmental Sensitive Factors</th>
<th>Object of Protection</th>
<th>Class</th>
<th>Location</th>
<th>Relative Location to alignment</th>
<th>Engineering Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological environment</td>
<td>Engineering land, soil borrow/spoil disposal site, and occupied vegetation and farmland</td>
<td>/</td>
<td>Harbin and Jiamusi</td>
<td>Line and its two sides</td>
<td>Subgrade, station yard, bridges and tunnels</td>
</tr>
<tr>
<td></td>
<td>Basic farmland</td>
<td>/</td>
<td>Harbin and Jiamusi</td>
<td>Occupied</td>
<td>Subgrade, station yard, and bridges</td>
</tr>
<tr>
<td></td>
<td>Water conservation facilities</td>
<td>/</td>
<td>Harbin and Jiamusi</td>
<td>Occupied</td>
<td>Subgrade, station yard, bridges and tunnels</td>
</tr>
<tr>
<td>Acoustic environment</td>
<td>There are a total of 179 sensitive points including 23 special ones like schools and hospitals</td>
<td>/</td>
<td>Harbin and Jiamusi</td>
<td>Residential buildings, schools and hospitals within the area 200m away from the two sides of the railway line</td>
<td>Train operation</td>
</tr>
<tr>
<td>Vibration environment</td>
<td>There are a total of 96 sensitive points including 6 schools and 3 hospitals</td>
<td>/</td>
<td>Harbin and Jiamusi</td>
<td>Sensitive points within the area 60m away from the two sides of the railway line</td>
<td>Train operation</td>
</tr>
<tr>
<td>Electromagnetic radiation</td>
<td>There are a total of 89 residence communities</td>
<td></td>
<td>Harbin and Jiamusi</td>
<td>Radio television users within the area 80m away from the two sides of the railway line</td>
<td>Electric locomotive operation</td>
</tr>
<tr>
<td>Water environment</td>
<td>Yilan County Centralized Drinking Water Source Protection Area</td>
<td></td>
<td>Yilan County</td>
<td>More than 400m away from the nearest point of class-2 protection area</td>
<td>Subgrade</td>
</tr>
<tr>
<td></td>
<td>Surface water along railway line</td>
<td>Category III or IV</td>
<td>Harbin and Jiamusi</td>
<td>Along the line</td>
<td>Bridge</td>
</tr>
<tr>
<td>Atmospheric environment</td>
<td>Region along railway line</td>
<td>Category II</td>
<td>Harbin and Jiamusi</td>
<td>Along the line</td>
<td>Emission of dist, vehicle exhaust, boiler gas pollutants</td>
</tr>
<tr>
<td>Other social sensitive regions</td>
<td>There are no sensitive points like catholic church and ancestral temple within engineering land.</td>
<td>/</td>
<td>Harbin and Jiamusi</td>
<td>Along the line</td>
<td>/</td>
</tr>
</tbody>
</table>
2. MITIGATION MEASURES

A series of mitigation measures have been developed in the Environmental Management Plan based on the conclusions and recommendations of the environmental impact assessment. Please refer to Table 2-1, Table 2-2 and Table 2-3.

Apart from mitigation measures included in the Environmental Management Plan, project design and construction will also be subject to a great number of laws, regulations, technical guidelines and operation procedures of China. All of these are by defaulted statutory requirements on project design and construction management. Some main documents include:

- Code of Environmental Protection Design for Railway Engineering (TB10501-98)
- Environment and Hygienic Standards for Construction Site (JGJ146-2004)
- Construction Technology Safety Regulations for Railway Tunnels (TBJ404-87)
- Construction Technology Safety Regulations for Railway Bridges and Culverts (TBJ403-87)
- Construction Technology Safety Regulations for Temporary and Auxiliary Railway Engineering Projects (TBJ411-87)
- Standards on Water and Soil Loss Prevention for Development and Construction Projects (GB50434-2008)
- Regulations on Supervision of Railway Construction Engineering (TB10402-2003)
- Construction Site Management Regulations
- Construction Project Safety Regulations and Regulations of Environmental Acceptance in Final Inspection of Railway Engineering
- Railway Environmental Protection Regulations
- Railway Environmental Supervision Regulations
- Regulations on Execution of Railway Environmental Protection Plan
- “Three at Same Time” (design, construction and operation at same time) Regulations for Railway Construction Project

In addition to national guidelines, the mitigation measures for construction, noise/dust control, waste management, community health and safety in this EMP are also consistent with the general principles and measures in the World Bank’s Environmental, Health and Safety General Guidelines and EHS Guidelines for Railways.

The general mitigation measures in the Table 2-1, 2-2 and 2-3 are supplemented by specific mitigation measures in the appendix of this EMP, including:

- Appendix 1: Noise Mitigation Measures
- Appendix 2: Vibration Mitigation Measures
- Appendix 3: Tunnel Construction Impact on Residents’ Drinking Water
- Appendix 4: Mitigation Measures for Water Source Protection Area
- Appendix 5: Sewage Treatment Measures
- Appendix 6: Soil Borrow Area and Soil (Slag) Disposal Site
- Appendix 7: Soil Erosion Control Measures
### Table 2-1 Implementation Plan for Environmental Protection Measures in Design Phase

<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment choice</td>
<td>Railway may impact environmental sensitive areas</td>
<td>Carefully studying alternate alignment and avoiding and reducing impact on environmental sensitive areas (like nature reserves, scenic spots, forest park, cultural property and water source protection area); Consulting local government authority and gaining approval;</td>
<td>During preparation of design and environmental assessment</td>
<td>-</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
<td>Regular</td>
<td>meeting of design and environmental assessment consultants</td>
</tr>
<tr>
<td>Land acquisition and resettlement</td>
<td>Selected linear will reduce amount of land acquisition and resettlement as far as possible; Resettlement Action Plan</td>
<td>Determining 38 soil borrow areas and 47 spoil disposal sites; The “Specific Water and Soil Loss Control Plan” (including centralized reclamation plan), which is formulated based on Soil and</td>
<td>During preparation of design and environmental assessment/Resettlement Action Plan</td>
<td>289742.895</td>
<td>Design institute, environmental assessment consultant and consultant for resettlement action plan</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation, World Bank and Land Resources Bureau</td>
<td>Regular</td>
<td>meeting of design and environmental assessment consultants</td>
</tr>
<tr>
<td>Design of water and soil loss control plan</td>
<td>Water and soil loss caused by access roads, soil borrow area/spoil disposal site</td>
<td>Determining 38 soil borrow areas and 47 spoil disposal sites; The “Specific Water and Soil Loss Control Plan” (including centralized reclamation plan), which is formulated based on Soil and</td>
<td>During preparation of design and environmental assessment</td>
<td>6340.566</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation, World Bank and Water Conservation Bureau</td>
<td>Water and soil loss control plan that is approved by Water Conservation Bureau (included in design and bidding documents)</td>
<td>Regular</td>
</tr>
</tbody>
</table>
Water Conservation Law of the People’s Republic of China, is a legal constraint file and a component of comprehensive environmental management system. This plan includes specific technical information and regulations on water and soil loss control measures for construction site, soil borrow area, spoil disposal site, access roads, temporary engineering, dam, slope and tunnel portal. Besides it also stipulates supervision plan (integrated into bidding document/contract), implementation supervision, budget and final inspection checkup mechanism. (For overview of this plan, please refer to Appendix 6)

<table>
<thead>
<tr>
<th>Design of noise reduction measures</th>
<th>Public area that is influenced by noise out of limit during operation</th>
<th>During preparation of design and environmental assessment</th>
<th>96888</th>
<th>Design institute and environmental assessment consultant</th>
<th>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</th>
<th>Standard on Environmental Noise in Urban Area (GB3097-93) and Limiting Value for Boundary Noise and Measurement Method</th>
<th>Regular meeting of design and environmental assessment consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Setting 32 vertical type sound barriers for bridge section with a total length of 13,910 linear meters; (2) Setting 78 vertical type sound barriers for bridge section with a total length of 36,440 linear meters; (3) Setting 3 L-shaped</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Design of noise reduction measures

Public area that is influenced by noise out of limit during operation

(1) Setting 32 vertical type sound barriers for bridge section with a total length of 13,910 linear meters;
(2) Setting 78 vertical type sound barriers for bridge section with a total length of 36,440 linear meters;
(3) Setting 3 L-shaped

During preparation of design and environmental assessment

96888

Design institute and environmental assessment consultant

Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank

Standard on Environmental Noise in Urban Area (GB3097-93) and Limiting Value for Boundary Noise and Measurement Method

Regular meeting of design and environmental assessment consultants
<table>
<thead>
<tr>
<th>Design of vibration reduction measures</th>
<th>Public area that is influenced by vibration during operation</th>
<th>Relocate 654 sensitive points along the railway line to weaken impact of railway vibration on residents’ living. (Please refer to Appendix 2)</th>
<th>During preparation of design and environmental assessment</th>
<th>Investment involved in noise control fee</th>
<th>Design institute and environmental assessment consultant</th>
<th>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</th>
<th>Standard on Environment in Urban Area (GB10070-88)</th>
<th>Regular meeting of design and environmental assessment consultants</th>
</tr>
</thead>
</table>
| Design of road intersection/pedestrian crossing | Road system jam, residence separation and water drainage/irrigation system blocking | - Designing 450 culverts with a total length of 13,087 linear meters;  
- Designing 1 highway bridge with total area of 5,600m²;  
- Moving trenches furrows | During preparation of design and environmental assessment | 31300.0213  
6305.8890  
1322.8470 | Design institute and environmental assessment consultant | Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank | Included in preliminary design and detail design | Regular meeting of design and environmental assessment consultants |
<p>| Station design | Wastewater discharged to water body, treatment of solid waste | - Design treatment measures (SBR, septic-tank and unpowered) | During preparation of design and environmental assessment | 226 | Design institute and environmental assessment consultant | Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank | Included in preliminary design and detail design | Regular meeting of design and environmental assessment consultants |</p>
<table>
<thead>
<tr>
<th>Further survey and excavation for cultural relics</th>
<th>Avoid potential impact on underground cultural relics (if any) during construction</th>
<th>Biological tank) for stations</th>
<th>assessment</th>
<th>Harbin-Jiamusi Railway Corporation and World Bank</th>
<th>Corporation and World Bank</th>
<th>One time when survey is finished</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before construction, Harbin-Jiamusi Railway Corporation will employ a licensed archaeological institute to make a general survey and excavation for cultural relics along the railway line.</td>
<td>Before construction</td>
<td>620.0</td>
<td>Harbin-Jiamusi Railway Corporation signs an agreement with a licensed archaeological institute to make a survey</td>
<td>Cultural Relics Bureau and Harbin-Jiamusi Railway Corporation</td>
<td>Carry out survey and protection according to Law of the People’s Republic of China on Protection of Cultural Relics</td>
<td></td>
</tr>
<tr>
<td>Alignment choice</td>
<td>Railway may impact environmental sensitive areas</td>
<td>-</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
<td>Avoid expanded sensitive areas as far as possible</td>
<td>Regular meeting of design and environment consultants</td>
</tr>
<tr>
<td>Carefully studying alternate alignment and avoiding and reducing impact on environmental sensitive areas (like nature reserves, scenic spots, forest park, cultural property and water source protection area); Consulting local government authority and gaining approval;</td>
<td>During preparation of design and environmental assessment</td>
<td>-</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
<td>Avoid expanded sensitive areas as far as possible</td>
<td>Regular meeting of design and environment consultants</td>
</tr>
<tr>
<td>Selected linear will reduce amount of land acquisition and resettlement as far as possible; Resettlement Action Plan</td>
<td>During preparation of design and environmental assessment/Resettlement Action Plan</td>
<td>289742.895</td>
<td>Design institute, environmental assessment consultant and consultant for resettlement action plan</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation, World Bank and Land Resources Bureau</td>
<td>Resettlement Action Plan that is formulated according to bank policies</td>
<td>Regular meeting of design and environmental assessment consultants and organization of Resettlement Action Plan</td>
</tr>
<tr>
<td>Land acquisition and resettlement</td>
<td></td>
<td>51339.53</td>
<td>Design institute and environmental</td>
<td>Harbin-Jiamusi Railway</td>
<td>Water and soil loss control</td>
<td>Regular meeting of design and environmental assessment consultants and organization of Resettlement Action Plan</td>
</tr>
<tr>
<td>Design of water and soil</td>
<td>Water and soil loss caused by access</td>
<td>Determining 38 soil borrow areas and 47</td>
<td>During preparation of</td>
<td>Design institute and environmental</td>
<td>Harbin-Jiamusi Railway</td>
<td>Water and soil loss control</td>
</tr>
<tr>
<td>Loss control plan</td>
<td>roads, soil borrow area/spoil disposal site</td>
<td>spoil disposal sites; The “Specific Water and Soil Loss Control Plan” (including centralized reclamation plan), which is formulated based on Soil and Water Conservation Law of the People’s Republic of China, is a legal constraint file and a component of comprehensive environmental management system. This plan includes specific technical information and regulations on water and soil loss control measures for construction site, soil borrow area, spoil disposal site, access roads, temporary engineering, dam, slope and tunnel portal. Besides it also stipulates supervision plan (integrated into bidding document/contract), implementation supervision, budget and final inspection checkup mechanism. (For overview of this plan, please refer to Appendix 6)</td>
<td>design and environmental assessment</td>
<td>assessment consultant</td>
<td>Corporation, Railway Corporation, World Bank and Water Conservation Bureau</td>
<td>plan that is approved by Water Conservation Bureau (included in design and bidding documents)</td>
</tr>
<tr>
<td>Design of noise reduction measures</td>
<td>Public area that is influenced by noise out of limit during operation</td>
<td>(1) Setting 32 vertical type sound barriers for bridge section with a total length of 13,910 linear meters; (2) Setting 78 vertical type sound barriers for bridge section with a total length of 36,440 linear meters; (3) Setting 3 L-shaped sound barriers at subgrade section 8+4m with a total length of 890 linear meters; (4) Setting 3m high enclosures at Jiamusi CRH storage yard with a total length of 2,000 linear meters; (5) Setting 152 sound insulation ventilators with total area of 163090m² which will be implemented according to noise monitoring result and the situation of being out of limits during operation; (6) Relocation of 1,487 households. (please refer to Appendix 1)</td>
<td>During preparation of design and environmental assessment</td>
<td>96888</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
</tr>
<tr>
<td>Design of vibration reduction measures</td>
<td>Public area that is influenced by vibration during operation</td>
<td>Relocate 654 sensitive points along the railway line to weaken impact of railway vibration on residents’ living. (Please refer to Appendix 2)</td>
<td>During preparation of design and environmental assessment</td>
<td>Investment involved in noise control fee</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
</tr>
<tr>
<td>Design of road intersection/p</td>
<td>Road system jam, residence separation and water</td>
<td>Designing 450 culverts with a total length of 13,087</td>
<td>During preparation of design and</td>
<td>31300.0213</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
</tr>
<tr>
<td>Pedestrian crossing</td>
<td>Drainage/irrigation system blocking</td>
<td>Linear meters; Designing 1 highway bridge with total area of 5,600m²; Moving trenches furrows</td>
<td>Environmental assessment</td>
<td>6305.8890 1322.8470</td>
<td>Railway Corporation and World Bank</td>
<td>Detail design</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
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<td>-------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Station design</td>
<td>Wastewater discharged to water body, treatment of solid waste</td>
<td>Design treatment measures (SBR, septic-tank and unpowered biological tank) for stations</td>
<td>During preparation of design and environmental assessment</td>
<td>226</td>
<td>Design institute and environmental assessment consultant</td>
<td>Harbin-Jiamusi Railway Corporation, Railway Corporation and World Bank</td>
</tr>
<tr>
<td>Further survey and excavation for cultural relics</td>
<td>Avoid potential impact on underground cultural relics (if any) during construction</td>
<td>Before construction, Harbin-Jiamusi Railway Corporation will employ a licensed archaeological institute to make a general survey and excavation for cultural relics along the railway line. Before construction</td>
<td>620.0</td>
<td>Harbin-Jiamusi Railway Corporation signs an agreement with a licensed archaeological institute to make a survey</td>
<td>Cultural Relics Bureau and Harbin-Jiamusi Railway Corporation</td>
<td>Carry out survey and protection according to Law of the People’s Republic of China on Protection of Cultural Relics</td>
</tr>
<tr>
<td>Action</td>
<td>Potential Impact/Problem</td>
<td>Mitigation Measures</td>
<td>Implementation Schedule</td>
<td>Budget (RMB 10,000)</td>
<td>Implementation Responsibilities</td>
<td>Supervision Responsibilities</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<td>---------------------</td>
<td>------------------------------------------</td>
<td>-------------------------------</td>
</tr>
</tbody>
</table>
| Excavation of stone and soil, soil borrowing and disposal, and access roads building | Vegetation loss Water and soil loss      | • Forest land will be acquired according to legal procedures of relevant laws.  
• Using confirmed soil borrow area/spoil ground. A new soil borrow area/spoil ground will be examined and approved by environmental supervision engineers.  
• Retaining topsoil and using that for reclamation in future.  
• Building retaining wall and drainage system before/during dumping.  
• Timely protecting cut slope/vegetation and soil borrow area/spoil ground with engineering method or by planting green belt.  
• Conducting environmental protection education on constructors and teaching them how to identify key plants to be protected. If any other protected plant is discovered during construction, report to environmental supervision engineer.  
• Trying to use existing village road as access roads.  
• Opening of a new access roads will be examined and approved by environmental supervision engineers. Construction site near a forest will strictly control fire source.  
• After completion, carrying out revegetation for cut | During construction | Refer to contract | Contractor | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Fully implementing “Water and Soil Loss Control Plan” | Supervised by ESE every day |
<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Excavation of stone and soil, soil borrowing and disposal, and access road building | Damage to cultural properties | - Following accidental procedures:  
  - Once discovered, immediately stopping excavation and protecting the site;  
  - Reporting to environmental supervision engineers/Harbin-Jiamusi Railway Corporation which will report to local cultural relics bureau;  
  - Construction can be restored only after the cultural relics bureau has carried out necessary investigation or rescuing conservation and approval;  
  - Educating construction workers knowledge about cultural property protection and accidental procedures;  
  - For cultural properties near project line, consulting relevant administration before construction and then making adequate protection measures during construction (e.g.: building enclosure to prevent workers from entering the site) | During construction | Refer to contract | Contractor | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Law of the People’s Republic of China on Protection for Cultural Relics | Supervised by ESE every day |
| Tunnel construction **Spoil waste disposal** | Reusing discarded materials as far as possible for construction of dam or other railway facilities;  
  - As for reusing of discarded materials for urban construction or building of | During construction | Refer to contract | Contractor | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Correctly implementing mitigation measures | Supervised by ESE every day |
<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Wastewater discharge | residential infrastructure facilities, conducting close discussion with local government and residential areas;  
- Remaining waste materials can be properly treated in a confirmed spoil ground. A new spoil ground will be approved by environmental supervision engineers;  
- Adopting advanced geographic exploration and prediction techniques. Using grouting method for leakage sealing and water drainage restriction; and installing tunnel lining at a proper time;  
- Using a sedimentation filtering basin to treat wastewater on tunnel construction site and then discharging wastewater to nearby irrigation ditches;  
- Strictly implementing construction safety regulations. |  |  |  |  |  | Construction Technology Safety Regulations for Railway Tunnels (TBJ404-87) |  |
| Potential safety hazard for workers |  |  |  |  |  |  |  |  |
| Bridge construction | Waste water discharged to surface water body | - Building bridge piers with a cofferdam and treating mud via the sedimentation tank before discharge;  
- Correctly treat precipitates in a special spoil ground;  
- Toilets on construction site must be equipped with septic-tank or mobile toilet be adopted. Wastewater is discharged to drainage system of near towns;  
- Domestic wastewater from construction site will not be | During construction | Refer to contract | Contractor | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Quality of surface water will conform to relevant standards and requirement of Surface Water Environment Standard (GB3838-2002) | Supervised by ESE every day | Supervised by local environmental monitoring station at regular intervals (Table 2-4) |
<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Construction site and material transportation | Impact of noise on nearby residential area                    | - Construction vehicles will drive slowly when entering towns and residential areas;  
- Using construction machinery with low noise;  
- Conducting noise monitoring at sensitive points during construction.  
- Avoiding transportation at night (22:00—6:00) in populated residential areas 30m within two sides of the construction access roads;  
- If construction is necessary at night:  
  - inform nearby residential area in advance;  
  - approval of local government;  
  - post a notice to inform nearby residential areas;  
  - monitor noise                                                                 | During construction                                               | Refer to contract       | Contractor                | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Correctly implementing mitigation measures | Supervised by ESE every day | Supervised by local environmental monitoring station at regular intervals (Table 2-4) |
| Construction site and material transportation | Impact on local road traffic and safety                       | - Contractor will establish a reasonable construction plan, including suitable transportation line and cargo transportation change plan.  
- Conducting close cooperation with local traffic administration.  
- Appointing special personnel to direct the traffic at main intersections with local highway.  
- Setting clear safety signal near all schools (limit speed at 20km/h, no honking, attention to children) | During construction                                               | Refer to contract       | Contractor                | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Correctly implementing mitigation measures | Supervised by ESE every day |
<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Construction site and material transportation | Impact of dust mixed in air on nearby residential areas | ● Spraying water on construction site and access roads and reducing generated aerial dust to minimum;  
● During transportation, covering bulk material transportation vehicles and cleaning them before leaving construction site;  
● To keep optimal performance, properly maintaining construction vehicles and machineries;  
● Correctly organizing storage and processing site of bulk materials and covering them in dry weather;  
● Conducting revegetation for cut slope, fill slope, soil borrow area and spoil ground in time. | During construction | Refer to contract | Contractor | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Correctly implementing mitigation measures | Supervised by ESE every day  
Supervised by local environmental monitoring station at regular intervals (Table 2-4) |
| Campsite and workers | | ● Contractor will coordinate with local government and public and set work sheds;  
● Providing sufficient sanitary facilities at campsite;  
● Setting a notice board at main construction site and notifying complaints and suggestions to public contactor;  
● Access roads planning will take into account road development of the local residential area;  
● Conducting land acquisition and resettlement compensation according to Resettlement Action Plan;  
● Local culture will be respected when relocating | During construction | Refer to contract | Contractor | Harbin-Jiamusi Railway Corporation and environmental supervision engineer (ESE) | Correctly implementing mitigation measures | Supervised by ESE every day |
<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
|        | graveyards or sensitive cultural architectures;  
        | Correctly maintaining or recovering public engineering in time;  
        | Carrying out safety education for nearby residents in advance, including prevention and control of infectious diseases;  
        | Employing local workers to increase income of local residents. | | | | | |
### Table 2-3 Implementation Plan for Environmental Protection Measures in Operation Phase

<table>
<thead>
<tr>
<th>Action</th>
<th>Potential Impact/Problem</th>
<th>Mitigation Measures</th>
<th>Implementation Schedule</th>
<th>Budget (RMB 10,000)</th>
<th>Implementation Responsibilities</th>
<th>Supervision Responsibilities</th>
<th>Monitoring Index</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Operation of railway line | Impact of noise on residential areas, schools and hospitals | • Installing noise reduction devices according to design (refer to Appendix 1)  
• Monitoring noise in Family Dormitory Building of Harbin Medical University and Nanba Family Dormitory Building and | During construction, and before/during operation | 96888 | Contractor  
Contracted environmental supervision station | ESE, Harbin-Jiamusi Railway Corporation  
Harbin-Jiamusi Railway Corporation  
Local environmental protection bureau | Noise | One time in check & acceptance; Twice/year, 5 years (Table 2-5) |
| Operation of railway | Impact of vibration on nearby sensitive objects | • Installing vibration reduction devices according to design (refer to Appendix 2)  
• Monitoring Dafangli, Riverside New City and Jiada residential areas | Before operation  
During operation | Included in noise treatment fee | Contractor  
Contracted environmental supervision station | ESE, Harbin-Jiamusi Railway Corporation  
Harbin-Jiamusi Railway Corporation  
Local environmental protection bureau | Vibration | One time in check & acceptance; Twice/year, (Table 2-5) |
| Operation of railway | Electromagnetism interference with TV signal receiving in nearby residential areas | • Reserving compensation budget for installation of cable television | | 35.65 | Harbin-Jiamusi Railway Corporation  
Harbin-Jiamusi Railway Corporation  
Local environmental protection bureau | Harbin-Jiamusi Railway Corporation  
Local environmental protection bureau | Signal to noise ratio | One time during operation |
<p>| Operation of railway | Wastewater discharge may pollute nearby | • Installing designed sewage treatment facilities (refer to Appendix 5) | Before operation | 226.0 | Contractor | ESE, Harbin-Jiamusi Railway | pH, DO, COD, BOD₅ | 4 times/year |</p>
<table>
<thead>
<tr>
<th>Surface water body</th>
<th>Monitoring emission in operation phase</th>
<th>During operation</th>
<th>Refer to operational cost</th>
<th>Railway environmental supervision station</th>
<th>Corporation Harbin-Jiamusi Railway Corporation Local environmental protection bureau</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation of station</td>
<td>Treatment of solid waste</td>
<td>Collecting and treating wastes from stations and trains at local municipal waste landfill</td>
<td>During operation</td>
<td>Refer to operational cost</td>
<td>Railway station management department</td>
</tr>
<tr>
<td>Operation of station</td>
<td>Treatment of solid waste</td>
<td>Collecting and treating wastes from stations and trains at local municipal waste landfill</td>
<td>During operation</td>
<td>Refer to operational cost</td>
<td>Railway station management department</td>
</tr>
<tr>
<td>Recovery of ecological environment</td>
<td>Survival of plants in green belts</td>
<td>Maintaining green belts along railway line and in soil borrow/spoil ground and station area</td>
<td>During operation</td>
<td>Refer to operational cost</td>
<td>Railway station management department</td>
</tr>
<tr>
<td>Recovery of ecological environment</td>
<td>Survival of plants in green belts</td>
<td>Maintaining green belts along railway line and in soil borrow/spoil ground and station area</td>
<td>During operation</td>
<td>Refer to operational cost</td>
<td>Railway station management department</td>
</tr>
</tbody>
</table>

- **Surface water body**
- **Monitoring emission in operation phase**
- **During operation**
- **Refer to operational cost**
- **Railway environmental supervision station**
- **Corporation Harbin-Jiamusi Railway Corporation Local environmental protection bureau**
- **Operation of station**
- **Treatment of solid waste**
- **Collecting and treating wastes from stations and trains at local municipal waste landfill**
- **During operation**
- **Refer to operational cost**
- **Railway station management department**
- **Harbin-Jiamusi Railway Corporation Local environmental protection bureau**
- **Recovery of ecological environment**
- **Survival of plants in green belts**
- **Maintaining green belts along railway line and in soil borrow/spoil ground and station area**
- **During operation**
- **Refer to operational cost**
- **Railway station management department**
- **Harbin-Jiamusi Railway Corporation Local environmental protection bureau**
- **Recovery of ecological environment**
- **Survival of plants in green belts**
- **Maintaining green belts along railway line and in soil borrow/spoil ground and station area**
- **During operation**
- **Refer to operational cost**
- **Railway station management department**
- **Harbin-Jiamusi Railway Corporation Local environmental protection bureau**
- **Recovery of ecological environment**
- **Survival of plants in green belts**
- **Maintaining green belts along railway line and in soil borrow/spoil ground and station area**
- **During operation**
- **Refer to operational cost**
- **Railway station management department**
- **Harbin-Jiamusi Railway Corporation Local environmental protection bureau**
- **Recovery of ecological environment**
- **Survival of plants in green belts**
- **Maintaining green belts along railway line and in soil borrow/spoil ground and station area**
- **During operation**
- **Refer to operational cost**
- **Railway station management department**
- **Harbin-Jiamusi Railway Corporation Local environmental protection bureau**

- **Collecting and disposing wastes**
- **4 times/year**

- **Water and soil loss control plan**
- **4 times/year**
Table 2-4  Environmental Monitoring Plan in Construction Phase

<table>
<thead>
<tr>
<th>Item</th>
<th>Phase</th>
<th>Monitoring Point</th>
<th>Monitoring Parameters</th>
<th>Monitoring Methods</th>
<th>Frequency</th>
<th>Standard</th>
<th>Executor</th>
<th>Responsible</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td></td>
<td>Sensitive points like Family Dormitory Building of Harbin Medical University, Nanba Residential Buildings and Changlong Shijia</td>
<td>Equivalent A sound level</td>
<td>GB12523-2011 Environment Noise Emission Standard for Construction Field</td>
<td>2 times/year</td>
<td>GB12523-90 Noise Standard for Construction Site</td>
<td>Entrusted by construction organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Vibration</td>
<td></td>
<td>Sensitive points like Changlong Shijia and Hongqi Jiayuan</td>
<td>VLz10</td>
<td>GB10071-88 Measurement Methods for Environmental Vibration in Urban Areas</td>
<td>2 times/year</td>
<td>GB3096-93 “Standard on Environmental Noise in Urban Areas”</td>
<td>Entrusted by construction organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Air quality</td>
<td></td>
<td>Main construction sites along the line</td>
<td>Construction dust and emission of transport vehicles and construction machineries</td>
<td>On-site inspection</td>
<td>4 times/year</td>
<td>/</td>
<td>Construction organization, operation organization or entrusted monitoring organization with relevant qualification</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Water environment</td>
<td></td>
<td>Construction campsite</td>
<td>Ph, SS, COD, BOD5 and animal and vegetable oil</td>
<td>To be monitored according to Wastewater of Environmental Monitoring Technical Specifications</td>
<td>1 time/year</td>
<td>GB8978-1996 Integrated Wastewater Discharge Standard</td>
<td>Entrusted by construction organization</td>
<td>Owner</td>
<td>Local environmental protection and water conservation authorities</td>
</tr>
</tbody>
</table>

Water quality parameters and surroundings | On-site inspection                                                                 | Drinking water standard | Entrenched by construction organization | Owner | Local environmental protection and water conservation authorities |
| Water and soil loss and revegetation | Construction | Roadbed slope, soil borrow area, spoil disposal site and construction access roads | Water and soil loss, protection effect, vegetation amount and survival rate | / | 1 time/month, spot check | / | Entrusted by construction organization | Owner | Local environmental protection and water conservation authorities |
## Table 2-5  Environmental Monitoring Plan in Operation Phase

<table>
<thead>
<tr>
<th>Factors</th>
<th>Monitoring Point (Section)</th>
<th>Parameters</th>
<th>Frequency</th>
<th>Implementation Responsibilities</th>
<th>Responsible</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Sensitive points like Family Dormitory Building of Harbin Medical University and Nanba Residential Buildings</td>
<td>Equivalent A sound level</td>
<td>2 times/year</td>
<td>Entrusted by operation organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Vibration</td>
<td>Sensitive points like Changlong Shijia and Riverside New City</td>
<td>VLzmax</td>
<td>2 times/year</td>
<td>Entrusted by operation organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Air quality</td>
<td>Concentration at chimney end</td>
<td>Fume and NOₓ</td>
<td>1 time/year</td>
<td>Entrusted by operation organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Water environment</td>
<td>Stations like Yilan Station, Fangzheng Station and Binxian Station</td>
<td>Ph, SS, COD and BOD₅</td>
<td>1 time/year</td>
<td>Entrusted by operation organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Electromagnetic radiation</td>
<td>Residential areas that are influenced by electromagnetic field, with focus on sensitive points for which protection measures are made</td>
<td>TV signal strength; background radio noise strength</td>
<td>1 monitoring after operation is normal</td>
<td>Entrusted by operation organization</td>
<td>Owner</td>
<td>Local environmental protection authority</td>
</tr>
<tr>
<td>Water and soil loss and revegetation</td>
<td>Roadbed slope, spoil disposal site, big temporary engineering and construction access roads</td>
<td>Water and soil loss and growth situation of vegetation</td>
<td>4 times/year and additional 1 time after rainstorm</td>
<td>Entrusted by operation organization</td>
<td>Owner</td>
<td>Local environmental protection and water conservation authorities</td>
</tr>
</tbody>
</table>
3. ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES

3.1 Management Organization and Responsibilities

Environmental management in construction phase is undertaken by project owner (Harbin-Jiamusi Railway Corporation), contractors and environmental supervision engineers (refer to Figure 3-1). During operation, environmental management will be taken charge of by Harbin-Jiamusi Railway Corporation.

Main environmental management responsibilities for these undertakers contain:

- Harbin-Jiamusi Railway Corporation
  - Project office of Harbin-Jiamusi Railway Corporation is responsible for overall environmental management in construction phase. An environmental protection department will be set up and be in the charge of environment officers.
  - Environmental protection department under Harbin-Jiamusi Railway Corporation has 1-2 officers. Their responsibilities are stated as follows:
    1) Being responsible for overall environmental management under the administration of project office and the supervision and guidance of provincial and local (city-level) environmental protection bureau, forestry bureau and water conservation bureau. In construction phase, submitting environmental management report and compiling environmental monitoring report each month.
    2) Entrusting an environmental monitoring organization to carry out environmental monitoring in construction phase and offering support for this work.
    3) Ensuring that Environmental Management Plan is included in bidding document and construction agreement, supervising construction organization to adopt pollution control measures. If the construction team violates environmental protection procedures or does not...

Figure 3-1  Environmental Management in Construction Phase
use pollution control measures, immediately inform it of the violation and report to project office. If a pollution accident happens, assist in handling environmental pollution.

4) Guarantying that Environmental Management Plan is included in bidding document and supervision engineer agreement, and supervising and participating in environmental supervision.

5) Employing environmental advisors to provide technical support for environmental protection in construction phase, offer environmental protection guidance for contract and carry out in-service training on environmental protection to project managers, supervisors and contractor.

● Contractors

Contractors will implement specific environmental mitigation measures described in Environmental Management Plan and contract, make an environmental protection work plan for the contract, report to supervision engineers new environmental problems or cultural relics that are discovered by accident, and carry out consistent public construction consulting. Each contractor will appoint 1-2 full-time officers to undertake environmental management according to contract.

● Environmental supervision engineers (ESE)

All environmental supervision engineer companies will assign one environmental supervision engineer respectively as required by the contract. Environmental supervision engineers:

1) On behalf of project office, examining if engineering design conforms to requirements in “environmental impact assessment” and Environmental Management Plan, especially requirement related to demanded site environmental management and impact mitigation measures.

2) Supervising site environmental management system of contractors, including performance, experience and handling of site environmental problems and guiding rectification;

3) Reviewing implementation of contractors for Environmental Management Plan, inspecting and confirming environmental supervision procedures, parameters, places, devices and results.

4) Reporting to project office the implementation of Environmental Management Plan.

5) Examining and approving invoice or making payment based on implementation of Environmental Management Plan. This is a component of work for supervision engineers.

● Independent environmental consultants (IEC)

Harbin-Jiamusi Railway Corporation will employ independent environmental consultants (IEC) to conduct independent supervision on Environmental Management Plan. The chief IEC will review record, procedures and process in an independent and professional way. He/she can require a team (i.e. independent environmental consultant team) to assist in site inspection. IECs will have extensive knowledge and abundant experience with environmental inspection and examination and be able to put forward independent, objective and professional suggestions based on project environmental performance (with at least 5 years’ experience). IECs will be familiar with project engineering through checking reports (including Environmental Management Plan). In particular, IECs are required to complete following responsibilities:

1) Checking and reviewing all aspects of Environmental Management Plan in independent, objective and professional way;

2) Verifying and confirming accuracy of monitoring result, devices, places and procedures and
location of sensitive objects;
3) Carrying out spot check on monitoring data and sampling procedures;
4) Conducting site inspection randomly;
5) Examining and verifying suggestions and requirements for environmental impact assessment based on implementation of environmental protection measures;
6) Checking effectiveness of environmental mitigation measures and project environmental performance;
7) Checking and demonstrating environmental acceptability of construction methods (including temporary and permanent engineering), relevant design plan and submittals; if necessary, IECs will seek for alternate plans with minimum impact together with designer, contractor and project office in the construction phase;
8) Verifying investigation results for all items with unqualified environmental quality performance and also effectiveness of corrective actions;
9) Based on treatment procedures for unqualified items as specified in Environmental Management Plan, feeding back audit results to project office and environmental supervision engineer team and put forward suggestions about fine, pause or other punishment to supervision engineers (SE);
10) Providing environmental trainings for contractors, environmental supervision engineers (ESE) and project office before and during construction;
11) Making a semi-annual report and submitting it to project office, railway corporation and World Bank.

● Environmental monitoring station

Project office of Harbin-Jiamusi Railway Corporation will entrust an environmental monitoring station to implement the environmental monitoring plan made in Environmental Management Plan.

3.2 Environmental Supervision

Environmental supervision is an important means to ensure the effective implementation of Environmental Management Plan. According to contract, all supervision engineer companies will assign at least one professional environmental supervision engineer respectively to supervise the environmental performance of contractors every day within scope of supervision contract.

3.2.1 Environmental Supervision Plan

Before environmental supervision, environmental supervision engineers (ESE) will establish a project environmental supervision plan according to regulations and standards on environmental protection, design documents, construction contract, supervision contract and environmental management plan. The supervision plan mainly includes following contents:

● Scope, phase and time limit of environmental supervision

Scope of environmental supervision: project region and project-impacting region
Scope of work: construction site, living campsite, construction access roads, and supplementary facilities as well as areas with environmental pollution and ecology damage due to construction within abovementioned scope.
Working stage: environmental supervision for preparation, construction and project maintenance.
Supervision timeframe: from construction preparation to expiry of project maintenance period. Maintenance period lasts for 1 year from time of completion. Project environmental supervision is divided into three phases: construction preparation period, construction period and defects liability period.

- **Objective**

Objective of environmental supervision: to fulfill obligation for environmental supervision, provide service for the project in an independent, fair, scientific and effective way and carry out overall environmental supervision in accordance with laws, regulations and policies issued and stipulated by state and relevant departments, procedures, regulations and technical standards of World Bank together with approved design documents, bidding documents and legally contracted supervision and construction contracts, with an aim to facilitate project design, construction and operation to meet environmental protection requirements.

- **Working procedures**

Working procedures include job logging mechanism, employee training, reporting mechanism, letter communication and regular environmental meeting. One environmental protection supervision meeting will be held each month. At the meeting, contractors will make a review and summarize recent environmental protection work. Environmental supervision engineers will make an overall assessment on environmental protection work for all objects this month, recognize work performance, highlight existing problems and put forward rectification requirements. Each meeting will have minutes.

- **Preparation for construction**

Environmental supervision engineers will make an “environmental supervision work plan” and submit it to the preparation office of Harbin-Jiamusi Railway Corporation before entrance to construction site. The plan will contain the composition of environmental supervision organization and the list of environmental supervision personnel. Environmental supervision engineers will be familiar with contract articles and relevant technical regulations and carry out site survey so as to have a general understanding of site terrain, surface features, hydrogeology and environment.

“Environmental supervision work plan” and environmental supervision regulations will be approved by preparation team of Harbin-Jiamusi Railway Corporation.

- **Quality control**

Environmental supervision engineers will: conduct overall check, supervision and management of construction, pay attention to prior control, prevent and control adverse factors that may generate impact on environment in time, and make prevention measures before an accident; eliminate all potential hazards that may influence environment; reinforce post-action control and ensure that project delivered by contractors meet requirements in drawings and technical specifications and conform to all kinds of environmental protection requirements.

- **Coordination, information collection and management**
Mainly realizing coordination among all parties via a coordination meeting. Collecting, filing, managing, categorizing, classifying and dividing information into volumes based on owner’s requirement, regulations of World Bank, state and relevant local departments as well as engineering characteristics of the project. Holding a theme meeting at regular intervals. Checking and supervising if contractors have classified information and technical documents in time so as to ensure clarity and integrity of engineering information and file as well as synchronism of technical documents and drawings and actual objects.

3.2.2 Contents of Environmental Supervision

1. Environmental Supervision before Construction

Audit of pollution control plan: checking emission connection situation of “waste water, exhaust gas and solid waste” among construction technologies based on process design for specific project. Also, checking advancement of design and treatment technology adopted in main pollutant emission process together with feasibility of treatment measures. Before project commencement and after reporting to relevant environmental protection department, gradually planning and implementing final treatment and disposal methods for pollutants according to regulations and treatment requirements in relevant documents.

Review on environmental protection articles in construction contract: construction contractor must abide by relevant environmental protection requirements. These requirements will be reflected in the construction contract in form of specific articles. In the construction process, reinforcing supervision, check and monitoring to reduce pollution to environment and examining civilized construction quality of construction organization and also environmental management level.

2. Environmental Supervision in Construction Process

Environmental supervision engineers will conduct site supervision every day. For example: if construction is carried out according to environmental protection articles; if supervision construction process meets environmental protection requirements; if construction engineering meets environmental protection standard and construction is carried out according to environmental protection design requirement; and if all environmental protection measures are implemented in construction process (ensure conformance to environmental protection requirement). Main contents include:

(1) Supervising situation of water and soil loss caused by main engineering and temporary engineering. Checking if water and soil conservation facilities meet design requirement and if soil is borrowed and discarded according to procedures and positions; what is most important is to supervise that sand and stone discarded in construction will not be dumped to side slope so as to ensure that landscape will not be damaged. Temporary subsiders will be built during construction. Earth surface will be protected with hack or other areas easily susceptible to water and soil loss will be protected with straw mattress and plastic films before rainstorm. Ensuring that rivers, channels and sewage system are unblocked and in good use conditions.

(2) Environmental supervision on treatment of industrial and domestic sewage: supervising source of industrial and domestic sewage, discharge amount and water quality index as well as progress of handling facilities and result. Checking and supervising if it conforms to approved emission requirements.

(3) Environmental supervision on atmospheric pollution: atmospheric pollution in engineering
region is mainly caused by exhaust gas and dust from construction and production. They will be exhausted only after the source of pollution is up to standard. The engineering region will meet specified environmental quality standard. The region influenced by engineering will conform to relevant standard.

(4) Environmental supervision on noise control: to prevent noise damage, preventing strong noise or vibration source according to design requirement. In particular, for explosion engineering, noise environmental quality for project area and project-impacting area will meet relevant standard.

(5) Environmental supervision on solid waste disposal: solid waste contains industrial and domestic wastes and industrial residue. The site will be clean and tidy.

(6) Environmental supervision on wild animals and plants: preventing impact of water and soil loss. Controlling construction according to vegetation protection procedures and isolating rare animals.

(7) Environmental supervision for personnel health: ensuring safety and reliability of drinking water, preventing infectious diseases and providing necessary welfare and sanitary facilities.

(8) Supervision on building and installation of environmental protection facilities: supervising construction of sewage treatment facilities and sound barriers and implementation of greening engineering.

3. Supervision on Completion Inspection

(1) Supervising and managing the monitoring and implementation of environmental restoration and the operation of environmental protection treatment facilities.

(2) Supervising the compilation of completion document

(3) Organizing preliminary check

(4) Assisting owner in organizing final inspection on the project

(5) Compiling a final report on environmental supervision

(6) Classifying environmental supervision completion data.

3.3 Contractor Management

During construction, contractors will always reside at construction sites and mainly be responsible to effectively control and reduce impact on environment. Most environmental protection measures will be implemented by contractors. To ensure that contractors will implement environmental protection measures and Environmental Management Plan, following measures will be adopted:

- Authentication articles will contain environmental management when qualification of contractors is being reviewed in prequalification phase.
- Giving preference to bidders who have passed certification of ISO9000 and ISO14000 under same conditions.
- In each construction process, at least one full-time worker will be assigned to conduct environmental supervision & monitoring and implement specific environmental protection measures.
- In the compilation of bidding document, project initiator will combine all environmental protection measures into relevant articles (via approved Environmental Impact Assessment and Environmental Management Plan) so as to make bidders familiar with details about environmental protection. The bidding document will contain relevant budgetary estimates. Therefore, it is the obligation and responsibility of a bid winner to implement environmental protection measures.
Before project commencement, contractors will receive relevant environmental training. In all sections, there will be at least 1 senior manager and 1 environmental protection specialist to participate in trainings organized by senior environmental protection experts and local management organizations. This kind of training will be held 2-3 days in advance before a contract is signed. It covers:

- Relevant state and local laws and regulations as well as emission standards;
- Environmental protection technology guideline;
- Environmental Impact Assessment and Environmental Management Plan;
- Specific requirements and monitoring methods for monitoring points;
- Specific requirements for monitoring report and monitoring information feedback;
- Proper mitigation measures;
- Emergency measures for critical situations and leakage of hazardous materials;
- Mass participation and solution to mass complaints in construction process;
- Contractors’ responsibility for environmental protection;

Construction supervision organization will undertake its responsibility for environmental supervision by assigning environmental supervision engineers. Environmental supervision requirements are also included in bidding document and finally integrated into contract with supervision engineering company. At least two bid-winning construction supervision engineers (one is a senior manager) will participate in abovementioned training.

4. ENVIRONMENTAL TRAINING PLAN

Before construction, contractors, supervision engineers and all environmental management personnel of environmental protection department of project office in Harbin-Jiamusi Railway Corporation will receive at least one time of environmental protection training. Main environmental protection managers and environmental supervision engineers will receive in-service trainings. There will be 1-3 month training and study time. For training plan, please refer to Table 4-1.

4.1 Training Target and Content

1. Training on Environmental Management Personnel and Environmental Supervision Engineers

Training on environmental supervision engineers and managers of project office aims to strengthen environmental management during construction and operation, ensure environmental supervision quality and effectiveness of environmental management and further to improve quality of whole project. Via trainings, environmental managers will identify main environmental problems and defects in environmental management in construction process and report to the project office so as to adopt necessary prevention measures as soon as possible. During construction, the project office will invite environmental consultants with similar experience (environmental experts or environmental management organizations) to conduct site trainings with respect to potential problems and corresponding solutions.

2. Training on Contractors

Before project commencement, environmental personnel and workers of bid winner will receive systematic environmental knowledge training so as to avoid damage to environment due to misoperation in construction process. Training on environmental personnel of contractor aims to specifically describe the responsibility of construction organization for environmental protection.
That on workers plans to intensify correct operation methods in construction process to reduce and avoid unnecessary damage. Training on contractors will be organized by the project office. A contract will be signed with competent environmental consultants. The main tasks for environmental consults lie in describing possible environmental damage in construction process, required environmental protection measures and methods for environmental problem treatment. Through training, contractors will have a full understanding of their responsibility for environmental protection and consequences that may be brought about by environmental damage. Also, construction workers will have direct view of protection methods and protection degree of sensitive points. Based on actual situation of the project, training for workers will last for one week.

3. During project operation, Harbin-Jiamusi Railway Corporation will organize training on environmental protection knowledge for its employees at regular intervals so as to enable them to identify environmental problems that may exist at their own operating posts and make necessary measures. Each employee will be aware of environmental protection.

4.2 Training Methods and Expenses

For training plan, please refer to Table 4-1.
<table>
<thead>
<tr>
<th>S/N</th>
<th>Training Object</th>
<th>Contents</th>
<th>Organizer</th>
<th>Number of Participants</th>
<th>Duration</th>
<th>Place</th>
<th>Budget (RMB 10,000)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Workers of project office and environmental protection office</td>
<td>Knowledge of environmental protection management</td>
<td>Project office</td>
<td>6 persons</td>
<td>1 month</td>
<td>Harbin</td>
<td>4</td>
<td>Expenses to be borne by Harbin-Jiamusi Railway Corporation</td>
</tr>
<tr>
<td>2</td>
<td>Workers of project office and environmental protection office (department)</td>
<td>Visiting similar linear engineering projects and studying mature environmental management experience</td>
<td>Project office</td>
<td>6 persons</td>
<td>Half a month</td>
<td>Harbin</td>
<td>12</td>
<td>Expenses to be borne by Harbin-Jiamusi Railway Corporation</td>
</tr>
<tr>
<td>3</td>
<td>Workers of project office and environmental protection office (department)</td>
<td>Comprehensive studying knowledge of environmental protection and management and learning contents of &quot;environmental impact assessment&quot; for the project</td>
<td>Project office</td>
<td>3 persons</td>
<td>3 months</td>
<td>Harbin</td>
<td>9</td>
<td>Expenses to be borne by Harbin-Jiamusi Railway Corporation</td>
</tr>
<tr>
<td>4</td>
<td>Workers of project office and environmental protection office (department)</td>
<td>Visiting similar project areas (especially loan projects of World Bank) at home and abroad and learning mature experience with environmental protection management</td>
<td>Project office</td>
<td>6 persons</td>
<td>1 month</td>
<td>Nanning and Guangzhou</td>
<td>50</td>
<td>Expenses to be borne by Harbin-Jiamusi Railway Corporation</td>
</tr>
<tr>
<td>5</td>
<td>Responsible persons of supervision organization and project environmental supervision on site</td>
<td>Knowledge of environmental supervision, contents of environmental impact assessment and contents of relevant environmental protection design document</td>
<td>Project office</td>
<td>12 persons</td>
<td>1 month</td>
<td>Harbin</td>
<td>6</td>
<td>Expenses to be borne by supervision organization</td>
</tr>
<tr>
<td>6</td>
<td>Main technology and construction responsible persons of contractors</td>
<td>Knowledge of environmental protection and environmental management</td>
<td>Project office</td>
<td>60 persons</td>
<td>1 month</td>
<td>Harbin</td>
<td>20</td>
<td>Expenses to be borne by Contractor</td>
</tr>
<tr>
<td>7</td>
<td>Construction workers</td>
<td>Knowledge of project environmental protection</td>
<td>Project office</td>
<td>1,500 persons</td>
<td>1 week</td>
<td>Harbin and Jiamusi</td>
<td>7</td>
<td>Expenses to be borne by Contractor</td>
</tr>
</tbody>
</table>

**Total**: 108
5. LEGAL FORCE OF ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan is not only a guideline for construction organization to implement environmental protection measures, but also a basis for environmental protection department to check and accept environmental protection work. Therefore, it will enjoy equal legal force to contract and bidding document.

When the project owner, Project Preparation Office of Harbin-Jiamusi Railway Corporation, invites bidders in public, the Environmental Management Plan will be provided to the bidder as a basic document. The bidding document will include relevant mitigation measures described in the Environmental Management Plan while the bidder budge will contain expenses for all kinds of environmental protection measures.

When project owner examines bidding document, commission to implement Environmental Management Plan will be considered as a basis for review. For contract signing, Environmental Management Plan will be implemented as a service item and stipulated as one of bases for project quality check & acceptance. Before project commencement, environmental management personnel of project owner will have full understanding of the importance of Environmental Management Plan and introduce that to construction organization.

In supervision, environmental supervision engineers will consider Environmental Management Plan as a basis. If environmental protection measures are not implemented, relevant engineering will not be rejected for inspection.

Before engineering commencement, construction organization will appoint special personnel to implement Environmental Management Plan and compile environmental protection measures plan, and also implement all measures according to time schedule described in the Environmental Management Plan.

6. ENVIRONMENTAL MANAGEMENT FRAMEWORK OF TEMPORARY WORKS

Due to restriction to feasibility study phase, soil borrow area and spoil (slag) disposal sites have been only preliminarily selected. More detailed field optimization will be carried out in preliminary design and detail design phases.

Moreover, access roads are expected to be reasonably determined only when contractor starts construction preparation on site. Some soil borrow area and spoil disposal site can be adjusted based on actual situation, namely: a new oil borrow area/spoil disposal site will be selected in construction phase.

6.1 Management Framework

According to general construction management practices, contractor will use soil borrow area and spoil disposal site that are recommended in environmental assessment and project design documents, or if necessary, adjust/confirm new soil borrow area and spoil disposal site as well as access roads according to actual situation and negotiation with local government and residential areas. Under any circumstances, following procedures will be followed:

- Before commencement of this kind of engineering, contractors will establish a temporary engineering plan (including access roads and soil borrow/disposal area) and a design plan, containing sufficient environmental protection measures and reclamation
This kind of plan will be submitted to environmental supervision engineers and/or project owner for review and approval. In construction phase, environmental supervision engineers and project owner will supervise the environmental performances of these contractors on site.

6.2 Site Selection Criteria

To optimize the soil borrow/disposal area in design phase and select a new site/access roads in construction phase, following principles will be abided by:

Soil borrow area
- It will be located in a wasteland as far as possible, e.g.: massif with sparse vegetation;
- Avoid basic farmland;
- Avoid forestry, meadow or an area that is susceptible to debris flow;
- Avoid industrial and agricultural production facilities (e.g.: houses, poles and towers);
- Avoid sensitive areas like natural reserve areas, scenic spots, forest parks and water resource protection areas.

Spoil disposal site
- Avoid environmental sensitive areas like natural reserves areas, scenic spots, forest parks and water resource protection areas;
- Use low-terrain area with big volume as far as possible;
- Select discarded valleys and wasteland that are not susceptible to water erosion;
- It will not be near river bank, lake or water reservoir. If it is hard to make barren rocks far away from rivers, protect them with retaining walls;
- It will not influence flood discharge amount and irrigation function of rivers, valleys and water drainage/irrigation ditches;
- Ensure safety of farmland and architecture at downstream;
- It will not be at the upstream of residential areas;
- It will not be located in landslide area.

Access roads
- Use existing village highways as far as possible and properly reinforce road surface and water drainage system;
- Avoid passing through populated towns/villages;
- In planning a new access roads, consider using it as a connecting road between local village and remote villages;
- Avoid sensitive areas like natural reserve area, scenic spot, forest park and water resource protection area.

6.3 Access Roads Design Suggestions

Village access roads used by local agricultural machineries will be utilized as a base for construction road setting. Existing village roads or other roads will be used to reduce filling amount of temporary engineering, impact on farmland vegetation and water and soil loss. Based on actual project situation, the construction organization is recommended to negotiate with constructor of Pingwu Expressway so as to share partial construction road and decrease demand for new access roads.

Construction road will be designed in next phase. Generally, access roads is 3.5m wide. If large-scale
machines are transported, the road will be properly expanded.

During construction process, soil drainage ditches will be properly set at two sides of the road. Drainage ditches will be 0.3m high and 0.3m wide at slope ratio of 1:1. Drainage project will be connected with surrounding water channels. A simple drainage connection project will be set for every 3km to protect farmland from being eroded by sewage exhausted by construction access roads. The roadbed slope of access roads will be protected with high-density silk screen so as to prevent slope collapsing. The high-density silk screen will be 3m wide. Some roads will be completely restored before construction commencement. These roads will be covered with topsoil from nearby soil borrow/disposal ground (topsoil peeled off from access roads construction is not retained). Occupied farmland, meadow and wasteland will be revegetated. And occupied farmland will be reclaimed. Trees suitable for local area will be planted, such as masson pine and aalii. Trees will be planted at a space of 4.0×4.0m and shrub 2.0×2.0m.

Some construction access roads will be transferred to local residential areas as village traffic aisles. Before transfer, proper maintenance and repair will be carried out.

7. ENVIRONMENTAL INVESTMENT BUDGET

7.1 Principles and Basis

For budget of environmental mitigation measures, following principles will be followed:

- “People causing pollution will be responsible for pollution control and developer will be responsible for protection”. The total project environmental protection investment will include investment in environmental protection, monitoring and engineering management for environmental protection and main engineering and also that for reducing or removing adverse impact of project construction on environment. In engineering investment, investment projects related to environmental protection and water and soil conservation will be calculated separately. Other investment items beyond engineering will be considered as investment for environmental protection.

- “Pay attention to key problems”. Firstly give priority to protect environmental factors that are severely impacted by project, attract public concern and are at higher protection level and take priority in capital distribution.

- “Functional restoration”. Adopt mitigation and compensation measures to restore original functions.

- “One-time compensation”. Realize alternative compensation or reasonable one-time compensation for environmental damage that cannot be restored.

- As a main part of project investment, environmental protection will conform to cost components, budget basis and price level of main job.

- Follow Budget and Budget Quota for Soil and Water Conservation Project of Development and Construction Project (SZ [2003] No. 67)

7.2 Investment Category

According to Article 62 of Regulations on Environmental Protection Design for Construction Projects: “Environmental protection facilities will include devices, equipment, monitoring methods and engineering facilities for pollution control and environmental protection” and “budget for investment in environmental protection facilities for construction projects with environmental protection facilities will be appropriate”.

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In accordance with relevant regulations stipulated in *Budget for Water and Soil Conservation of Development and Construction Projects* and the scope of work for environmental protection for development projects, investment items will be categorized into environmental protection measures (including environmental protection and monitoring measures), water and soil conservation measures, environmental protection measures for resettlement area, water and soil conservation measures and site clearing for project resettlement area.

### 7.3 Environmental Protection Investment Budget

Static environmental protection investment budget for Harbin-Jiamusi railway project is calculated on the basis of price level of 2012.

#### Table 7-1  Investment Budget for Environmental Protection Measures

<table>
<thead>
<tr>
<th>Project</th>
<th>Engineering Item</th>
<th>Investment (10,000 yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological protection</td>
<td>Ecological protection and water and soil loss control, etc.</td>
<td>51339.53</td>
</tr>
<tr>
<td>Noise/vibration abatement</td>
<td>Sound barrier: 51,860m</td>
<td>26081</td>
</tr>
<tr>
<td></td>
<td>3m high enclosure: 2,000</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Sound proof window: 163,090m²</td>
<td>8155</td>
</tr>
<tr>
<td></td>
<td>Relocation: 1,487 households</td>
<td>62552</td>
</tr>
<tr>
<td>Electromagnetic protection</td>
<td>Network access cost (reserved)</td>
<td>35.65</td>
</tr>
<tr>
<td>Sewage treatment</td>
<td>Sewage treatment facilities</td>
<td>226</td>
</tr>
<tr>
<td>Underground water</td>
<td>Compensation for residents whose living and production water usage is influenced by tunnel engineering</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Water quality monitoring expenses</td>
<td>15.0</td>
</tr>
<tr>
<td>Atmospheric controlling</td>
<td>Atmospheric controlling facilities</td>
<td>1335</td>
</tr>
<tr>
<td>Environmental supervision</td>
<td>Protection of land and vegetation; impact of noise, wastewater, dust and solid waste from construction on environment</td>
<td>278.11</td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td>Pollution impact of water and soil loss and dust from earth and stone and wastewater, noise and vibration from construction</td>
<td>260</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>150397.3</td>
</tr>
</tbody>
</table>