E4251 v1

MINISTRY OF TRANSPORT

DIRECTORATE FOR ROADS OF VIETNAM
PROJECT MANAGEMENT UNIT 3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

VIETNAM ROAD ASSET MANAGEMENT PROJECT

Component C: Road Asset Improvement

Component C1: NH.38 section from Quan Goi - Yen Lenh

Hanoi, June 2013

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PROJECT EMPLOYER **CONSULTANT AGENCY**

Hanoi, June 2013

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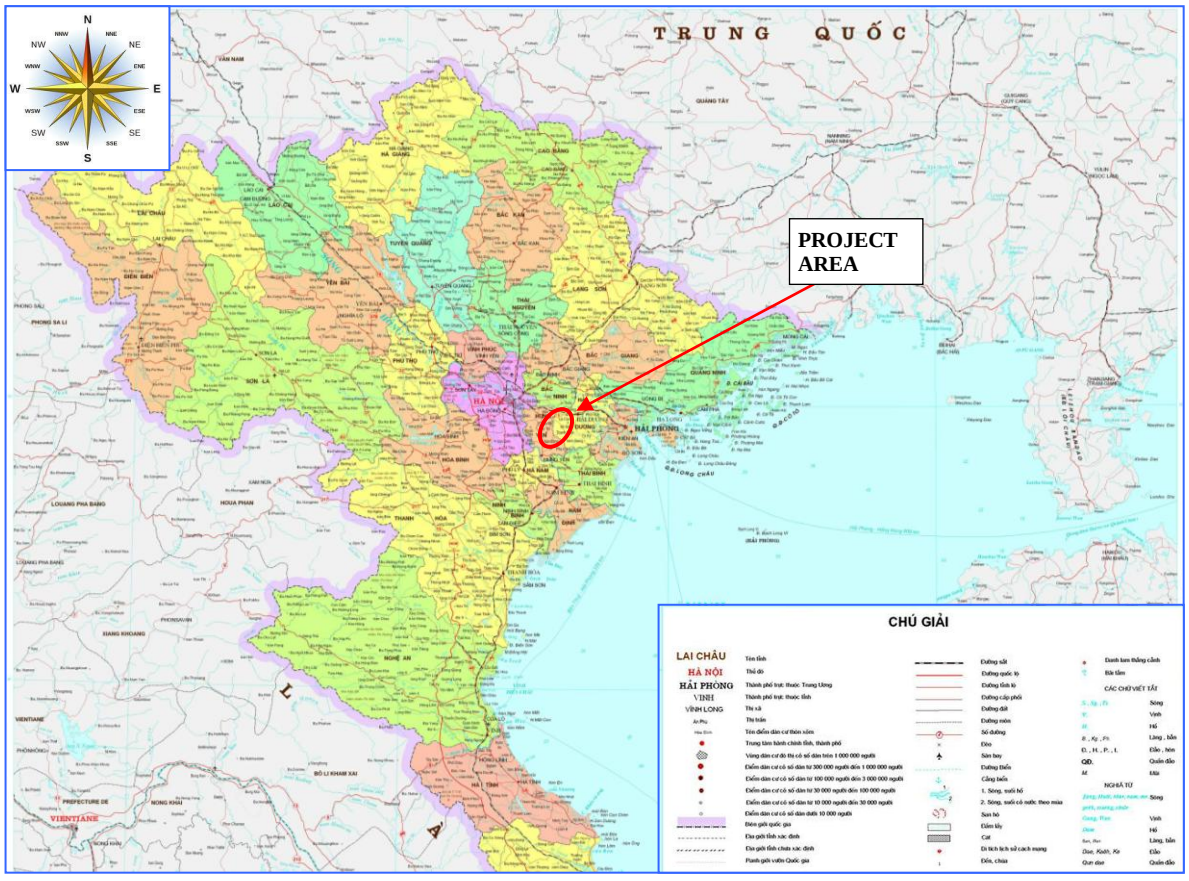
INTRODUCTION

1. Project Context

The National Highway No. 38 (NH38) starts from Ninh Xa T-road, intersecting with National Highway 1A (NH1A) in Bac Ninh city and ends at Luu Hoang T-road, intersects the National Highway No. 21B (NH21B) in Ha Nam province. NH38 passes four provinces of Bac Ninh, Hai Duong, Hung Yen, Ha Nam and connects to NH1A, the National Highway No. 5 (NH5), the National Highway No. 39 (NH39), Hanoi - Hai Phong Expressway, and Cau Gie - Ninh Binh Expressway.

On NH38, the section from Sat bridge to NH39 has a strategic role and is considered the key section to form the potential orbit of Hanoi. In the future, there will be many strategic orbit roads, but at present NH38 is seen as one of the important components and needs to be upgraded. Therefore, it is included in component C1 of the Vietnam Road Asset Management Project (VRAMP), the NH38 Quan Goi - Yen Lenh section (hereinafter the Project). The upgrading of the NH38 section is implemented according to Decision no. 346/QD-BGTVT issued on 19/2/2009 by Ministry of Transport (MOT) on approval for the NH38 investment project, Quan Goi – Yen Lenh section. Accordingly, the project is mainly in Hung Yen province and partly in Hai Duong province. Except for the section following the existing road at Km38+325 to Km43+760, the alignment of the subproject NH38 Quan Goi - Yen Lenh is mostly new, following alignment alternatives that avoid densely populated areas.

Figure 1. Project Area



MOT is the agency approving the project. The Directorate for Roads of Vietnam is the project Owner. Project Management Unit No.3 is the project implementation agency.

2. Legal and Technical Bases for Environmental Impact Assessment

2.1. Technical and Legal Documents

2.1.1. Vietnam Laws and Regulations

This is a new construction project, subject to environmental impact assessment in accordance with Annex II, Decree 29/2011/ND-CP dated 18/4/2011 of the Government on strategic environmental assessment, environmental impact assessment, and environmental protection commitment. Being located in 2 provinces / cities, the project is subject to appraisal and approval by the Ministry of Natural Resources and Environment according to Appendix III of Decree No. 29/2011/ND-CP.

The legal and technical documents include:

- In relation to environment and land use:
  - Law on Environment Protection 2005 ratified by 11th National Assembly of the Socialist Republic of Vietnam, 8th session on 29/11/2005 and effective since 01/7/2006;
  - Law on Water Resources ratified by the 10th National Assembly of the Socialist Republic of Vietnam, 3rd session on 20/05/1998, revised in 2012 and effective January 1, 2013;
  - Land Law ratified by the 11th National Assembly of the Socialist Republic of Vietnam, 4th session on 26/11/2003;
  - Biodiversity Law approved by the 12th National Assembly of the Socialist Republic of Vietnam, 4th session, on 13/11/2008
  - Decree No. 59/2007/ND-CP dated 09/04/2007 of the Government on management of solid waste;
  - Decree No. 84/2007/ND-CP of the Government dated 25/05/2007 providing additional regulations on granting land use certificates, land acquisition, implementation of land use, process and procedures of compensation, support and resettlement for the Government's land recovery, and settlement of land-related claims;
  - Decree 69/2009/ND-CP dated 13/8/2009 of the government providing additional regulation on land use planning, land price, land recovery, compensation, support and resettlement;
  - Decree 29/2011/ND-CP dated April 18, 2011 of the Government regulating on

strategic environmental assessment, environmental impact assessment, environmental protection commitment;

- Circular 14/2009/TT-BTNMT dated October 1, 2009 of Ministry of Natural Resources & Environment providing in details the compensation, support and resettlement; the process and procedures of land recovery, land handover or land lease;
- Circular No. 12/2011/TT-BTNMT dated 14/4/2011 providing regulations on hazardous waste management;
- Circular No. 06/2007/TT-BTNMT of Ministry of Natural Resources and Environment dated 15/06/2007 guiding implementation of the said Decree No. 84/2007/ND-CP dated 25/05/2007;
- Circular 26/2011/TT-BTNMT dated 18/7/2011 detailing a number of articles of Decree No. 29/2011/ND-CP of April 18, 2011 of the Government on environmental assessment the strategic environmental impact assessment, environmental protection commitment;
- Circular No. 25/2009/TT-BTNMT dated 16/11/2009 issuing national technical code on environment;
- Circular No. 39/2010/TT-BTNMT regulating national technical code on environment;
- Circular No. 09/2010/BGTVT dated 06/4/2010 providing regulations on environmental protection in development of transport infrastructure;
- Decision No. 04/2008/QD-BTNMT on 18/07/2008 issuing national technical code on environment;
- Decision 16/2008/QD-BTNMT 31/12/2008 on issuing national technical code of environment;
- Decree No. 117/2009/ND-CP dated 31/12/2009 of the Government on acts against illegal violation relating to environmental protection work;
- Circular No. 28/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural Resources and Environment providing guidelines on technical process of surrounding air environment monitoring and noise;
- Circular No. 29/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural Resources and Environment on regulations on continental water surface environment monitoring;
- Circular No. 30/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural

Resources and Environment regulates technical process of underground environment monitoring;

- Circular No. 33/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural Resources and Environment regulates technical process of soil environment monitoring;

– Regarding investment project:

- Construction Law ratified by 11th National Assembly of the Socialist Republic of Vietnam, 4th meeting session on 26/11/2003;
- Law No.38/2009/QH12 on amendment of law relating to capital construction laws;
- Road Traffic Law adopted by 12th National Assembly of the Socialist Republic of Vietnam, 4th session on 13/11/2008;
- Law on Inland Waterway Traffic adopted 11th National Assembly of the Socialist Republic of Vietnam, 5th session on 15/06/2004;
- Decree No. 99/2007/ND-CP dated 13/06/2007 of the Government on management of investment construction cost;
- Decree No. 03/2008 dated 07/01/2008 of the Government amending articles of Decree No. 99/2007/ND-CP;
- Decree No. 12/2009/ND-CP dated 10/02/2009 of the Government on management of investment construction projects;
- Decree No. 83/2009/ND-CP dated 15/10/2009 issued by the Government as amendment of some articles of Decree No. 12/2009/ND-CP;
- Decree No. 11/2010/ND-CP dated 24/02/2010 of the Government regulating on management and protection of road transport infrastructure;
- Decree No. 112/2009/ND-CP dated 14/12/2009 of the Government on management of investment construction cost;
- Decision No. 346/QD-BGTVT dated 19/2/2009 of the Ministry of Transport approving for NH38 investment project, Quan Goi – Yen Lenh section;
- Submission letter No. 2306/TTr-BNH.DA2 on 07/12/2012 of Project Management Unit 2 requesting for approval for the Technical Design of National Highway No. 38 Rehabilitation Project, Quan Goi – Yen Lenh Section;
- Document no. 304/TB-TCDBVN dated 12/24/2012 of Directorate for Roads of Vietnam;

– Other related documents.

2.1.2. Safeguards Policies of the World Bank

Environmental assessment: The subproject shall also comply with the safeguards policies of the World Bank, namely, Environmental Assessment (OP/BP 4.01), and Involuntary Resettlement (OP/BP 4.12). The environmental impact assessment (EIA) will determine the positive and negative impacts, consider the comparison with feasible alternatives and proposing the necessary measures to avoid, mitigate, or compensate for the potential negative environmental and social impacts. In addition, an Environmental Management Plan (EMP) for the subproject, covering the proposed mitigation measures, has also been developed accordingly.

Public consultation: According to the Policy OP 4.01 of the World Bank and Decree No. 29/2011/ND-CP of Vietnamese Government, public consultation shall be implemented. During the preparation of this EIA, the project-affected groups, local communities and authorities have been consulted about the project's environmental aspects and their views have been taken into account. In addition, such groups will be consulted throughout project implementation as necessary to address the related environmental and social issues that affect them.

Disclosure of information: According to the World Bank's safeguards policy and Decree No. 29/2011/ND-CP of the Government, the environmental impact assessment report should be widely publicized to the affected people. For meaningful consultations, the relevant material and this EIA have been provided to the project-affected groups and communities in a timely manner prior to consultation and in a form and language that are understandable and accessible to the groups being consulted. The final draft and final EIA reports will also be proper disclosed at the subproject sites and PMU 3 office.

2.2. Applicable Technical Regulations and Standards

– TCVN 7210:2002, Vibration and collision. Vibration due to means of road transport - allowance limits for public environment and residential areas;

– QCVN 03:2008/BTNMT: National Technical Regulation on permissive limits of heavy metals in the soil;

– QCVN 05:2009/BTNMT: National technical regulation on ambient air quality;

– QCVN 06:2009/BTNMT: National technical regulation on some harmful substances in the ambient air environment;

– QCVN 08:2008/BTNMT, National technical regulation on surface water quality;

- QCVN 09:2008/BTNMT, National technical regulation on ground water quality;
- QCVN 14:2008/BTNMT, National technical regulation on domestic sewage;
- QCVN26:2010/BTNMT, National technical regulation on noise;
- QCVN 27:2010/BTNMT: National technical regulation on vibration;
- QCVN 40:2011/BTNMT: National technical regulation on industrial wastewater;
- QCVN 43:2012/BTNMT, National technical regulation on sediment quality;
- The environmental standards of the International Organizations and the construction area such as WHO, FAO-ISO-9000, Canadian Standards on Sediment;

2.3. Sources of Reference Documents and Data Created by the Project Owner

- Project Description – Investment Construction Project establishment step.
- Socio-economic and environmental resources survey data of the Project Area collected by the Center for Sustainable Community Development (CSD).

The environmental survey data of the subproject area in August 2011 implemented by CSD under a contract with the Project owner include the data on environmental quality of air, noise, vibration, surface water, soil, and sediment. Subproject locations, number, frequency, measurement time, survey and sampling items are presented in detail in Chapter 2. Public consultation was carried out with communal people's committees and representatives of local communities, details are presented in Chapter 6. Project contents, possible environmental issues and proposed mitigation measures are introduced during the consultation process. At the same time, the opinions of consulted resident were recorded and added to the corresponding content of the reports for each specific road section.

The detailed survey data is done by the methods prescribed by experienced professionals. Because the time of survey and measurement serving EIA Report of the project coincides with the time of investment consideration and decision of the project, the updated data is reasonable.

2.4. Structure of the EIA Report

The report structure is divided into the following main components:

Summary of the environmental impact assessment report: This section summarizes the main content of the project, the impacts on the natural environmental, socioeconomic, mitigation measures and environmental management plan.

Introduction: It introduces the subproject context, the legal basis, and method for preparation and implementation of the EIA report.

Chapter 1 - Brief description of the project: The chapter presents an overview description of the project, the route alternatives, the proposed work-items and methods of construction organizations.

Chapter 2 - The natural, environmental and socio-economic conditions of the project area: This chapter provides an overview on the actual status of baseline environment including geography, geology, hydrology, environmental components, ecosystem, flora and fauna, and socio-economic conditions in the project area. Some initial comments on the potential impacts will be also addressed in this chapter.

Chapter 3 - Environmental impact assessment: This chapter will focus on the refinement of the typical impacts, consideration of the affected objects to assess the impact level by each phase of the project implementation, from pre-construction to construction and operation phase of the project. In addition, the potential impacts will be analyzed in-depth. The assessment and analysis will be complemented by specialized software, the calculation formula and/or lessons of reference from other similar activities/projects.

Chapter 4 - Measures for prevention and mitigation of adverse impacts, and prevention and response to environmental incidents: This section provides information about the mitigation measures for each project phase with each various relative parties. In addition, the arising risks/potential risks will be managed through the providing plans proposed in the report.

Chapter 5 - Environmental monitoring and management program: This chapter includes (i) environmental management system with the coordination manner and specific responsibilities of the parties involved; (ii) monitoring indices and monitoring programs, including program of environmental quality monitoring indicators; (iii) estimated cost.

(The environmental monitoring and management program is presented following the Circular 26/2011/TT-BTNMT. At the same time, an EMP as required by the World Bank will be prepared in a separated report).

Chapter 6 - Public consultation: This section summarizes the implemented consultation activities as well as the key issues, the concerns and suggestions of the community on environmental issues of this project.

Conclusions, recommendations and commitments: This section sets forth the general conclusions to the identified environmental impacts and recommendations to governmental agencies at all levels to get assistance for solving the problems beyond the ability of the project. The commitments of the project owner on implementation of the environmental management program, environmental monitoring program and the

commitments to the community as outlined in the sections of the previous chapters.

3. Methodology for Environmental Impact Assessment

Environmental impact assessment work has been developed following regional approach; it means to carry out an overview research to preliminarily assess the impacts, then through the field survey results to assess the specific environmental impacts.

Phase 1: Preliminary Environmental Impact Assessment

Overview research: The study was done by collecting and analyzing information in the relevant documents. (These steps have been completed under the Road Network Improvement Project).

Detailed study: carrying out overall survey of the route planned for investment and the preliminary proposed alternatives to provide initial comments on the actual status of the environment and the unique characteristics of the region planned for investment by collecting information through the following activities: (i) establish and record the information following the forms to build the baseline database of socio-economic status and environment, (ii) take photos of current status of the subproject area for monitoring and assessing the baseline environment before, during and after the project implementation as well as potential impacts along the project route (iii) conduct the economic and social survey via the survey sheets; (iv) directly interview local leaders and representatives of relevant agencies on the economic, social, environmental state as well as the initial comments on the impact of the project to the local community.

Analysis and identification of environmental impacts on the basis of baseline environment and design alternatives: An impact matrix has been created to compare the baseline environmental factors and characteristics of activities of the project, as a basis to make qualitative judgments of main types of impacts, which are likely to arise.

Analysis and evaluation of the selected investment alternatives from the environmental viewpoint: The main impacts will then be considered for comparison and reference of the levels (combination of qualitative and quantitative information) according to the different technical alternatives. A system of ranking methods was prepared according to the different types of impact. The overall impact level on the environment between the technical alternatives will be quantified with specific points as a basis for comparison.

Coordination for implementation of the project: The environmental issues are integrated in the design process and selection of alternatives. The group of environmental experts and technical experts work closely together from the beginning of the implementation to identify the route alignments and determine the scope of

influence until the alternatives are established. The proposed alternative will be reviewed in view of the optimal in terms of the environment in matching with other factors such as technical complexity, construction, operation and maintenance costs, and institutional - organizational management, etc. before making a final selection decision.

Phase 2: Detailed environmental impact assessment

Based on the selected alternative, the Consultant will continue assessment in details. The sequence and method of implementation include:

Studying the documents following the existing orientation:

- Documents on the final selected alternative with specific quantitative information such as: The basic design drawings; topographical maps; geological survey map; site plan, architecture of the work-items of the project
- The materials on traffic (traffic density, congestion critical spots, the current state of the roads, etc.), survey reports of material pits, waste/solid waste management on all roads of the project and the vicinity;
- Calculation of quantitative parameters relating to specific characteristics of investment project routes based on: population divided positions, excavation soil mass, volume of sand to be transported, a number of main roads to be used, etc.
- Collection of information on the state of the ecology and biodiversity and determine the extent of biodiversity in the route passing through areas.

Detailed field survey: determining the impact boundary and the vulnerable positions and surrounding the impact vulnerable areas on the routes selected for investment.

Establishing and implementing environmental monitoring programs and indicators: Based on the baseline parameters, uniform properties and specific characteristics of investment routes to implement sampling and analysis of the environment criteria (air, noise, vibration, surface water, sediment, groundwater, and soil).

Application of some formula and specialized calculation software (Mathematical simulation) to forecast some of the environmental impacts arising (Gaussian model - air pollution; ASJ model - noise pollution, etc.).

Analysis of impacts arising (with supplementation of quantitative parameters) the impacts generating from the project implementation (both negative and positive) in the design phase, construction and operation; assessment of risks; setting up mitigation measures and risk management; detailed management plan/environmental monitoring programs; capacity improvement training courses; cost estimation for implementation of environment management plan. The contents are as follows:

- Computing and setting up tables, graphs, etc.
- Analysis of trends of changes.
- Mapping, and visualize the impacts: combination of Google Map, AUTOCAD and MAPINFO; and calculating charts.
- Matching with the standards and level assessment of pollution.
- Referring to the actual experience of related projects.
- Benefit analysis.
- *Public consultation in wards/communes in the project:* the main stakeholders participating in the project include: the commune-level People's Committee representatives and representatives of communities in areas affected by the project.
- *Submitting the reports to the environmental experts* (experts of World Bank) for review and getting comments.
- *Disclosure of information:* after technical evaluation by the experts, EIA Report will be widely disclosed: at the Vietnam Development Information Center (VDIC) of the World Bank in Hanoi and on the Infoshop of the World Bank in Washington DC; in Vietnamese at the PMU3 office and at the project sites. The contribution opinions will be considered, summarized and finalized in the final report.

4. Environmental Impact Assessment Implementation

The Project's EIA Report is carried out by the representative of Project owner – Project Management Unit 3 with the consultancy of CSD.

- Representative of the Employer (Project owner): Project Management Unit 3
  - Address: 18 – Pham Hung, Mai Dich, Cau Giay, Hanoi.
  - Tel: 04.37680063 Fax: 04.37680073
- EIA Consultant: Center for Sustainable Community Development
- Representative by: Mr. Ho Ngoc Hai Position: Director
- Address: 5 – Nguyen Viet Xuan, Hanoi.
- Tel: 04. 3852 3090 Fax: 04. 3565 5800

The members directly involving in preparation of the EIA Report of the Project are all EIA knowledgeable experts who are specialized in areas: control of air pollution, water pollution, environmental ecology, environment technology, environmental managements with the following representative names:

1	MA. Pham Van Xuan, Environmental Management – Environmental geology

2	Engineer. Pham The Giang, Hydrograph – Environment
3	MA. Nguyen Dinh, Environmental Science
4	MA. Bui Nguyen Pho, Environmental science
5	BSc. Đang Vu Hien, Ecology.
6	BA. Pham Thanh Hao, Environmental economics
7	Engineer. Nguyen Hong Van, Environmental economics
8	BA. Le Viet Cao, Environment Technology
9	BA. Tran Phương Lan, Environmental Management – Law and policies on environment
10	MA. Tran Tuan Anh, Environmental geology.
11	BA. Ngo Thi Thanh Hoa, Environmental Engineering.
	and other collaborators

CHAPTER I. BRIEF DESCRIPTION OF THE PROJECT

1.1. Name of Project

Vietnam Road Asset Management Project, Component C: Road Asset Improvement, Component C1: NH38 Quan Goi - Yen Lenh section.

1.2. Project Owner

- Employer: Directorate for Roads of Vietnam
  - Address: D20, Ton That Thuyet, Cau Giay, Hanoi
  - Telephone: 04.35373672 Fax: 04.38571440
- Project Management Unit: Project Management Unit 3
  - Contact Address: No.122, block 12A Trung Hoa Street, Trung Yen Urban Area Cau Giay District, Hanoi City.
  - Telephone: 04.37836052 Fax: 04.37836053

1.3. Geographical Location of the Project

From the beginning point of the road section under the Project, NH38 runs in southeast direction to intersect with NH39. NH38 runs northwards and crosses NH5 towards Hanoi. The new section is proposed between Km45+900 and Km49+500 to the bypass section in An Thi. Then NH38 continues northwards to Provincial Road No. 388 turning west in Cam Giang.

The Project location extends through 14 communes/ towns of Hai Duong and Hung Yen provinces, including: Minh Duc commune (My Hao district, Hung Yen province), Hung Thinh, Vinh Tuy, Vinh Hong, Trang Liet, Thuc Khang (Binh Giang district, Hai Duong province), Phu Ung, Bai Say, Tan Phuc, Quang Vinh, An Thi Town, Quang Lang communes, (An Thi district, Hung Yen province), Nghia Dan, Toan Thang Communes, (Kim Dong District, Hung Yen province).

The project geographical coordinates, the beginning point, and the end point of the Project's elements are presented in table 1.1.

Table 1.1. Location of beginning point and end point of the Project

Item	Beginning point	End point
NH38	Km0+000 (Sat bridge station)	Km52+716 (NH38 station)
Location	Three-way intersection bw. NH38 and NH5 flyover's approach road.	Crossing NH39

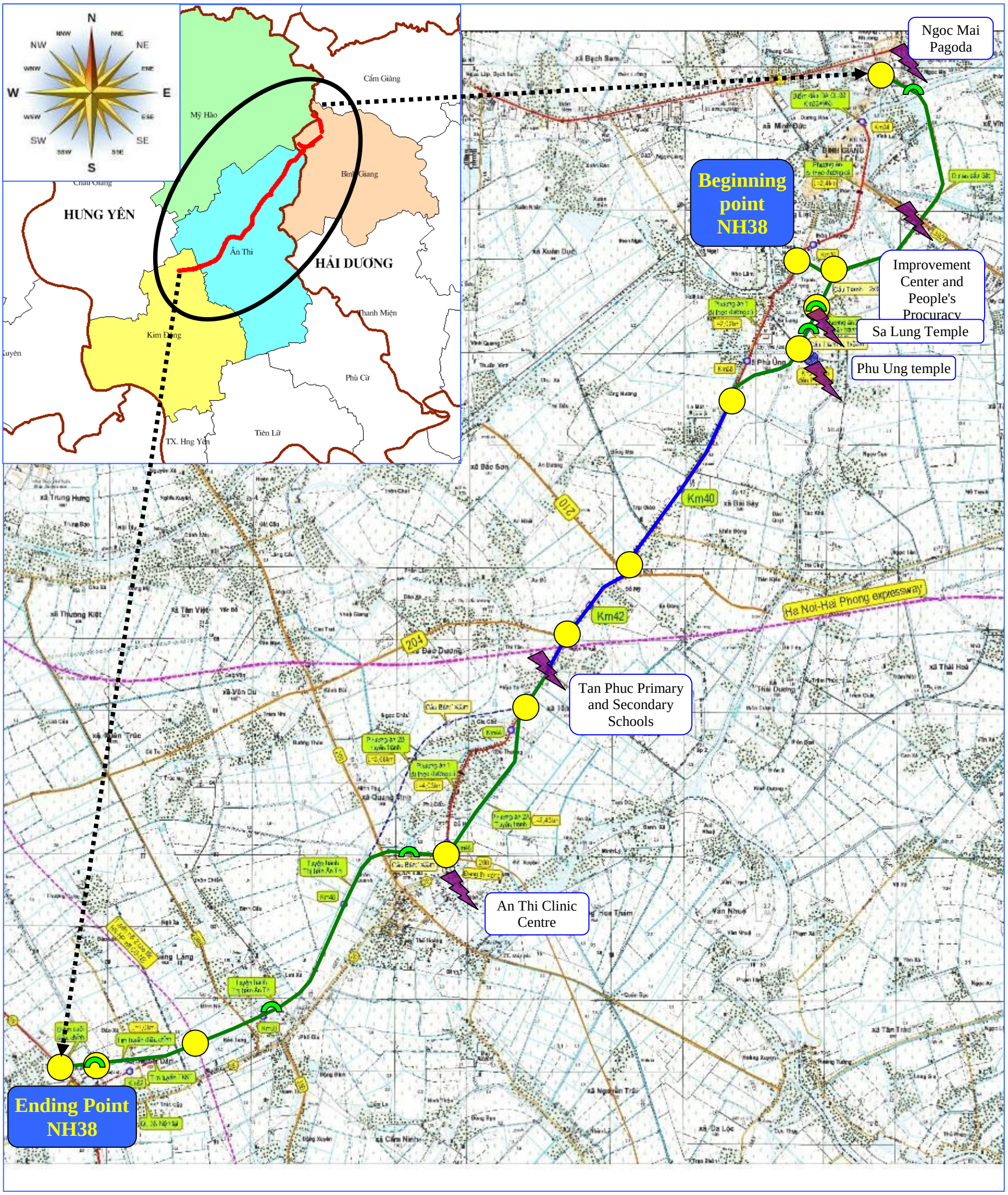
Item	Beginning point	End point
Coordinates	20°55'23,78"N; 106°9'16,38"E	20°47'45,16"N; 106°2'34,96"E

The project's extent passes the Red River delta, with a relative flat terrain. Except the section following the existing road from Km38+325 to Km43+760, the route alignment of the project section on NH38, the Quan Goi - Yen Lenh section, is mainly new construction, following the alignment alternatives that bypass or avoid densely populated areas:

- *Transport road system:* The main roads in the project area include the national highways (NH38, NH38B, and NH39); provincial roads and district roads (210, 201, 204B. etc.), and local roads. Traffic flow on roads is not high, with the majority of transport means being motorcycles, cars, and trucks.
- *Rivers and waterways system:* The project crosses Ke Sat river (or *Sat* river), Cuu An river, Bun river, Quang Lang river, and Dien Bien river. Except for Sat river and Dien Bien river, there is no waterway transportation on the other rivers and canals. Besides, the project also cuts some irrigation ditches and canals serving irrigation of the fields inside the project area.
- *Conservation areas:* In the project area, there are no national parks or natural reserves. The nearest natural reserve is Tam Dao National Park, which is 60km from the project location in the North.
- *Population and production – business activities:* The population in the project area concentrates in the neighborhood groups and lives along the existing roads. Economic activities along the route are varied with several trades, professions, of which the dominant one is agriculture. In district centers and along the existing roads, besides agricultural activities, the households, thanks to their advantages of location, also run small businesses and services.
- *Historical, religious, cultural works and objects likely to be affected by the project:* The project will not occupy space of cultural, historical works. However, there are a large number of temples/churches in this area such as Sat cathedral and Phu Ung temple. The nearest cultural, historical, religious object is Ngoc Mai pagoda, about 75m from the project site.

Geographic location map of the project is shown in Figure 1.1.

Figure 1.1. Geographical location map of the Project



NOTES

- New road sections
- Coinciding sections (remained)
- Intersection
- Bridge
- Residential area
- Pagoda, temple, school, etc.

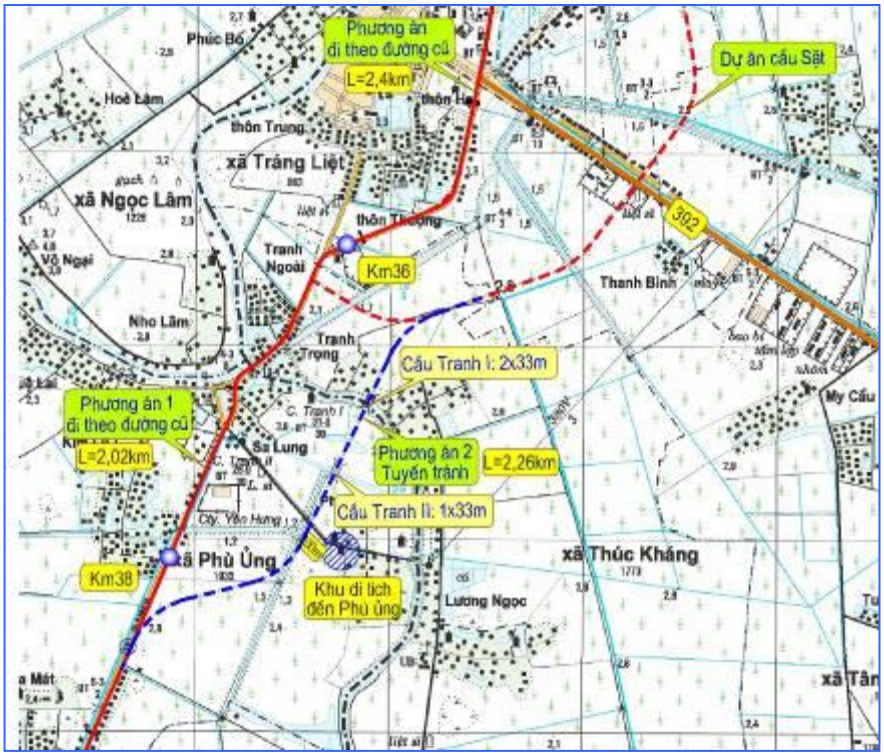
1.3.1. Project Alignment Alternatives and the Selected Alternative

a. Section passing Sa Lung Hamlet (Km36+200 - Km38+324)

Section passing Sa Lung hamlet (Km36+200 - Km38+324): The project studies two local route alignment alternatives as follows (figure 1.2):

- Alternative 1: Expansion of the existing road embankment (NH38).
- Alternative 2: A new section that intersects with the three-way intersection of the Sat Bridge subproject at Km3+774.39, is parallel to the existing NH38 in 440m eastwards, and about 200m from Phu Ung temple westwards, and joins NH38 at Km38+324.

Figure 1.2. Alternative for the Section Passing Sa Lung hamlet



Comparing the technical, economic, and environmental criteria, (for details see chapter 3), Alternative 2 is recommended for selection. The section is totally new construction with a total length of 2.25km according to the recommended alternative.

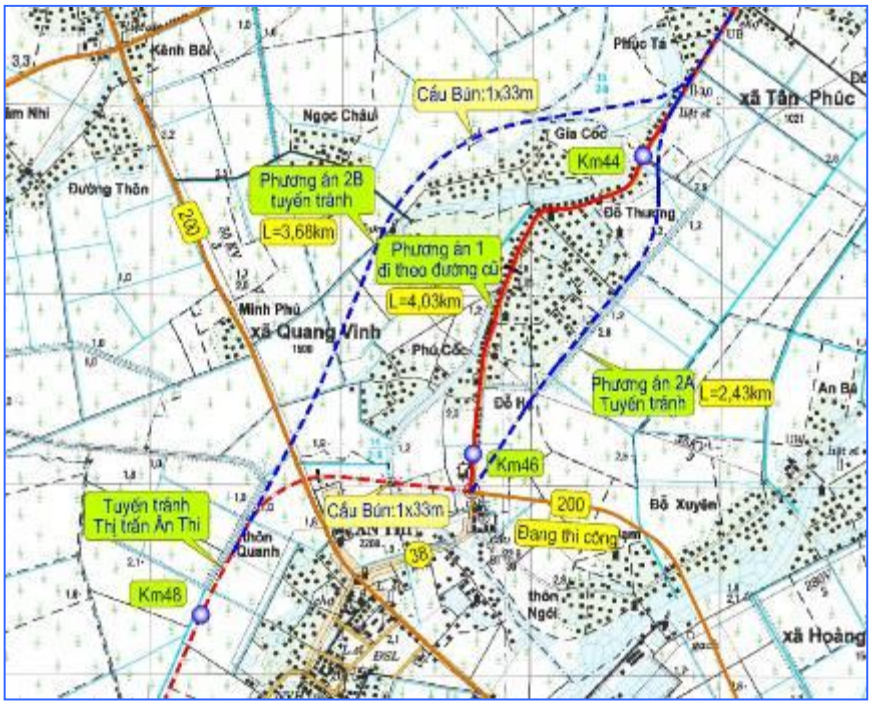
b. Section passing Do Thuong hamlet (Km43+600 - Km47+600)

The section passing Do Thuong hamlet (Km43+600 - Km47+600): The project studies three local route alignment alternatives as follows (figure 1.3):

- Alternative 1: The route coincides with the existing road and beginning of the section that bypasses An Thi town.

- Alternative 2A: The route is eastwards of Do Thuong hamlet, then crosses NH38 and joins the An Thi bypass section;
- Alternative 2B: The route is westwards of Do Thuong hamlet, then crosses NH38 and joins the An Thi bypass section.

Figure 1.3. Alternatives of sections passing Do Thuong hamlet



Comparing the technical, economic, and environmental criteria (details see chapter 3), Alternative 2A is recommended for selection. The section is totally new construction with a total length of about 3.68km according to the recommended alternative.

1.4. Main Contents of the Project

1.4.1. Objective of the Project

The main objective of the project is to enhance traffic capacity of the NH38.

1.4.2 *Quantity, Scale of the Project's Work Items*

1.4.2.1. Major Work Items

The project shall be studied in investment in:

- Construction of NH38 Quan Goi - Yen Lenh section with a total length of about 21.3km, of which:
  - Construction of bypass sections with a total length of about 15.8km;
  - Keeping the existing NH38 of about 5.5km (Km38+325 to Km43+760);

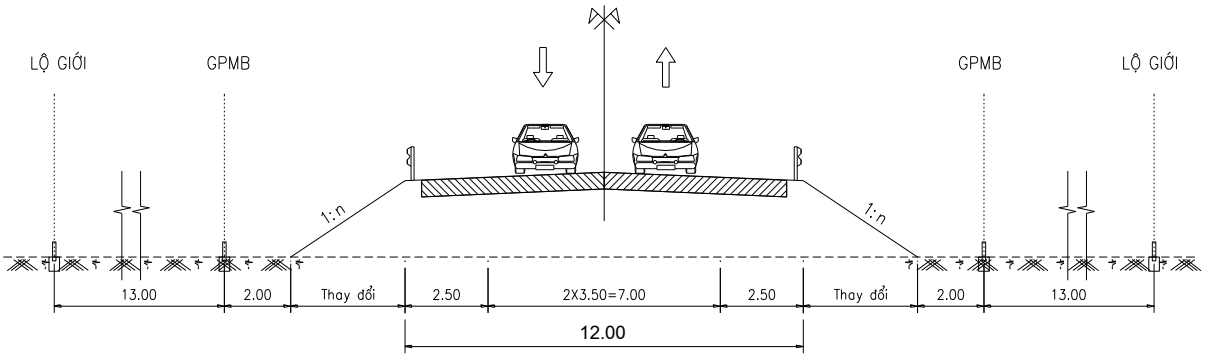
- Repaving NH38 pavement for Km33+963 - Km38+400; Km43+600 - 47+600 sections with a total length of about 8.2km;
- Construction of 13 at-grade intersections;
- Construction of 06 new bridges with each bridge's length < 200m;
- Drainage system and traffic safety.

a. Roadwork

a1. Scale

- The project route alignment is designed as class-III grade plain road, V_{design} = 80km/h;
- Cross-section scale: B_n = 12.0m, including carriageway of 7.0m, treated roadside 2.0m each side and soil shoulder 0.5m each side (figure 1.4).

Figure 1.4. Cross-section scale



a2. Pavement structure

Pavement design is according to AASHTO 1993:

- Asphalt concrete surface course: 5cm;
- Asphalt concrete binder course: 7cm;
- Base course: 15cm
- Subbase course: 25cm

a3. Embankment structure

The embankment is filled with sand at K > 0.95, for 50cm layer below the pavement alone. It shall be compacted to K > 0.98, meanwhile using geotextile for separation.

a4. Soft soil treatment

Based on geological conditions of the project area, project scale, specifications, design solutions of soft soil treatment selected include: excavation and soil replacement, PVD, surcharge filling and sand drain.

b. Intersection

On the whole route there will be 13 at-grade intersections. Crossings and stations are presented in table 1.2.

Table 1.2. Summary of intersections

No.	Crossings	Station
1	Sat bridge (under VRAMP)	Km3+900
2	Dyke	Km4+300
3	Access road to relic site	Km5+025
4	Existing NH38	Km5+900
5	Hanoi - Haiphong Expressway	Km41+310
6	PR204	Km42+550
7	Existing NH38	Km43+900
8	PR200 and Existing NH38	Km46+117
9	2 Expressway connection road	Km51+000
10	Dien Bien river bank road	Km52+390
11	Existing NH39	Km52+817
12	NH38 and NH5 bridge approach road	Km0+000
13	Existing NH38	Km4+500

c. Bridgework

The project will build 06 river crossing bridges. Design solution and natural, socio-economic characteristics of the bridges are presented in table 1.3.

Table 1.3. Design solutions for bridges within the Project's extent

No.	Bridge name/ station	Length (m)	Breadth (m)	Superstructure	Substructure	Remarks
1	Sat (Km0+529)	143	13	PCI girder (4x33)	Bored pile (D = 1 m); 2 bank piers and 1 pier in flow	Sat river (water used for irrigation); at the two bridge ends there is agricultural land.
2	Tranh 1 (Km4+400)	82	13	PCI girder (2x33)	Bored pile (D = 1 ÷ 1.5m)	Cuu An river (water used for irrigation).

No.	Bridge name/ station	Length (m)	Breadth (m)	Superstructure	Substructure	Remarks
						People live along the approach road on the north bank.
3	Tranh 2 (Km4+800)	43	13	PCI girder (1x33)	RC pile	Cuu An river (water used for irrigation); at the two bridge ends there is agricultural land.
4	bun bridge (Km46+633)	42	13	Slab girder (1x33)	Bored pile (D = 1 m)	Bun river (water used for irrigation); at the two bridge ends there is agricultural land.
5	Dia bridge (Km49+920)	28	13	Slab girder (1x18)	RC pile	Quang Lang river; at the two bridge ends there is agricultural land.
6	Tinh bridge (Km52+360)	34	13	Slab girder (1x24)	RC pile	Dien Bien river (water used for irrigation); at the two bridge ends there is agricultural land.

c. Drainage system

On the entire route there will be 74 drainage culverts, of which 64 are pipe culverts and 10 are box culverts. Besides, The project will relocate 3,052m irrigation canal.

d. Preventive works and traffic safety

The traffic management works include: signs, mileage posts, road markings and traffic islands sufficiently according to ‘Road Signaling Rules 22TCN-237-01”, accordingly:

- Reflective signs will be used and hang on steel posts at easily noticeable locations;
- Road markings are thermoplastic reflective painting, ensuring that drivers can realize even at night time and day time in all weather conditions.
- Mileage posts and guardrails shall be installed on the edge of dangerous road sections, filling embankments, and bridge approach roads.
- Traffic islands are pre-casted concrete block, on which flowers and ornamented trees are planted.

1.4.2.2. Quantity and scale of auxiliary items

a. Land acquisition

Land acquisition of the project is determined based on the fact that the whole road is designed as class-III plain road. The quantity of land acquisition is summarized in table 1.4.

Table 1.4. Land Acquisition Quantity

No.	Item	Unit	Quantity
I	*Compensation for land*		
1	Residential land	m^2 /[household]	7,160 [216]
2	Agricultural land	m^2/ [household]	88,878 [541]
II	*Compensation for buildings*		
1	Grade-4 building	m^2	275
3	Grade-3 building	m^2	133
III	*Relocation of infrastructure*		
1	Electric pole	Each	76
2	Telephone pole	Each	37
IV	*Relocation of graves*	Each	13

b. Construction Sites

The layout plan of the construction sites is estimated as follows:

- The construction sites of Sat bridge (Km0+400), Tranh bridge 1 (Km4+400), Tranh bridge 2 (Km4+800), Bun bridge (Km46+633), Dia bridge (Km49+920), and Tinh bridge (Km52+360), have an average area of about 5,000m^2/construction site. Material site compounds, worker camps, plants, and girder casting yard will be located at these construction sites. Those bridge construction sites will also serve construction activities on the road in about 5km distance.
- In peak times, there will be about 50 workers working and living at each construction site.

c. Material and waste soil transportation

- *Natural materials:* soil, sand, stones used in construction of the project will be purchased from licensed material borrow pits/quarries. These materials will be transported to the construction sites by the owners of the material borrow pits/quarries via specialized trucks.
- *Semi-Products:*

- Cement concrete will be mixed by mixing plants set up at the construction sites;
- Asphalt concrete, as well as other materials, will be purchased from licensed plants and transported to the construction sites by specialized mixers.

Table 1.5 and figure 1.5 present borrow-pits/quarries, stock piles, and mixing plants capable to serve the project.

Table 1.5. List of borrow pits /quarries, stockpiles, and mixing plants

No	Name of borrow pits / stockpiles and mixing plants	Characteristics	Planned haul road
I	**borrow pits / stockpiles**		
1	Kien Khe quarry	Kien Khe townlet, Thanh Liem district, Ha Nam province (200,000 m^3/year)	PR494C - PR494 - PR971 - road 9710 - road no. 60 - NH38 - NH39 (50km)
2	Thanh Nghi soil borrow-pit	Thanh Nghi commune, Thanh Liem, Ha Nam (2.500,000m^3)	NH1A - PR494 - PR971 – road 9710 – road no. 60 - NH38 - NH39 (57km)
3	Yen Lenh stockpile	Hong Chau commune, Dong Hung district, Hung Yen province	NH39 (19km)
4	Trieu Duong stockpile	Hai Trieu commune, Tien Lu district, Hung Yen province	NH39 or PR200 (20km)
5	Military Stockpile	Tien Phong ward, Duy Tien district, Ha Nam province	PR223 – PR226 - NH39 (62km)
6	Thai Ha stockpile	Hung Yen Province, Thai Ha commune, Thai Thuy district, Thai Binh province	Dyke - NH10 - PR223 – PR226 - NH39 (76km)
7	Kenh Chanh Sand bank no. 1	Thuc Khang commune, Binh Giang district, Hai Duong province	Next to the road
8	Thong Nhat quarry	Phu Thu town, Kinh Mon district, Hai Duong province	PR388 – NH5 (51km)
II	**Asphalt concrete mixing plant**		
1	Thai Binh Road Management and Commercial Company Limited	Tien Phong ward, Duy Tien district, Ha Nam province	PR223 – PR226 - NH39 (62km)
2	TRICO	Hai Trieu Commune, Tien Lu district, Hung Yen province	NH39 or PR200 (20km)

No	Name of borrow pits / stockpiles and mixing plants	Characteristics	Planned haul road
3	Xuan Truong	Pho Noi town, My Hao district, Hung Yen province	NH5 (12km)

Figure 1.5. Locations of Material Pits/Yards and Mixing Plants

c. Dumping of Waste Soil, Rock, and Dredged Materials during Construction

The location for dumping waste soil was not specifically identified in preparatory stage of the investment project. The Project owner committed to reach an agreement in writing with the local authorities about rock and soil dumping locations of the waste soils during the project implementation.

Table 1.6 is the summary of some waste soil and rock dumping locations accepted by local authorities in principle.

Table 1.6. Summary of Some Waste Soil and Rock Dumping Locations Accepted by in Principle.

No	Dumping sites	Features
1	Upper Zone, Trang Liet Commune, Binh Giang district, Hai Duong province	Low-lying land under communal ownership. Capacity of about 10,000m3.
2	Lower Zone, Trang Liet Commune, Binh Giang district, Hai Duong province	Low-lying land area under communal ownership. Capacity of about 60,000m^3
3	Triple Gate Culvert, Trang Liet commune, Binh Giang district, Hai Duong province	Low-lying ponds under communal ownership. Capacity of about 30,000m^3.
4	Three-Plot Area in low-lying fields, Thuc Khang commune, Binh Giang district, Hai Duong province	-lying land area under communal ownership. Capacity of about 15,000m^3.
5	Nguu Xa Swamp, Quang Lang commune, An Thi district, Hung Yen province	Low-lying land under communal ownership. Capacity of about 7,200m^3.

Figure 1.6. Some Dumping Sites

Upper Zone of Trang Liet Commune

Triple Gate Culvert, Trang Liet commune

1.4.3. Measures, Volume of Construction Works of the Project

1.4.3.1. Implementation of Land Acquisition

According to Article 33, Decree No. 69/2009/NĐ-CP dated August 13, 2009 by the Government regarding to the supplementation of land using planning, land costs, land recovery, compensation, support and resettlement, the implementation of land acquisition compensation and resettlement belong to the Land Acquisition Component Project separated out from investment project and assigned to the provincial People's Committee where the project implemented independently.

The Project owner is responsible for securing to provide sufficiently and timely all the necessary documents (including the Resettlement Plan – RP), and project schedule, packages of each construction phase as well as capital distribution plan ensuring the implementation of land acquisition on schedule.

Funds for land acquisition and resettlement will be provided by the project owner and taken from the State budget.

After completion of land acquisition, the project owner will be handed over the ground plan by the Provincial People's Committee (PPC) for implementing work items.

1.4.3.2. Major Construction Methods

a. Site Preparation

Preparatory work is carried out for construction servicing. There are some main contents as follows:

- House demolitions, construction ground flattening: on the land recovered handed over by PPCs for construction, all perpetual works such as buildings, hydraulic structures will be demolished and flattened.
- Preparation of construction sites and access roads: including embankment activities, access roads, installation of work items at the site such as equipment maintenance stations and worker camps.

Site preparatory work will be completed before commencement of construction.

b. Canal Relocation

Before commencement of the construction, the project will make improvement the canals where the routes cross these sections (Figure 1.7).

– Canal relocation activities will be conducted and completed before the cultivating

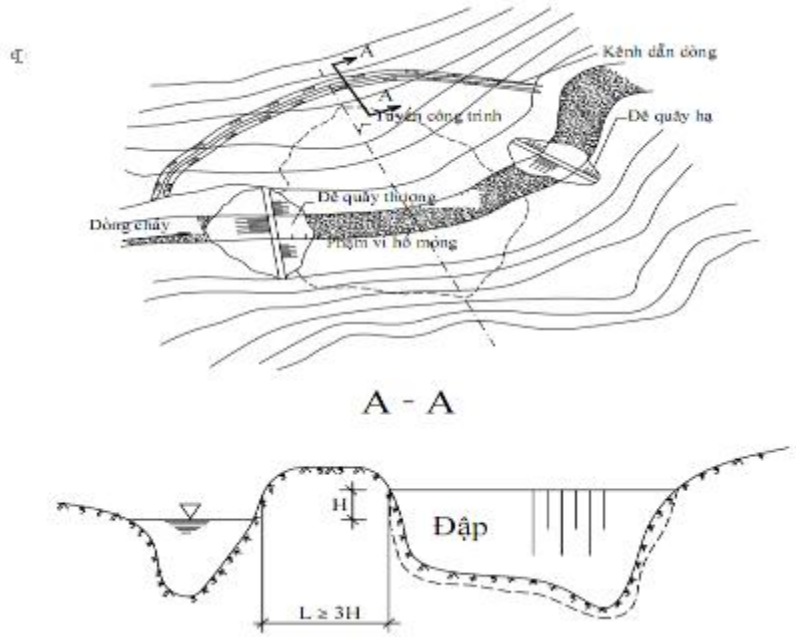
season;

– Feed temporary ditch from upstream to downstream will be conducted before constructing the cofferdam.

– After completing temporary ditches, irrigation from upstream to downstream the cofferdam will be constructed to create construction site;

– Construction of hydraulic works at the positions of the existing current. After completing all the construction at the existing current, the water flow will be returned to the original locations. Temporary ditches are rammed up and reverted the surface as current status.

Figure 1.7. Sketch of Canal Relocation Method



c. Construction of Road Sections and Intersections

c1. New Construction Sections

The route will be constructed as following steps:

– Construction of embankment: excavation and backfill of the embankment to elevation design by machines such as grabs, graders, compactors, rollers, etc. and soft soil treatment;

– Construction of pavement: construction of stabilized aggregate and tarred pavement by equipments such as rollers, asphalt distributors, watering cars and tilting cars.

c2. Road Sections of Pavement Replacement

Construction of road surface: execution of each side to secure traffic on NH38.

c. Construction of Bridges

c1. Construction of Substructure

c1.1. Construction of Abutment

Construction of abutment will be implemented in the following orders:

- Site leveling;
- Execution of pile system:
  - Bored pile: Locating the pile position, lowering the temporary casings; drilling holes; lowering the reinforcing cage; concreting bored pile; well casing sinking;
  - Reinforced concrete pile: Locating the pile position; shaking and lowering piles; consolidation;
- Construction of foundation pit: digging foundation pit; ship pile head; rip-rap, macadam; concreting;
- Construction abutment: erection of gallows, reinforcing, concreting;
- Execution of abutment body: erection of gallows, reinforcing, concreting;
- Finishing.

c1.2. Construction of Piers

The major construction methods for construction of piers are as follows:

- Site leveling:
  - Flatten construction ground;
  - Execution of prevented water cofferdam: making official roads; driving locating pile; erection of inside cribwork; driving steel sheet pile.
- Construction of boring pile systems: locating pile positions, well casing sinking , drilling hole; lowering reinforcing cage; concreting bored pile; extracting pile casing;
- Construction of foundation pit: digging foundation pit ; ship pile head; rip-rap, macadam; concreting;
- Construction of abutment base: erection of gallows, reinforcing, concreting; removal of formworks; land filling the foundation pit.
- Construction of abutment body: erection of form gallows, reinforcing, concreting;

– Completion: removal of formworks; land filling and finishing.

c2. Construction of Superstructure

c2.1. Construction of One-Span Bridge

The main steps for construction of one-span bridge include:

– Casting beams; preparation of vehicles and official roads behind abutment; moving the equipments to the right positions; moving beam span into official road behind abutment;

– Using girder vehicles, installing platforms , formwork installation; concreting;

– Construction of bridge deck, handrail, completion

c2.2. Construction of Multi-span Bridge:

The main steps for construction of multi-span bridge include:

– Casting beams; preparation of vehicles and official roads behind abutment; moving the equipments to the right positions; moving beam span into official road behind abutment;

– Moving crane boom to behind abutment position; using crane boom to install beams into the first position; installing platforms , forms; concreting;

– Preparation of official at the first position; moving the crane boom to new position; installing as steps mentioned above.

– Installing handrail, connection and completion.

d. Site Monitoring

The site monitoring includes settlement and horizontal displacement. These works are conducted from the beginning to ending when road surface structure is finished. After that, monitoring will be implemented only if required. Details of site monitoring is presented in Chapter 4, the prevention solutions to technical defects that cause collapse of construction works.

1.4.3.3. Work Volume

The total major volume of work - items of the project is presented in Table 1.7 and Table 1.8.

Table 1.7. Total Volume of Road Section and Intersection

TT	Items	Unit	Transition section TT. Binh Giang	Remaing transition section	The surface mat	Total
I	***Embankment***					
1	Land excavation	m^3	28,165	201,070	-	**229,235**
2	Existing pavement digging	m^3	-	886	-	**886**
3	backfilling	m^3	94,780	148,123	-	**242,904**
II	***Soft land treatment***	m^3				
1	Land changing	m^3	-	-	-	-
2	Backfilling	m^3	-	679,404	-	**679,404**
3	Geotextile fabric	m^2	-	342,951	-	**342,951**
5	Vertical artificial drain	m	-	-	-	-
III	***Pavement***					
1	AC surface course	m^2	3,190	185,599	295,200	**188,789**
3	AC binder course	m^2	3,536	188,130	295,200	**191,667**
5	Crushed stone aggregate class I	m^3	3,996	28,523	-	**32,519**
6	Crushed stone aggregate class II	m^3	6,840	35,629	-	**42,469**
IV	***Sewer***					
1	Circular sewer	m	-	267	-	**267**
2	Box culvert	m	-	44	-	**44**

Table 1.8. The Total Volume of Bridge Works

TT	Item	Unit	Sat	Tranh 1	Tranh 2	Bun	Dia	Tinh
1	Excavation	m^3	2,368	1,788	1,232	1,677	2,008	1,478
2	Backfill	m^3	2,660	2,610	3,668	4,211	1,800	3,228
3	Concrete	m^3	3,771	2,295	1,190	1,598	737	1,120
4	Reinforcing	*ton*	483	299	295	168	179	241
5	Block stone	m^3	597	172	266	691	413	543
6	Crushed stone	m^3	80	23	36	92	48	72
6	Reinforced concrete pile	*m*	-	-	2,480	-	1,920	1,984
7	Bored pile D = 1m	*m*	1,598	610	-	700	-	-
9	Bored pile D = 1,5m	*m*	-	272	-	-	-	-

1.4.4. List of Machines and Equipment

The main machines and equipment estimated to be used in construction of the routes, intersections, and bridge are presented in Table 1.9 and 1.10.

Table 1.9. Machines and Equipments for Road Works

TT	Machines and equipments for construction	Unit	Transition section TT. Binh Giang	Remaining transition section	The surface of mat	Total
I	***Machines and equipments for construction***	***shift***	***11,928***	***42,012***	***1.715***	***53,940***
1	Excavator 1,25m^3	Shift	226	795	-	**1,021**
2	Grader 110CV	Shift	654	2,301	-	**2,955**
3	Bladder 110CV	Shift	25	83	-	**108**
4	Roller 16T	Shift	1,224	4,312	-	**5,536**
5	Hammering machine	Shift	837	2,945	-	**3,782**
6	Spreader 130CV ÷ 140CV	Shift	87	310	-	**397**
7	Steel wheel roller 10T	Shift	293	1,033	-	**1,326**
8	Asphalt distributors 7T	Shift	161	568	752	**729**
9	Spreader 50 ÷ 60m^3/h	Shift	32	115	-	**147**
10	Roller 25T	Shift	96	338	-	**434**
11	water sprinkler 5m^3	Shift	96	338	402	**434**
12	Stamping machine 9T	Shift	6	20	-	**26**
13	Air compressor	Shift	81	282	-	**363**
14	Automobile 7T	Shift	1,182	4,165	109	**5,347**
15	Automobile 10T	Shift	6,928	24,407	452	**31,335**

Table 1.10. Machines and Equipments for Bridge Construction

TT	Machines and equipments for construction	Unit	Name of Bridge					
			Sat	Tranh 1	Tranh 2	Bun	Dia	Tinh
I	***Machines and equipments***	***Shift***	***1,310***	**945**	**881**	**1,110**	**683**	**871**
1	Pump BT 50m^3/h	Shift	205	148	142	174	107	132
2	Excavator 1,25m^3	Shift	21	15	14	18	11	14
3	Grader 110 CV	Shift	27	19	18	23	14	18
4	Mixer automobile 6m^3	Shift	113	82	76	96	59	76
5	Hoist 10T	Shift	56	40	38	47	29	38
6	Hoist 16T	Shift	134	97	90	114	70	90

TT	Machines and equipments for construction	Unit	Name of Bridge					
			Sat	Tranh 1	Tranh 2	Bun	Dia	Tinh
7	Hoist 25T	Shift	238	172	160	202	124	160
8	Air compressor $10m^3$/ph	Shift	21	15	14	18	11	14
9	Spreader 130 ÷ 140T	Shift	3	2	2	3	2	2
10	Steel wheel roller 10T	Shift	6	4	4	5	3	4
11	Rubber -tired roller 16T	Shift	33	24	22	28	17	22
12	Pile driver	Shift	366	264	246	310	191	246
13	Asphalt distributors 7T	Shift	3	2	2	3	2	2
14	Spreader 50 ÷ $60m^3$/h	Shift	3	2	2	3	2	2
15	Roller 25T	Shift	3	2	2	3	2	2
16	Watering car $5m^3$	Shift	3	2	2	3	2	2
17	Bladder 110CV	Shift	3	2	2	3	2	2
18	Excavator <= $1,25m^3$	Shift	9	6	6	8	5	6
19	Air compressor $1200m^3$/h	Shift	18	13	12	15	9	12
20	Tug	Shift	5	5	-	-	-	-
21	Automobile 10T	Shift	40	29	27	34	21	27

1.4.5. Input Fuel and Material

The volume of main construction materials corresponding to the route, intersection, and bridge items are presented in Table 1.12 and 1.13 mentioned above.

1.4.6. Progress of Project Implementation

The project is estimated to be commenced by 2015 with a construction period of 2 years. The time estimated to be constructed each work – items of the project is presented in Table 1.11.

Table 1.11. Estimated progress for Implementing Work – Items

Item	First year												Second year											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Preparation																								
Road section																								
Sat bridge																								
Remaining bridge																								

1.4.7. Investment Capital

The total investment cost of the project presented in Table 1.12.

Table 1.12. The Total Investment Cost of the Project

TT	Item	Cost (VND)
I	***Total construction work investment cost***	***911,976,139,375***
1	Construction cost	487,532,035,948
2	Land acquisition cost	143,946,690,362
3	Cost of QLDA, TVDT, other expenses	48,753,203,595
4	Earmark	231,744,209,470
II	***Environment cost***	***2,528,494,150***
1	Cost for Independent Monitoring Consultant	286,650,000
2	Cost for monitoring program implementation	1,268,781,045
3	Cost for capability building and training	73,000,000
4	Cost for the environmental treatment facilities	670,200,000
5	Contingency (10%)	229,863,105

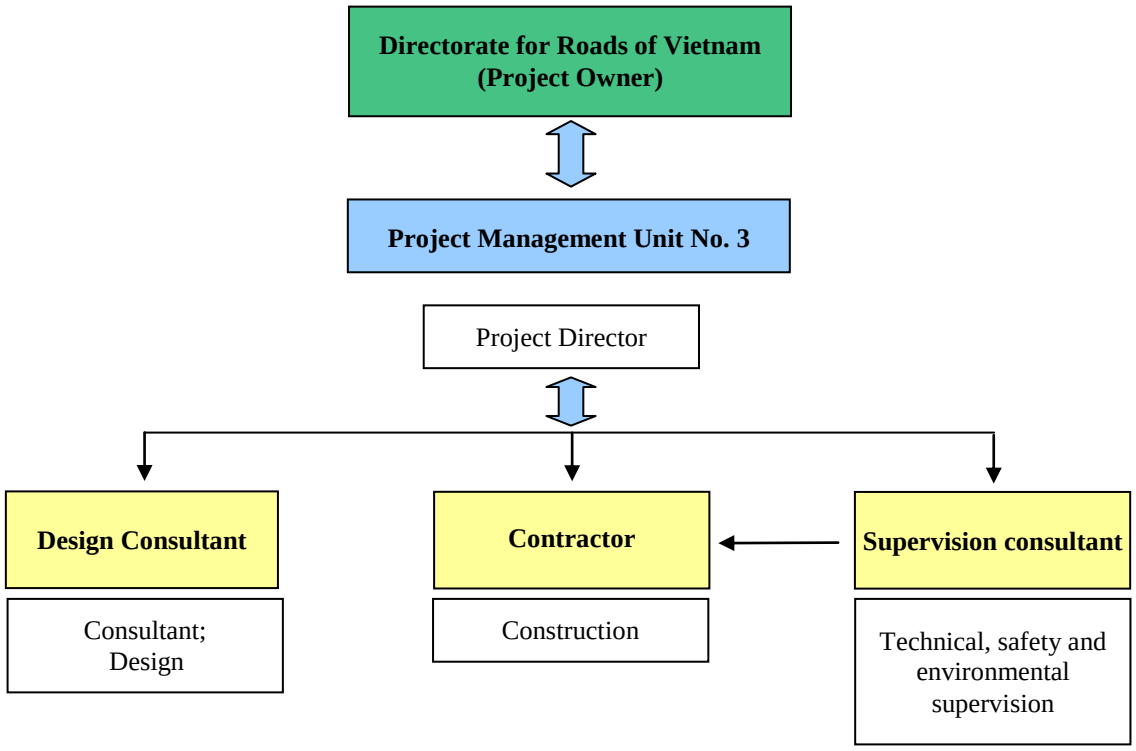
1.4.8. Project Management and Implementation

1.4.8.1. Management and Implementation

- Employer (Project owner): Directorate for Roads of Vietnam
- Project management : Project Management Unit No 3
- Project compiled by Consultant

Project organizational and management chart are presented in Figure 1.8.

Figure 1.8. Project Organizational and Management Chart



1.4.8.2. Implementation Procedure

a. Preparation of investment

The DRVN compiles Investment Project, the whole plan for compensation, aid and resettlement along with the assistance of consultant agency and submits to MOT for approval; prepares EIA Report at the same time to submit to the Ministry of Natural Resource and Environment (MONRE) for approval with support from consultancy of Sustainable Development Community Support Center. On that basis, submitting to Hai Duong People's Committee and Hung Yen People's Committee for providing land to develop investment activities of the project.

b. Investment Implementation

After having investment decision, the project owner will proceed with detailed design with assistance from the design consultant. For the environmental aspect, the project owner will prepare an EMP with assistance of environmental experts. The EMP includes specific mitigation measures and design of environmental treatment works mentioned in the project EIA Report that will be approved by MONRE. The EMP also includes environmental specifications to serve as basis for the contractors to develop their site specific environmental management plans (in accordance with the respective

bidding package). Compensation and resettlement activities which no longer belong to the Project, will be divided into small subprojects to be implemented by People's Committee of districts under the direct guideline of Hai Duong People's Committee and Hung yen People's Committee. The project owner is responsible for providing sufficiently expenditures for compensation, aid, and resettlement.

During construction, executing units or contractors have to implement all environmental protection methods. The project owner will supervise implementation of environmental protection measures by construction units/contractors and will hire environmental consultant to carry out all the environmental monitoring. Results of environmental monitoring will be periodically reported to the Departments of Natural Resources and Environment of Hai Duong and Hung Yen Provinces.

c. After Construction

Upon completion of construction, the project owner will hand over the project work to the investment decision agency, the MOT.

Environmental quality monitoring during guarantee period will be conducted by the road exploitation unit, and expenses will be taken from the project fund. The supervision and monitoring results will be periodically reported to MOT and the Departments of Natural Resources and Environment of Hai Duong and Hung Yen provinces once per six months.

CHAPTER 2. NATURAL ENVIRONMENTAL & SOCIO-ECONOMIC CONDITIONS OF THE PROJECT AREA

2.1 Natural Environmental Conditions

2.1.1. Geographical and Geological Conditions

2.1.1.1. Geographical and Conditions

In terms of nature, the project is located in an area with alluvial plain terrains, bearing characteristics of the Red River Delta. The topography of the project area is relatively flat, sloping gradually towards northwest - southeast; the terrain elevation varies from -2m (Ke Sat River) to +4m (dyke bank). The topographic surface is divided by a dense system of rivers, irrigation ditches and canals, and the flood prevention dyke at Sat river.

In terms of humanity, the project area is located in the land area of 14 communes/towns of Hai Duong and Hung Yen provinces, including Minh Duc commune (My Hao district, Hung Yen province); the communes of Hung Thinh, Vinh Tuy , Vinh Hong, Trang Liet, Thuc Khang (Binh Giang district, Hai Duong province), Phu Ung Bai Say, Tan Phuc, Quang Vinh, Thi An town, Quang Lang (An Thi district, Hung Yen province), Nghia Dan, Toan Thang (Kim Dong district, Hung Yen province).

The people cluster in villages along the roads. Population density is high in the towns and low in the agricultural regions. Economic activities vary from agricultural activities, which play a key role, to industrial activities and trade and services, which are focused in Binh Giang district. Some households located adjacent to the roads and in the center of towns have income from small business and trading.

Screening impacts : Due to higher embankment than the farmland along the route, the project could create division of land, which reduces local drainage capacity run off flow to the surrounding areas. This issue will be determined during the design process to provide an adequate drainage system and avoid local flooding situations.

2.1.1.2. *Geological Conditions*

Based on the geological survey records, the road foundation of the project belonging to the rehabilitation of NH38, section from km 22 +500 - km 66 +455 (under the Road Network Improvement Project - WB4) located in 2 provinces Hai Duong and Hung Yen which was established in 2006 and geological Survey Records of Bun Bridge - NH38 and Sat Bridge - NH38 of the same above mentioned project. The key features of the regional geological conditions are as follows:

The stratum features is the soft soil layer interspersed with discrete dust layers, in some places may have hard covers. The soft soil is unevenly distributed in both area and depth. Regional stratigraphy consists of 6 layers:

- Layer 1: Top soil, low plastic clay, moderate stiff, thickness 0.7 - 2,4m;
- Layer 2: Low plastic clay, moderate stiff, 0.5 - 4.1 m thick;
- Layer 3: Low plastic clay, very soft to soft, thickness 2 - 6.2m, pretty extensive distribution and discontinuously;
- Layer 4: Dust sand, discrete, large thickness;
- Layer 5: Low plastic clay, very soft to soft, unidentified thickness, concentrates in the beginning point mainly;
- Layer 6: Low plastic clay, moderate stiff, thickness is not identified.

Thus, the popular formation in the roject area is the Quaternary sediments originated from rivers, lakes, swamps with ingredients mostly being clay, sandy clay, clay sand and sandy dust, etc. in which, the soil layers located near the surface have low bearing capacity, high distortion, compression of large settlements, not suitable for construction. The remaining layers are basically suitable for construction.

Screening impacts : The process of road construction requires removal of surface soft soil layers and supplement of strengthening measures to ensure sustainable stability of works. The depth of stripped off topsoil layers will determine the amount of soil to be excavated, the quantity of transport vehicles, and the required capacity of the disposal sites, etc. and the impacts on the environment.

2.1.1.3. Hydrogeological Conditions

The groundwater in the project area is mainly located in two aquifers: Holocene (qh) and Pleistocene (qp). The water reserve is substantial and is a clean water source for domestic use of the provinces and the project Area.

- Holocene water-bearing complex: This is a water-rich aquifer and is widely distributed in the project area. The main lithological composition consists of a sand composite, clay composite, clay loam, organic silt, and plant dust mixed organic sand. The depth to the surface is from 2m to 4m or more shallow in some places; it is even close to the surface aquifer. The main sources of recharge are from rainwater, surface water, and partly from irrigation water. Water from this aquifer discharges to rivers, lakes, ponds, and freshwater areas or seeps into the lower aquifer; a small amount is evaporated or absorbed by plants. Today, people in the

project area use tubewells to get water primarily from this aquifer. Tubewell water often has high iron content.

- Early to late Pleistocene water-bearing complex: these are water-rich complexes and are widely distributed in the project area. The fluctuation of water yield is influenced by geographical conditions, climate, and level of exploitation. The water recharge for this aquifer is rainwater, surface water, water from irrigation, and water from Holocene water complex. The water-bearing complex flow discharges into rivers, lakes, and ponds. The major groundwater aquifers are generated from this water-bearing complex. According to the Electronic Information Page of Hung Yen, "Hung Yen has a huge groundwater mines, especially in areas along NH5 from Nhu Quynh to Quan Goi, which not only satisfy the requirements of industrial development and urban life of people in the province, but also provide large quantities for the neighborhood areas". However, these water mines are not detected in the project area.

Screening impacts: Shallow groundwater aquifer can be affected by polluted surface water in the bridge construction process at the abutments and piers using bored piling method.

2.1.2. Meteorological Conditions

2.1.2.1. Features of Meteorological Conditions

The project area is located in the Northern Delta climate zone with cold and little rain winters and hot humid rainy summers.

Below is the analysis of meteorological characteristics based on the project area statistics of Hung Yen and Hai Duong Meteorological stations in 05 years time (2007 - 2011).

- *Temperature (Table 2.1 and Figure 2.1)*: The average annual temperature is about 23.8°C. The mid-winter months (December - March) pretty cold, the temperature drops below 20°C. The coldest month is January (15.2 – 15.3°C). In 4 early months and middle of summer (May - August) the average temperature exceeds 26°C. The hottest month is July (29.7 – 29.9°C). Fluctuation value in temperature between night-time and day-time is about 5 - 6°C.

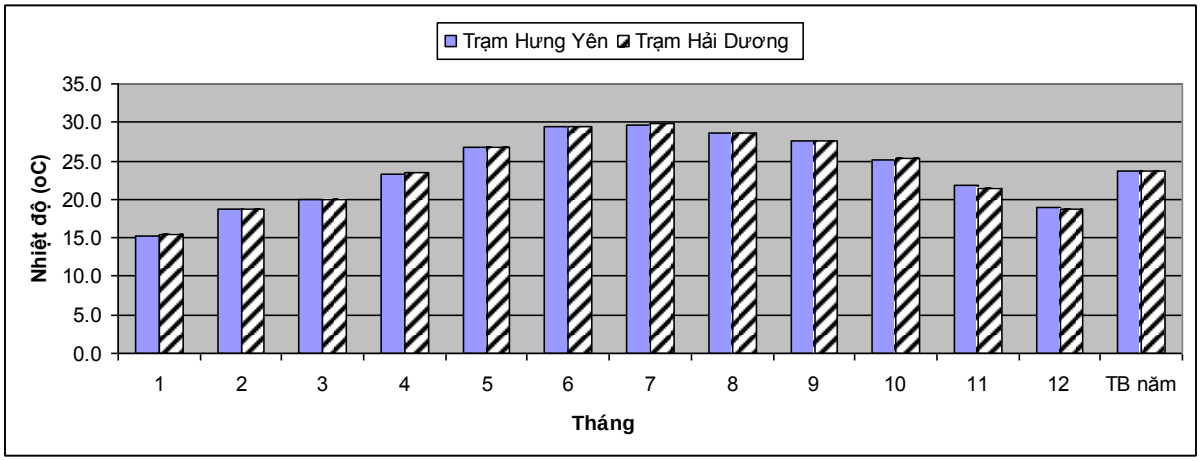
Table 2.1. Temperature Features (^{o}C)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Hai Duong Station													
Year 2007	16.5	21.4	20.8	22.8	26.6	30.0	30.0	28.6	26.7	25.3	20.4	19.4	24.0

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Year 2008	14.7	13.3	20.7	24.1	26.5	28.0	29.2	28.5	27.6	26.3	21.0	19.3	23.3
Year 2009	15.4	21.1	20.5	23.8	26.4	29.8	29.4	29.2	28.1	26.2	21.1	19.4	24.2
Year 2010	17.7	20.2	21.1	23.1	27.8	30.1	30.3	27.9	28.1	24.9	21.6	19.1	24.3
Year 2011	12.4	17.5	16.9	23.3	26.5	29.1	30.5	28.8	27.1	24.1	23.4	16.9	23.0
TB	**15.3**	**18.7**	**20.0**	**23.4**	**26.8**	**29.4**	**29.9**	**28.6**	**27.5**	**25.4**	**21.5**	**18.8**	**23.8**
Hung Yen Station													
Year 2007	16.3	21.2	20.7	22.8	26.5	29.8	30.0	28.5	26.6	25.1	20.4	20.0	24.0
Year 2008	14.6	13.2	20.5	24.0	26.8	28.0	29.0	28.5	27.5	26.0	20.9	19.7	23.2
Year 2009	15.3	21.9	20.5	23.8	25.6	29.8	29.3	29.2	28.2	26.0	21.1	19.4	24.2
Year 2010	17.5	20.3	21.3	23.0	28.2	30.4	30.5	28.2	28.2	24.8	23.2	19.1	24.6
Year 2011	12.4	17.3	16.6	23.1	26.5	29.1	29.5	28.7	27.0	24.0	23.3	16.9	22.9
TB	**15.2**	**18.8**	**19.9**	**23.3**	**26.7**	**29.4**	**29.7**	**28.6**	**27.5**	**25.2**	**21.8**	**19.0**	**23.8**

Source: Hung Yen and Hai Duong meteorological stations(2007 - 2011)

Figure 2.1. Temperature Regime Chart



Air temperature directly affects the diffusion and metabolism of pollutants in the atmosphere. The higher temperature, the greater rate of chemical reaction in the atmosphere, and the shorter time of pollutant storing in the atmosphere.

– *Humidity (Table 2.2, Figure 2.2):* The average annual humidity is high (82 - 83%). The wettest period is from February to April. The spring has an average humidity of 88 - 90%. The dry period is only within 2 months (November to January next year).

Table 2.2. Humidity Regime

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Average
Hai Duong Station													
Year 2007	73	86	91	85	83	82	82	87	86	81	73	81	83
Year 2008	82	74	85	87	85	85	82	84	87	83	77	80	83

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Average
Year 2009	75	90	87	87	85	83	82	85	86	81	71	79	83
Year 2010	86	84	84	88	86	78	80	88	85	75	74	77	82
Year 2011	71	83	83	85	82	84	83	83	84	83	81	71	81
Average	**77**	**83**	**86**	**86**	**84**	**82**	**82**	**85**	**86**	**81**	**75**	**78**	**82**
Hung Yen Station													
Year 2007	68	83	86	83	84	79	81	87	86	84	75	83	82
Year 2008	83	76	87	88	83	86	82	87	87	84	80	78	83
Year 2009	77	90	88	89	87	82	85	85	86	82	72	82	84
Year 2010	88	86	84	89	86	79	83	88	86	76	74	81	83
Year 2011	75	88	87	88	84	85	83	84	87	86	83	73	84
Average	**78**	**85**	**86**	**87**	**85**	**82**	**83**	**86**	**86**	**82**	**77**	**79**	**83**

Source: Hung Yen and Hai Duong meteorological stations(2007 - 2011)

Air humidity is a factor that influences the metabolism of the air pollutants and microclimatic factors affecting human health.

– *Rain (Table 2.3, Figure 2.2):* The annual average rainfall in the area is pretty large, (998 – 1,234mm). The rainy season lasts for 5 months (from May to September). The months with maximum rainfall are June and September with an average rainfall higher than 180mm. The seasons with little rainfall start in December and end in April. The months of minimum rainfall is December with an average rainfall of about 9mm.

Table 2.3. Rainfall Features

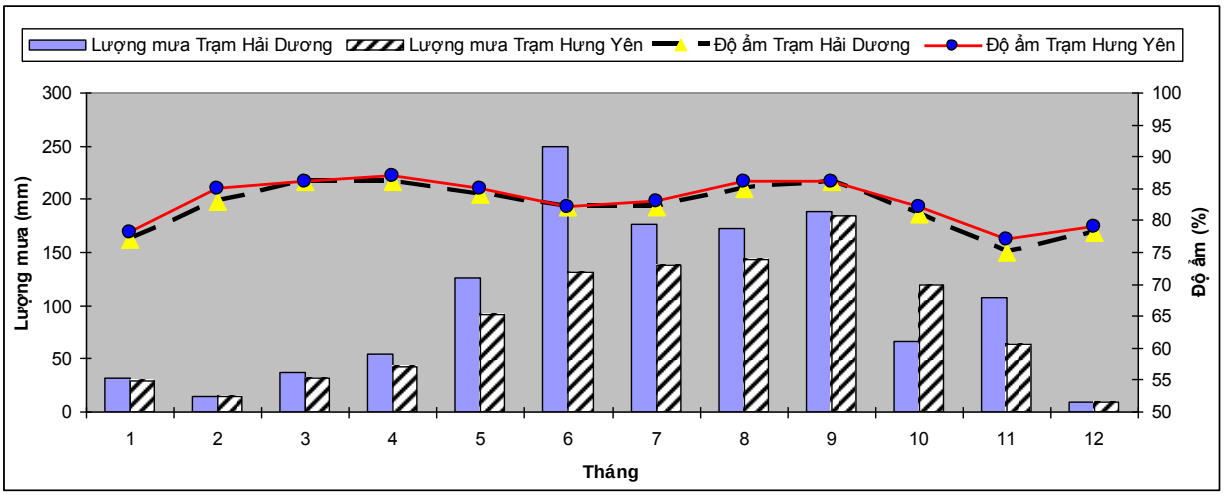
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Average
Hai Duong Station													
Year 2007	1	29	40	62	202	219	147	130	229	124	11	9	1,203
Year 2008	41	20	26	72	178	354	178	271	313	21	408	7	1,889
Year 2009	1	1	29	23	1	2	75	26	10	94	7	9	278
Year 2010	115	7	4	73	140	169	179	277	148	16	58	6	1,192
Year 2011	4	11	86	46	111	499	302	163	242	73	54	16	1,607
Average	**32**	**14**	**37**	**55**	**126**	**249**	**176**	**173**	**188**	**66**	**108**	**9**	**1,234**

Hung Yen Station													
Year 2007	1	34	35	65	145	107	158	184	251	173	13	10	1,176
Year 2008	40	15	37	33	100	304	218	222	311	238	190	8	1,716
Year 2009	5	1	24	17	2	6	77	32	10	98	6	9	287
Year 2010	95	9	7	39	80	87	95	177	68	36	71	7	771
Year 2011	4	15	59	61	130	149	141	101	279	50	40	11	1,040
Average	**29**	**15**	**32**	**43**	**91**	**131**	**138**	**143**	**184**	**119**	**64**	**9**	**998**

Source: Hung Yen and Hai Duong meteorological stations(2007 - 2011)

Rain help purify and dilute the pollutants in ambient air. Rain also creates runoff water sweeping away substances down to water sources. Evaporation carries some smelly substances into the air

Figure 2.2. Rainfall and Humidity Chart



– *Wind and wind direction (Table 2.4)*: the prevailing wind direction in winter is N and N-E with the average wind speed of 2.4 m/s (Hai Duong and 1.8m/ (Hung Yen); in summer, they are S and S-E with the average speed of 2.4 m/s (Hai Duong and 1.5m/ (Hung Yen).

Table 2.4. Wind Features

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Hai Duong	2.5	2.5	2.3	2.4	2.5	2.5	2.6	2.1	2.0	2.3	2.3	2.3	**2.4**
Hung Yen	1.8	1.9	1.7	1.8	1.8	1.6	1.6	1.4	1.5	1.6	1.6	1.6	**1.7**

Source: Hung Yen and Hai Duong meteorological stations(2007 - 2011)

Wind is the most important factor that impacts on the spread of pollutants in the air. The higher the wind speed, the further pollutants are transported away and the smaller the concentrations of pollutants because toxic gas is diluted with clean air. In contrast, with the low wind speed or windless, pollutants will concentrate near sources of waste.

– *Atmospheric stability:* Atmospheric stability in the project area is defined as class B (average instability) during the day, based on the average wind speed (table 2.4) and solar radiation during the day and cloud cover at night by Pasquill classification (table 2.5).

Table 2.5. Atmospheric Stability Classification (Pasquill, 1961)

Wind speed at 10m height (m/s)	In daytime by solar radiation			In night time by cloud cover	
	Strong ($h_o > 60^o$)	Moderate ($h_o = 35^o \div 60^o$)	Light ($h_o = 15^o \div 35^o$)	Cloudy, cloud cover> 4/8	Few cloud, cloud cover <4/8
< 2	A	A-B	B-C	-	-
2	A-B	B	C	E	F
3-4	B	B-C	C	D	E
5-6	C	C-D	D	D	D
>6	C	D	D	D	D

Note:

A: very unstable. *D: neutral.* *h_o: solar angle.*

B: unstable. *E: slightly stable.*

C: slightly unstable. *F: stable.*

Atmospheric stability decides the possibility to raise pollutants high.

2.1.3. Hydrological Conditions and Erosion State

2.1.3.1. Hydrological Features along the Project Route

The project area is affected by the hydrological regime of the Ke Sat River (also called Sat River). Along the river is a system of flood prevention dykes, which create two different hydrological regimes, the river hydrological regime and the in-field hydrological regime. During flood seasons, large and prolonged floods if coinciding with heavy rains in the plains will cause major flooding in the in-field areas. However, if river floods do not occur simultaneously with the in-field rain, there will be drought in the field area but flood in the river and vice versa.

The in-field canal and ditch system gets river water through gate culverts, so that drainage in the rainy season mostly by force and self draining to the river through the

culverts below the dikes when the river water level is low. Thus, except Sat Bridge position crossing Ke Sat River, the remaining water level is the in-field flooding water level.

The water level along the project route is presented in Table 2.6.

Table 2.6. Water Level along the Project Route

No	Location/Station	$H_{4\%}$ (m)	Notes
1	Km22+908	3.24	National Elevation System
2	Km24+390	3.14	
3	Km46+633	2.69	
4	Km49+920	2.63	
5	Km52+416.38	2.73	

2.1.3.2. Ke Sat River Hydrology

Ke Sat River is a 35 km flowing river in the east of Hung Yen province, linking between the Sinh river (Hai Duong) at the last section of Cuu An River. The section in Hung Yen is 20km, from Thinh Van (My Hao) to Tong Hoa (Phu Cu). Sat River flows parallel to the Red River, making Hung Yen province to have three sides of river. This is a major tributary of the Bac Hung Hai system, providing irrigation water for Hai Duong and Hung Yen provinces.

Yearly, the flow can be distinguished into two relative clear periods, the flood season and dry season, corresponding to two rainy period and less rain period. The flood season lasts about 5 months (starting in June and ending in October), and the dry season in the remaining months (from November to May the following year). The flow distribution is irregular with flood water usually accounts for most of the year. The rainfall in July to September is usually very large accounting for about 75 - 77% of the water in the entire year.

The entire irrigation system in the region is controlled by Bac Hung Hai irrigation gate. In 2004, Hung Yen and Hai Duong provinces were severely flooded due to the fact that the Bac Hung Hai irrigation system has not met the requirements of flood control. Sat River flood water level corresponding to a frequency of 1% is H1% = 3.33 m with a maximum flow rate $Q_{max} = 87m^3/s$.

Hydrological regime and flood status at Sat Bridge construction site is characterized as follows:

Flood frequency 1%	3.33m
Flood frequency 2%	3.19m

Flood frequency 4%	3.04m
Flood frequency 5%	2.98m
Flood frequency 10%	2.81m
Maximum flow (corresponding to floods)	$87m^3/s$

Screening impacts: Construction of bridge piers in the flow is likely to affect waterway transportation activities on Sat River. Other rivers have no transportation activities, so there will not be impacts on transportation during construction of bridges crossing the rivers.

During construction, there will be the risk of water pollution at the bridge construction sites and the locations receiving waste water from the construction sites; Arrangement of piers inside the flows is likely to affect hydrologic and hydraulic regimes.

2.1.4. Current Quality and Components of Physical Environment

The elements of natural resources, environmental quality, and socio-economic factors in the project have been surveyed, measured, and analyzed. The environmental survey chart of the project is presented in Figure 2.3.

2.1.4.1. Selection of Position, Parameter and Frequency for Measurement and Sampling

The locations for environmental quality survey in the project area were selected on the basis of:

- Selected locations represent the current environmental status of the area;
- Characteristics of waste emission sources;
- Vulnerable characteristics of the receiving objects.

Summary of measurement locations is presented in Table 2.7, in which:

- Ambient air quality was measured at 03 locations. Measured parameters include: Dust (TSP and PM_{10}) emissions (SO_2, NO_2, CO) and the micro-climate factors (temperature, humidity, wind speed, wind direction and pressure). Frequency of measurement includes: continuous for 16 hours, from 6:00 to 22:00, measuring one time per every 2-hour.
- Noise level was measured at 05 points coinciding with the locations for ambient air quality measurement. Measured parameters are: Leq. Frequency of measurement: 16 continuous hours, from 6:00 to 22:00, measuring 1 time per one hour, each time measures 3 campaigns.

- Vibration level was measured in 05 locations, coinciding with the locations for noise level measurement. Measured parameter inludes: Acceleration. Frequency of measurement is: continuous for 16 hours (from 6:00 to 22:00), measuring one time per every hour, each time measures 3 campaigns.
- Quality of surface water was measured, sampled at Sat Bridge (Km0+529), Tranh Bridge 1 (Km4+400), Bun Bridge (Km46+633), Dia Bridge (Km49+920), Tinh Bridge (Km52+360). In each river, water is taken from a cross-section, a hydro unit, and a water layer and once a day. Measured and analyzed parameters include: temperature, pH, turbidity, DO , TSS, oil, Coliform, E. coli (8 parameters).
- Sediments were sampled in the same locations for sampling the surface water. Analyzed parameters are: heavy metals (Cu, Pb, Zn, Cd, As). Frequency of sampling inlcudes: At each location, samples were taken once per each point.
- Groundwater quality was measured, sampled at 05 points which are well positions in residential areas. Measured and analyzed parameters include: temperature, pH, turbidity, DO, hardness ($CaCO_3$), TS, Fe, As, Coliform and E. coli (10 parameters). Frequency of sampling is: At each location, samples were taken once per each point.
- Quality of the soil for grain analysis: sampled at 05 points which are agricultural lands along the route. Analyzed parameters include: heavy metals (Cu, Pb, Zn, Cd, As). Frequency of sampling is: At each location, samples were taken once.

Table 2.7 presents the locations for measuring and surveying the environmental quality and current state at the time of measurement at the time of measurement:

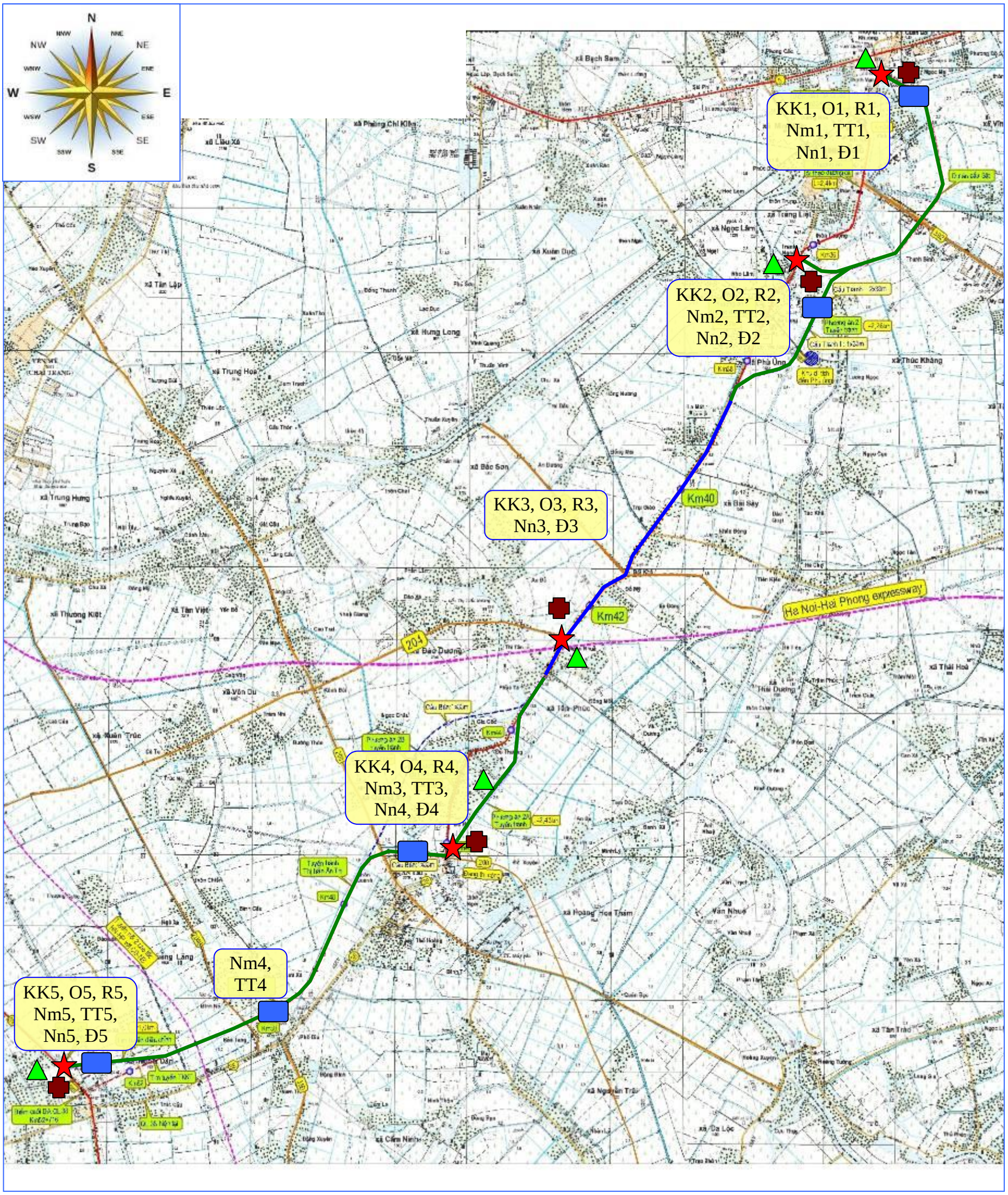
Table 2.7. Locations for Environmental Quality Survey

Location	Symbol	Coordinate	Weather	Time	Traffic and socio-economic features
I. Air, noise and vibration					
Beginning point	KK1 O1; R1	20°55'15,09"N; 106° 9'11,75"E	Sunny	Jan.2013	Approach roads at NH5 flyover. The inhabitants scattered, mainly concentrated at the intersection between NH5 and NH38.
Ending point of the Binh Giang Bypass	KK2 O2, R2	20°53'51,46"N; 106° 8'29,65"E	Sunny	Jan.2013	NH38 is asphalt paved, 5 - 6 meters wide, good quality. Traffic is not great and mainly are cars, buses and trucks carrying materials.

Location		Symbol	Coordinate	Weather	Time	Traffic and socio-economic features
PR204		KK3 O3, R3	20°50'59,94"N; 106° 6'36,27"E	Sunny	Jan.2013	NH38, asphalt pavement, road deterioration, many potholes, large vehicle traffic. Around the intersection are residential areas and paddy fields.
Quang Vinh Commune Residential Area (Km46+200)		KK4 O4; R4	20°49'16,89"N; 106° 5'38,21"E	Sunny	Jan.2013	NH38, asphalt pavement, road deterioration, many potholes, large vehicle traffic. Residents lives along NH38 running small business and trade. Traffic flow mainly include motorbikes and light trucks. Heavy trucks operate here at night time.
Ending point intersecting NH39 (Km52+716)		KK5 O5; R5	20°47'46,44"N; 106°2'30,14"E	Sunny	Jan.2013	NH39 is 11m wide, good quality road. Crowded residential on roadsides. Traffic volume includes all types including motorbikes, cars, buses and heavy trucks.
II. Surface Water and Sediment						
Sat Bridge	Centerline	Nm1; TT1	20°55'6,93"N; 106°9'29,22"E	Sunny	Jan.2013	River water is used for irrigation purposes. On the river, there is waterway transport activities.
Tranh Bridge 1	Centerline	Nm2; TT2	20°53'29,84"N; 106°8'39,22"E	Sunny	Jan.2013	River water is used for irrigation purposes. On the river, there is no waterway transport activities.
Bun Bridge	Centerline	Nm3; TT3	20°49'22,05"N; 106°5'23,52"E	Sunny	Jan.2013	River water is used for irrigation purposes. On the river, there is no waterway transport activities.
Dia Bridge	Centerline	Nm4; TT4	20°48'9,36"N; 106°4'13,60"E	Sunny	Jan.2013	River water is used for irrigation purposes. On the river, there is no waterway transport activities.
Tinh Bridge	Centerline	Nm5; TT5	20°47'46,50"N; 106°2'50,73"E	Sunny	Jan.2013	River water is used for irrigation purposes. On the

Location		Symbol	Coordinate	Weather	Time	Traffic and socio-economic features
						river, there is no waterway transport activities.
III. Soil and Groundwater						
Minh Duc Commune		Nn1, Đ1	20°55'16,57"N; 106°8'54,92"E	Sunny	Jan.2013	Bored wells, depth is 20 - 30m. Agricultural land, planting rice, two crops
Thuc Khang Commune		Nn2, Đ2	20°53'46,84"N; 106°8'24,17"E	Sunny	Jan.2013	
Tan Phuc Commune		Nn3, Đ3	20°50'59,94"N; 106° 6'36,28"E	Sunny	Jan.2013	
Quang Vinh Commune		Nn4, Đ4	20°49'44,56"N; 106°5'49,57"E	Sunny	Jan.2013	
Toan Thang Commune		Nn5, Đ5	20°47'46,44"N; 106°2'30,14"E	Sunny	Jan.2013	

Figure 2.3. Location Chart of Environmental Quality Survey



NOTES

- New construction
- Rehabilitation
- Air (KK), Noise (O), Vibration (R)
- Surface water (Nm), Sediment (TT)
- Groundwater NN)
- Soil (Đ)

2.1.4.2. Ambient Air Quality

a. Comparison Basis

QCVN 05:2009/BTNMT: National Technical Regulation on Ambient Air Quality.

b. Assessment

Measurement results are presented in table 2.8, illustrated in figure 2.4. Detailed results are presented in Appendix 3 – Results of Survey of Environmental Quality

Table 2.8. Measurement Results of Air Quality

Symbol	Location	Measurement period	Average value	Concentration (µg/m^3)				
				PM10	TSP	CO	NO_2	SO_2
KK1	Beginning point	Sept.2012	1h	142	186	1,917	51	80
			24h	125	166	1,670	45	70
KK2	Binh Giang bypass ending point	Sept.2012	1h	162	213	2,285	59	102
			24h	144	190	1,980	53	85
KK3	ĐT204	Sept.2012	1h	148	195	1,771	51	75
			24h	127	167	1,627	45	68
KK4	Residential area of Quang Vinh Commune	Sept.2012	1h	137	182	1,765	50	78
			24h	122	161	1,648	46	70
KK5	Ending point (intersecting with NH39)	Sept.2012	1h	191	255	2,547	66	102
			24h	166	221	2,218	59	92
QCVN 05:200Sept.BTNMT			**1h**	**-**	**300**	**30,000**	**200**	**350**
			24h	**150**	**200**	**-**	**100**	**125**

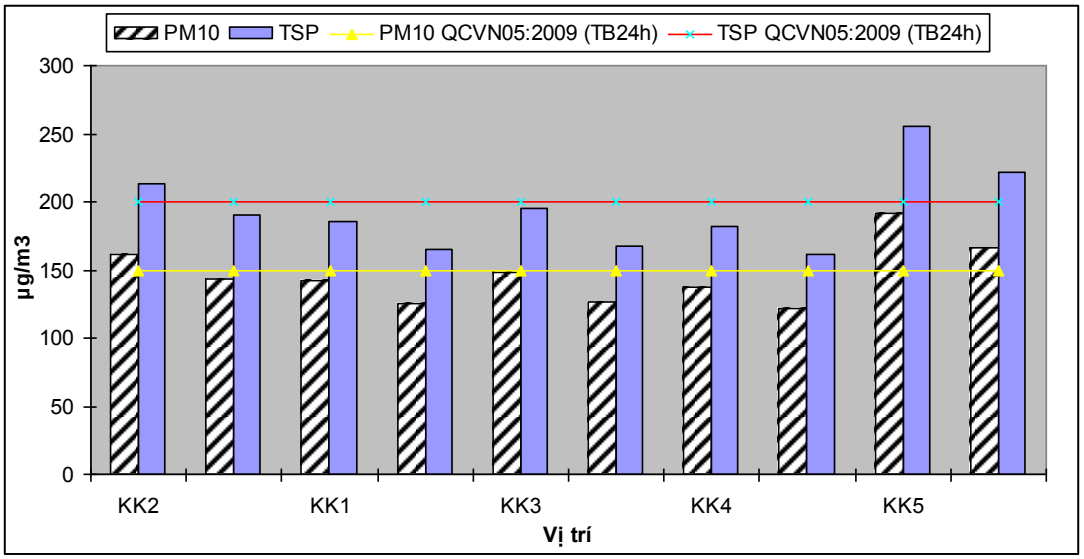
In comparison with QCVN 05:2009/BTNMT, it can be seen that:

- Total suspended particles (TSP) and PM_{10} dust: Except for the project ending point (intersecting NH39) with the dust concentration exceeding permissible limits 1.1 times; other locations are not polluted by dust.
- Concentration of exhausted gases (CO, SO_2, NO_2): lower than permissible limits many times.

c. Causes of Pollution

The causes of dust pollution in the intersection cutting NH39: traffic volume is quite large; on the other hand, at the time of monitoring, there is dirt on the road.

Figure 2.4. PM10 Dust and TSP in the Project Area



Impact screening: In case of absence of the project, environmental air quality along the project route and especially at intersections would be reduced due to increasing traffic flow.

During the project construction process, dust pollution may occur due to excavation and backfill activities, material transport and dust emissions arising from machinery, construction equipment and transportation. During the project operation dust pollution may be generated by exhausted gas emissions from vehicles operating on the road.

2.1.4.3. Noise Level

a. Comparison Basis

QCVN 26:2010/BTNMT: National Technical Regulation on Noise Level.

b. Assessment

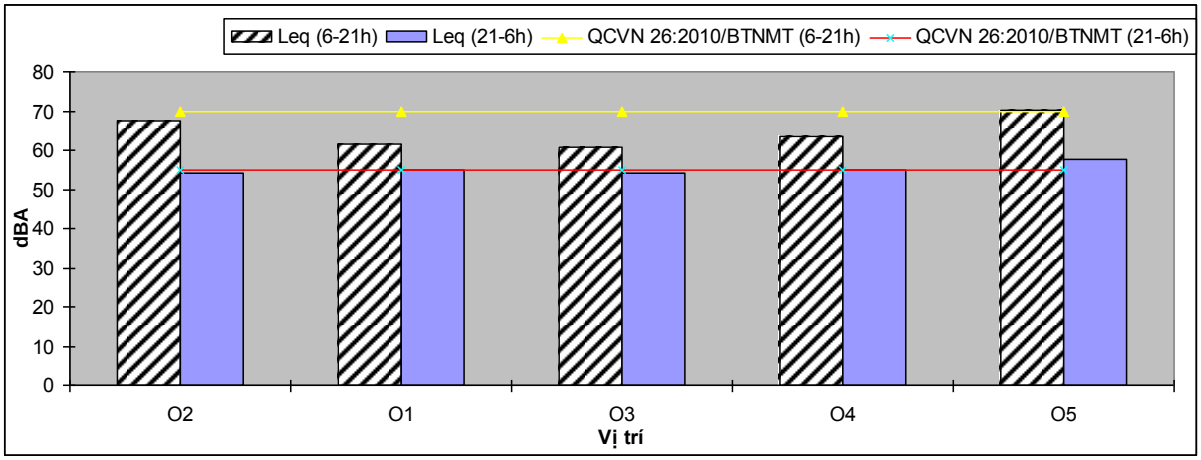
Measurement results are presented in table 2.9, illustrated in figure 2.5. Detailed results are presented in Appendix 3 - Results of survey of environmental quality.

Table 2.9. Measurement Results of Air Quality

Symbol	Location	Average value	Noise Level L_{eq} (dBA)
O1	Project beginning point	6:00 - 21:00	61.5
		21:00 - 6:00	54.9
O2	Binh Giang bypass ending point	6:00 - 21:00	67.5
		21:00 - 6:00	54.1

Symbol	Location	Average value	Noise Level L_{eq} (dBA)
O3	ĐT204	6:00 - 21:00	60.6
		21:00 - 6:00	54.2
O4	Residential area of Quang Vinh Commune	6:00 - 21:00	63.6
		21:00 - 6:00	54.8
O5	Project ending point (intersecting with NH39)	6:00 - 21:00	70.2
		21:00 - 6:00	57.7
QCVN26:2010/BTNMT		**6:00 - 21:00**	**70**
		21:00 - 6:00	**55**

Figure 2.5. Actual Noise Level in the Project Area



In comparison with QCVN26: 2010/BTNMT, it is appeared that partial noise pollution occured locally at the intersection with NH39. In the rest positions, noise level is less than permissible limits.

c. Causes of Pollution

The cause of noise pollution in the area is due to the area's traffic operation with high traffic flow along the raod and everyday economic activities of people in the region. Because the area is located on the national highway so that, at night time even though traffic flow is decreased but still exceeds the noise permissible limits.

(It is noted that at the time of the survey, there are a number of on-going construction projects in the project area such as Hanoi - Hai Phong Expressway project, construction of the road connecting Hanoi - Hai Phong Expressway and Cau Gie - Ninh Binh, and some of the rural road projects and local projects).

Screening impacts: In case of absence of the project, the noise level along the project route and especially at intersections would be increased due to increasing traffic flow and bad quality of the road.

During the project construction process, noise pollution may occur due to the operation of machinery and equipment. During the project operation noise pollution may appear due to vehicles running on the road.

2.1.4.4. Vibration Level

a. Comparison Basis

TCVN 7210:2002 - Vibration and collision. Vibration emitted by road traffic means. Maximum limits in the environment of public and residential areas.

b. Assessment

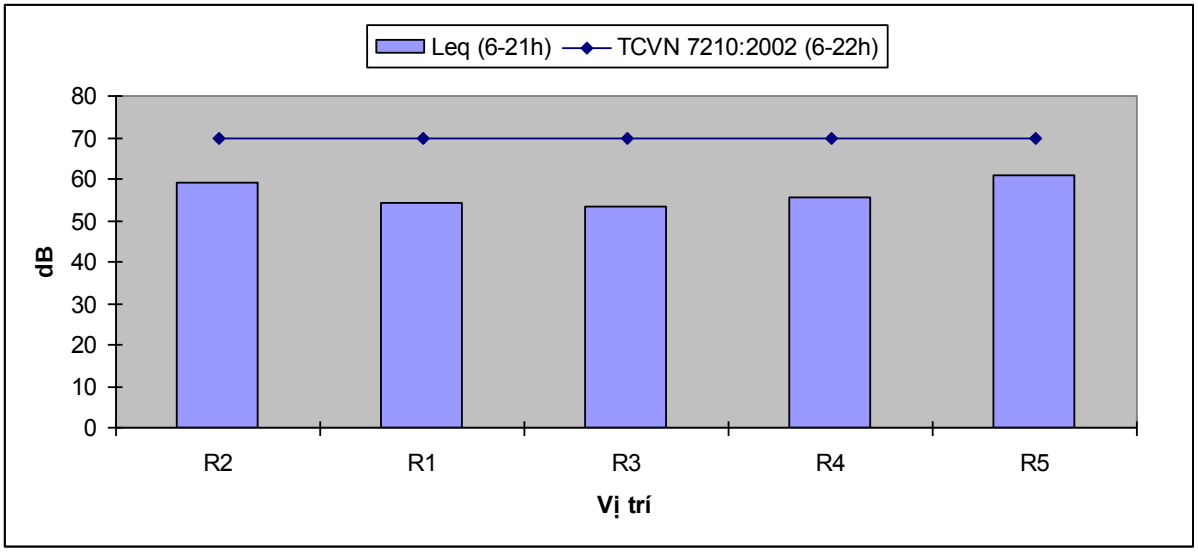
The measurement results are presented in table 2.10, illustrated in figure 2.6. The detailed results are presented in Appendix 3 – Results of survey of environmental quality.

Table 2.10. Measurement Results of Vibration Level (dB)

Symbol	Location	Average value	Vibration Level (L_{aeq})
R1	Project beginning point	6h - 22h	54.1
R2	Binh Giang bypass ending point	6h - 22h	59
R3	PR204	6h - 22h	53.4
R4	Residential area of Quang Vinh Commune	6h - 22h	55.6
R5	Project ending point (intersecting with NH39)	6h - 22h	61
TCVN7210:2002			**70**

Comparing with TCVN 7210:2002, the vibration level in the project area is lower than the permissible limits.

Figure 2.6. Actual Vibration Level in the Project Area



Screening impacts: In case of absence of the project, the vibration level along the project route and especially at intersections would be increased due to increasing traffic flow and bad quality of the road.

During the project construction process, vibration pollution may occur due to the operation of machinery and equipment. During the project operation vibration may appear due to the operation of vehicles on the road.

2.1.4.5. Surface Water Quality

a. Comparison Basis

QCVN 08/2008/BTNMT – National Technical Regulation on Surface Water Quality.

b. Assessment

The measurement and analysis results of surface water quality in the project area are presented in table 2.11 and Appendix 3 – Results of Survey of Environmental Quality.

Table 2.11. Analysis Results of Surface Water Quality

Location			Parameters							
			t°C	pH	Turbidity	DO	TSS	Oil	E. Coli	Total Coliform
Name of bridge	Name of river	Symbol	*°C*	-	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*MPN/100ml*	
Sat	Sat River	Nm 1	20.2	6.92	44	3.8	18	0.21	40	430
Tranh 1	Cuu An River	Nm 2	21.1	7.29	46	2.9	21	0.12	28	390

Location			Parameters							
			t°C	pH	Turbidity	DO	TSS	Oil	E. Coli	Total Coliform
Name of bridge	Name of river	Symbol	*°C*	-	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*MPN/100ml*	
Bun	Bun River	Nm 3	19.9	7.30	55	2.7	19	0.14	23	210
Dia	Quang Lang River	Nm 4	19.6	6.72	43	3.2	20	0.11	27	280
Tinh	Dien Bien River	Nm 5	20.1	6.71	44	2.9	19	0.16	35	330
QCVN 08:2009/ BTNMT		*B1*	*-*	*5.5-9*	*-*	*≥4*	*50*	*0.1*	*100*	*7,500*
		B2	*-*	*5.5-9*	*-*	*≥2*	*100*	*0.3*	*200*	*10,000*

Notes: QCVN08:2008/BTNMT - National Technical Regulation on Surface Water Quality;

Type B1: used for irrigation purposes or other uses require similar water quality purposes or used as type B2;

Type B2: transportation and other purposes with low quality water requirements.

In comparison with QCVN08:2008/BTNMT Class B1, it is seen that:

- For physio-chemical elements: pH, TSS are within the permissible limits. TSS contents in the positions are all within the permissible limits;
- For biochemical elements (DO): DO content at all positions only reached permissible limits type B2;
- For oil: Oil content at all positions only reached permissible limits type B2;
- For micro-organic elements (E.Coli, total coliform): .Coli and Coliform contents at all locations are less than the permissible limits.

Thus, the surface water quality in the rivers and canals in the project area meets the requirements of QCVN 08:2008/BTNMT class B1, except for incipient oil pollution.

c. Causes of Pollution

The socioeconomic activities in upstream of rivers and waterway activities (in Sat River and Dien Bien River) are the causes of oil pollution in the regional rivers.

Screening impacts : River water in the project area is used for irrigation purposes. The river water is under high pressure from the waste of economic activities and livelihoods in the region. With the presence of the project, the water and sediment in the river could be affected by increased suspended solids, oil and organic material arising from construction activities.

2.1.4.6. Groundwater Quality

a. Comparison Basis

QCVN 09:2008/BTNMT - National Technical Regulation on groundwater Quality.

b. Assessment

The measurement and analysis results of groundwater quality in the project area are presented in table 2.12 and Appendix 3 – Results of survey of environmental quality.

Table 2.12. Analysis Results of Groundwater Quality

No.	Parameter	Unit	Nn1	Nn2	Nn3	Nn4	Nn5	QCVN 09:2008 /BTNMT
1	Temperature	^oC	26.4	26.4	25.3	24.8	24.7	-
2	pH	-	5.71	6.69	5.77	6.2	6.54	**5.5 - 8.5**
3	Turbidity	*mg/l*	0	0	1	0	0	-
4	DO	*mg/l*	0.86	0.65	0.48	0.75	0.69	-
5	Hardness	*mg/l*	4.0	2.4	3.2	2.9	3.8	**500**
6	TS	*mg/l*	400	300	300	400	300	-
7	Fe	*mg/l*	0.26	0.23	0.43	0.37	0.31	**5**
8	As	*mg/l*	<0.001	0.002	0.001	0.002	0.001	**0.05**
9	E, Coli	*MPN/ 100ml*	KPHĐ	7	KPHĐ	KPHĐ	KPHĐ	**KHP**
10	Coliform		KPHĐ	23	KPHĐ	KPHĐ	KPHĐ	**3**

In comparison with QCVN 09:2008/BTNMT, it is found that:

- Physio-chemical elements (pH, TS, hardness: within the permissible limits;
- Heavy metals: Except Fe with: content of heavy metals is within permissible limits;
- Micro-organic elements (total coliform and E. coli): Coliform pollution was detected partially in some measured positions.

c. Causes of Pollution

Groundwater is taken from the upper water layers of surface water, rivers, canals. This is one of the causes of partial pollution in the project area by these factors.

<u>Screening impacts</u>: Groundwater in the project area is generally of good quality, except for some positions locally contaminated by bacteria. During bored piling, groundwater could be contaminated by the dirty water that flows through the drill pipe wall.

2.1.4.7. Sediment Quality

a. Comparison Basis

QCVN 43:2012/BTNMT – National Technical Regulation on Sediment Quality.

b. Assessment

The analysis results of sediment quality in the project area are presented in table 2.13 and Appendix 3 – Results of survey of environmental quality.

Table 2.13. Analysis Results of Sediment Quality

No.	Location			Cu	Pb	Zn	Cd	As
	Name of bridge	Name of river	Symbol	*(mg/100g)*				
1	Sat	Sat River	TT1	0.06	0.17	0.85	<0.01	0.24
2	Tranh 1	Cuu An River	TT2	0.06	0.19	0.37	<0.01	0.23
3	Bun	Bun River	TT3	0.05	0.21	0.26	<0.01	0.19
4	Dia	Quang Lang River	TT4	0.05	0.17	0.24	<0.01	0.27
5	Tinh	Dien Bien River	TT5	0.06	0.20	0.21	<0.01	0.16
QCVN 43:2012/BTNMT				**19.7**	**9.13**	**31.5**	**0.35**	**1.7**

In comparison with sediment criteria of QCVN 43:2012/BTNMT, it is seen that the content of heavy metals in sediment is all lower than the permissible limits.

Screening impacts: During construction, sediment in the river may be polluted by the construction and operation of waste arising from the construction area during construction.

2.1.4.8. Soil Quality

a. Comparison Basis

QCVN 03:2008/BTNMT – National Technical Regulation on Permissible Limits of Heavy Metals in Soil.

b. Assessment

The analysis results of quality of agricultural land are presented in table 2.14, detailed in Appendix 3 – Results of survey of environmental quality.

Table 2.14. Analysis Results of Soil Quality

No.	Criteria	Unit	Đ1	Đ2	Đ3	Đ4	Đ5	QCVN 03:2008/ BTNMT
1	Cu	mg/100g	0.06	0.05	<0.05	0.05	0.06	**5**
2	Pb	mg/100g	0.10	0.18	0.21	0.19	0.15	**7**
3	Zn	mg/100g	0.25	0.17	0.16	0.24	0.21	**20**
4	Cd	mg/100g	0.08	<0.01	0.04	0.07	0.06	**0.2**
5	As	mg/100g	0.11	0.19	0.17	0.12	0.14	**1.2**

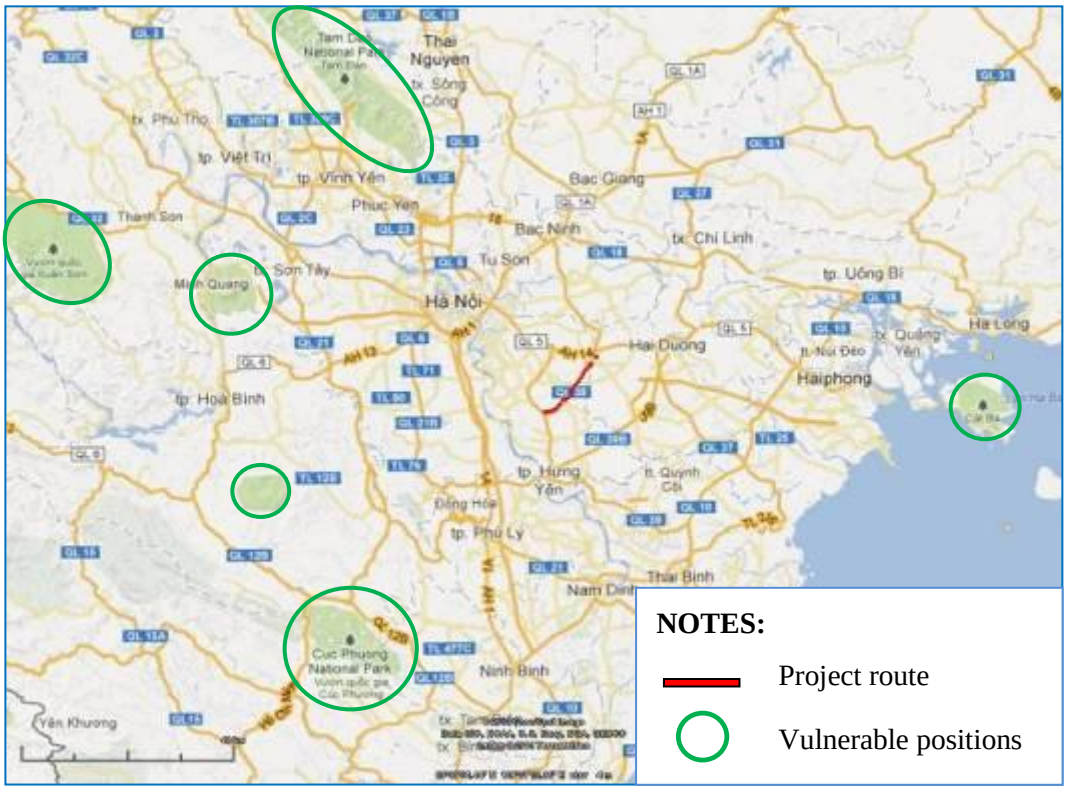
In comparison with QCVN 03:2008/BTNMT, it is found that the content of heavy metals is all within the permissible limits.

Screening impacts: Agricultural land in the project area is mostly used for rice, vegetables and aquaculture. Land environment along the project is likely to be degraded by pollution from construction activities.

2.1.5. Actual Biological Resources

The project is not located within or near the national park or nature reserve. The nearest nature reserve is Tam Dao National Park, locating at 60km from the project. Positions of the vulnerable zones (National Parks - Nature Reserves) is shown in Figure 2.7

Figure 2.7. Positions of the vulnerable zones



2.1.5.1. Terrestrial Ecosystems

Inside the project area, the agricultural ecosystem (specializing in rice, rice, farm produce) plays a key role. The flora is generally not diversified, the dominant species is the rice (*Oryza sativa*) and vegetables, such as potatoes (*Solanum tuberosum L*), legumes (*Fabaceae*), etc. The fauna are common species, no rare species listed in the Vietnam Red Book. The reptile species which can be seen, are mostly frog (*Holopbarachus rugulosus*), Ngoe (*Limnonectes limnocharis*), country frog (*Occidozyga lima*), Chau (*Rana guentheri*), bullfrog (*Kaloula pulchra*). The bird species observed are passerine (*Passeriformes)*. The species is also very poor, mainly Voles.

2.1.5.2. Aquatic Ecosystem

a. Aquatic plants

Aquatic plants are found along the banks and in the channels and rivers in the project area. There are no aquatic plants which are endangered species listed in the Vietnam Red Book 2007. In the survey conducted in January 2013, the species that were found are paddle Rong (*Vallisneria spiralis*); dog tail Rong (*Ceratophyllum demersum*), weasel-tail Rong (*Myriophyllum verticillatum*), Reed (*Phragmites comunis*), Nang (*Eleochais dulcis*); sedge (*Scirpus mucronatus*) waterlily (*Nymphaea pubessens*), etc.

This is a nutritious feed for livestock as well as creating reliable shelters for aquatic animals survive and grow. Aquatic plants also contribute in cleaning the water in the area, especially the species of Rong (*Ceratophyllum demersum*) and Reed (*Phragmites comunis*).

b. Fish species

In the project area, in addition to the natural species of fish living in rivers and channels, there are fish species in ponds. In the survey implemented in Jan.2013, species are found including anabas (*Anabas testudineus*), blackfish (*Chana striatus*), triped Mai (*Rasbora cephalotaenia*), Muong (*Hemiculter leuciculus*), Eel (*Monopterus albus*), loach (*Misgurus anguillicaudatus*), etc. In general, density of wild fish is not high. Fish production is not much developed, mostly serving local needs. Fish farming in ponds is according to household size and is used for local demands.

Screening impacts: Biodiversity along the route is low because the project area has no natural forest but man made vegetation and urban ecosystems. In the project area, no rare plant and animal species of high biological value or preservation are found. The nearest high valuable Nature Reserve is Tam Dao National Park, locating at 60km from the Project.

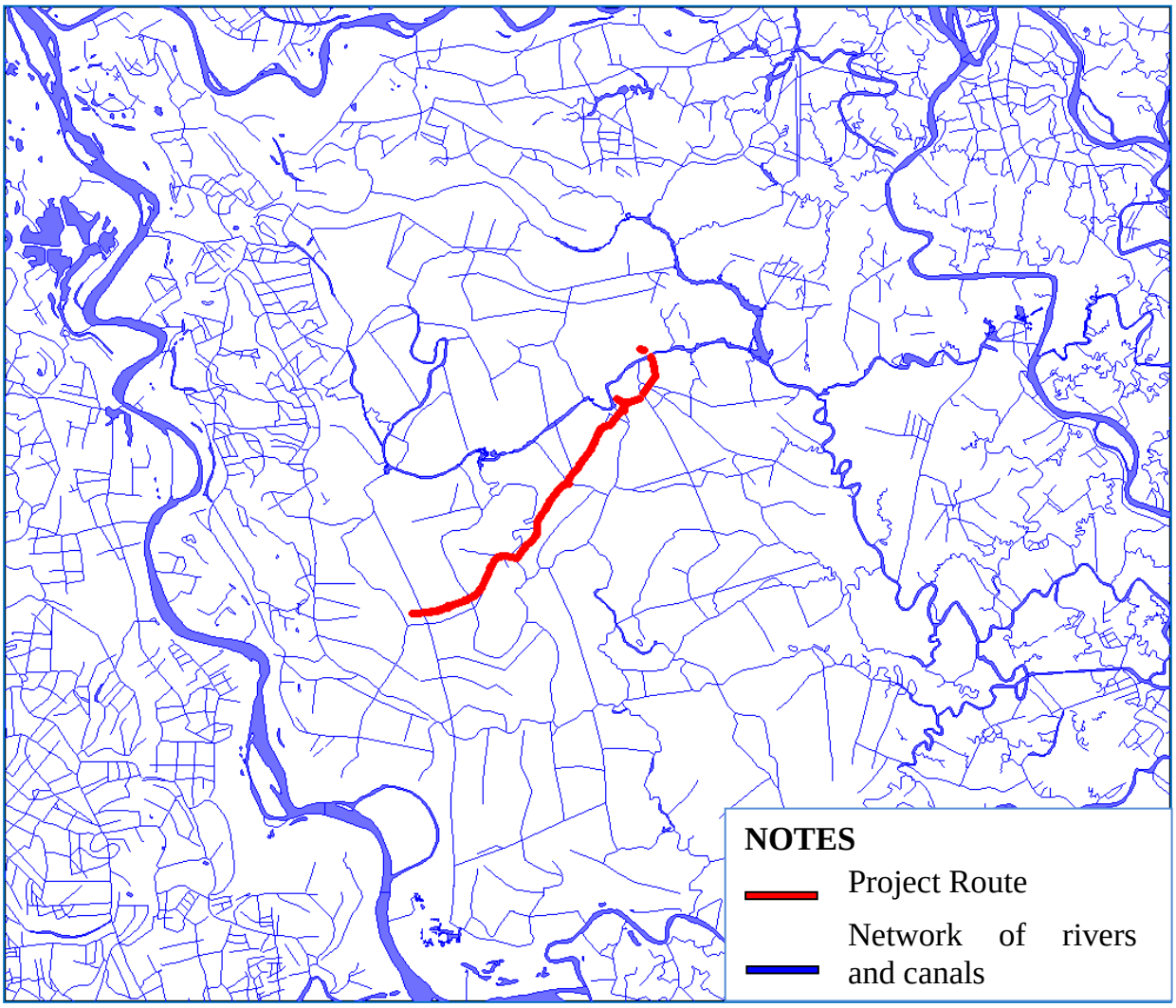
Wetland ecosystems in the river channel is likely to be indirectly affected by the pollution of surface water by the waste generating from the Project activities.

2.1.6. Actual Nonbiological Status

2.1.6.1. Water Resources

Surface water resources in the region are relatively abundant with a dense system of rivers and channels (Figure 2.8). The rivers and channels the project cuts through are the water supply sources for irrigation of the cultivated fields in the region.

Figure 2.8. Network of rivers and canals in the project area



<u>Screening impacts</u>: River water in the project area is used for irrigation purposes. Besides the risk of deterioration of water quality, the project activity may disrupt water supplies for farms in the region.

2.1.6.2. Mineral Resources

Most of the project area is located Hung Yen province. The mineral quantity in Hung Yen is small and of few types, generally not meet the requirement for economic

development. The primary focus is mineral materials for construction industry, including:

- Limestone: Distribution is mainly on Hoang Tan island. The reserve is over 1 million m^3, which is being exploited at a scale of 50-60 thousand m^3 per year. However, the limestone mining here needs a good management to protect environment and landscape for tourism development.
- Clay: the district's most important mineral is the source of clay for production of construction materials such as brick and tile. Clay is widely distributed in the Na Song Khoai Mountain, Minh Thanh, Dong Mai, Tien An, and Cong Hoa. The total reserves amount to millions of cubic meters, which can be exploited for producing cement and brick production serving local needs.
- Sand and gravel: they are scattered along the river in the district. The reserves are several million m^3, pretty good quality to withstand high pressure, which is being exploited for the construction site.
- Coal: There is a small reservoir located in the Da Chong area, Minh Thanh commune with the reserve of around 20-30 thousand tons. People previously exploited manually as fuel for production and living locally.
- In addition, in Minh Thanh area, there is also a sand mine with a large reserve (millions of cubic meters), good volume, high bearing strength and can be exploited to meet the needs of local construction development.

During the project preparation, FS Consultant implemented the assessment of the actual status of mining areas and the ability to provide for the project. The mines are operated under the licensing and management of the Department of Natural Resources and Environmental of the City. The list of mines is expected to be used during project implementation is shown in Section 1.4.2.2.

Screening impacts: The operating material mines in Hung Yen province and the surrounding provinces can be used for the project to reduce the possibility to open new materials mines that can cause significant adverse impacts on the environment.

The locations of mines, transportation routes, distance from the mine location to serve the project will have a decisive role to the extent and scope of the affected area, especially the problem of air pollution, noise , traffic safety in mines and landscape as well as on the service roads.

2.2. Socio-economic Conditions

Survey of the socio-economic characteristics has been conducted within the project

communes/towns: Trang Liet, Thuc Khang communes (Binh Giang district, Hai Duong province), Phu Ung, Bai Say, Tan Phuc, Quang Vinh, An Thi town, Quang Lang (An Thi district, Hung Yen province), Nghia Dan, Toan Thang (Kim Dong district, Hung Yen province) in January - March 2012. The statistics of socio-economic characteristics are summarized in Table 2.15. Socioeconomic questionnaires are enclosed in following Appendix.

Table 2.15. Statistics of Socio-economic Features in Regions within the Project Area

No.	Items	Unit	Minh Duc	Hung Thinh	Vinh Tuy	Vinh Hong	Trang Liet	Thuc Khang	Phu Ung	Bai Say	Tan Phuc	Quang Vinh	An Thi Town	Quang Lang	Nghia Dan	Toan Thang
1	***Population of households***															
-	Household		2,100	2,746	1,270	2,450	1,600	2,200	1,920	1,515	1,361	1,396	2,622	2,020	1,778	3,000
-	Population		8,100	9,864	4,250	9,350	6,300	7,814	7,677	6,032	4,082	5,587	9,274	6,470	6,780	11,000
-	Average person/ household	per./household	4	4	3	4	4	4	4	4	3	4	4	3	4	4
-	Male	%	50	51.3	45.9	42.8	49.5	49.5	51.6	52.6	50.5	48.6	49.4	46.4	51	46.8
-	Female	%	50	48.7	54.1	57.2	50.5	50.5	48.4	47.4	49.5	51.4	50.6	53.6	49	50.2
-	Natural population growth rate	%	1.1	1.30	1.45	1.60	1.65	1.05	1.05	0.85	1.25	1.15	0.85	1.10	1.20	0.95
2	***Ethnic group***															
-	Kinh	household	8,100	2746	1270	2,450	1,600	2,200	1,920	1,515	1,361	1,396	2,622	2,020	1,778	3,000
-	Others	household														
3	***Income***															
	Occupation		**2,100**	**2,746**	**1,270**	**2,450**	**1,600**	**2,200**	**1,920**	**1,515**	**1,361**	**1,396**	**2,622**	**2,020**	**1,778**	**3,000**
-	Agriculture	household	840	1,098	826	1,715	368	836	1,152	712	544	489	656	1,616	1,689	1,500
-	Forestry	household						264								
-	Trade & services	household	420	824	254		634	990	576	500	476	419	786	101	89	900
-	Traditional crafts	household														
-	Official	household	210		63			110	174			139		41		600
	Other	household	630	824	127	735	598		18	303	341	349	1,180	262		
	Income Level															
-	Average income	VND/ per./ month	1,050,000	1,800,000	1,300,000	1,200,000	1,092,000	1,000,000	1,000,000	1,900,000	1,300,000	1,000,000	2,000,000	1,800,000	750,000	1,100,000
-	Poor household ratio	%	3.5	3.8	10.5	9.6	6	9.5	11.2	9.7	10.5	12.4	7	12.3	11.5	12.9
4	***Land use***		**548.36**	**196.17**	**440.48**	**835.36**	**206.33**	**815.28**	**828.5**	**711**	**474**	**556.8**	**768.25**	**675.72**	**446.6**	**735.68**
-	Total area	ha	552.68	196.17	440.48	835.36	206.33	815.28	828.5	711	474	556.8	768.25	675.72	446.6	728.98
-	Agricultural land	ha	347.11	141.53	279.81	530	103	553.13	710.1	469.5	347.57	424.02	441.34	469	283.2	505.56
-	Forestry land	ha												120.67		
-	Housing land	ha	61.49	19.32	25.29	39	102	45.85	57.6	50.5	40.83	41.88	11.43	61	53.34	220.42
-	Special used land	ha	120.26													
-	Unused land	ha	1.41				0.36									
-	Surface water land	ha	18.09	8.68	47.81	70		41.08	60.8	80.7	85.6		41.83	25.05	110.06	9.7
-	Other	ha		26.64	87.57	196.36	0.97	175.22		110.3		90.9	273.65			

No.	Items	Unit	Minh Duc	Hung Thinh	Vinh Tuy	Vinh Hong	Trang Liet	Thuc Khang	Phu Ung	Bai Say	Tan Phuc	Quang Vinh	An Thi Town	Quang Lang	Nghia Dan	Toan Thang
5	***Culture***															
-	Temple/ pagoda	works	12				1	7							8	7
-	Church	works					1									
-	Shrine	works														
-	Ranked historical relic	works	1					2				1			2	1
6	***Living activities***															
-	Use of electricity	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100
-	Use of tap water	%			2	2	50					3	20			
-	Use of well water	%	100		98	98	50	100	100	100	100	97	80	100	100	100
7	***Infrastructure***	works														
-	School	works	3	3	3	3	4	3	3	3	4	3	7	3	4	5
-	Medical aid station	works	1	1	1	1	1	1	1	1	1	1	1	1	1	1
-	Market	works		1	1	1		3	1	1	1	1	1	1		1

Source: Socio-economic investigation data collected by Commodity Sustainable Development Support Center (CSD)

2.2.1. Economic Conditions

2.2.1.1. Economic Conditions of the Localities in the Project Area

In the communes and townships within the project, economic activities are quite diversified including agriculture, trade and public services, in which agriculture is the main economic activity with major crops being rice to be grown in two crops a year. Business activities, in which a part from trading activities in residential markets, there is also business of households living in the town center and along the existing road. Industrial activity accounts for only a small part and concentrates mainly in Binh Giang district. The public service households also account for a small portion.

2.2.1.2. Economic Conditions along the Project Route

a. On the bank of Hai Duong Side

The economic activities that bring the main income for people in the region is agricultural production. In addition to the agricultural activities, some households located in the northern end of Sat Bridge (near the flyover at National Highway 5) also have income from business, small trading activities.

b. On the Bank of Hung Yen side

The economic activities along the project route are quite diverse, with the main activity being agriculture, which accounts for about 80%. Those who run business and trading have pretty high income from 5 - 7 million/month. Agricultural activities have lower income, from 0.6 - 1.5 million/household/month. Industrial activities and trade and services are mainly in Binh Giang district because this sector is relatively well developed with many factories and enterprises. Some households living next to the roads and in the center of town also get the revenues from business and small trading activities.

Screening impacts: Permanent or temporary occupation of agricultural land will cause the loss of income for agricultural producers.

2.2.1.3. Current State of Transportation

a. Road Traffic

The current status of road traffic in the project area includes national roads (such as NH38, NH38B, NH39), provincial roads, district roads (e.g. 210, 201, 204B. etc.), and local roads.

– The section of NH38 passing the territory of Hung Yen province has asphalt

concrete pavement, width from 5 - 8m wide. Many road sections have deteriorated with surface roughness and cutting edge with many potholes. The density of traffic on NH38 is not high with main types being motorcycles and trucks, especially heavy trucks operating on the road at some time periods during the day.

- The national highways, provincial roads, and other district roads intersect with NH38 have been paved. The traffic on these roads is not heavy with the main vehicle types being motorcycles and trucks.
- The local roads are quite small with many concrete and granular roads. The types of vehicles operating primarily on the road are bikes and motorbikes and density is low. In addition, these roads also serve pedestrian walking to fields for cultivation.

b. Waterway Traffic

Except for Sat River and Dien Bien River, other rivers have no waterway transport activities. The waterway means which operate in those rivers are small boats serving transportation of agricultural products, building materials and fishing boats of Dong Xa fishing village in Ke Sat town.

Screening impacts: During the construction phase, congestion and unsafe traffic are likely to happen at intersections with existing road, on the material transport routes, and on Sat River due to:

- *Occupation of traffic road/waterway;*
- *Increasing traffic density on the routes;*
- *Material spillage caused slippery conditions leading to unsafe traffic;*

2.2.1. Social Conditions

2.2.2.1. Social Conditions of the Localities in the Project Area

a. Characteristics of population and ethnicity

Hai Duong and Hung Yen provinces are both located in the centre of Red River Delta so that the most prominent characteristic is high population density (average 1,000 - 1,300 people per km^2, about 3.8 - 5 times higher than the national average of 260 people per km^2). However, in the extent of the project, population is unevenly distributed, populated in the wards, towns and sparse in communes. The workforce accounts for about 60% of the total population.

At the communes in the project area, 100% of the residents are the Kinh peole, no ethnic minorities are presented in the project area.

b. Labor and Income

Survey results show that income per capita in the communes/town is approximately 1.3 million VND/person/month. This income level varies by localities and there are differences of income level. In particular, the locality of lowest income is Nghia Dan (750,000d/person/month), the locality of highest income is An Thi town (2 million/person/month).

An Thi town has the highest per capita income (2 million/person/month); in Nghia Dan commune, residents have the lowest income because most of them are farmers. The high income localities are the wards/communes with business and trading activities and other activities. The average poverty rate of the project area is 9.12%, in which Toan Thang Commune has the highest poverty rate of 12.9%.

c. Living conditions and community services

100% of the communes in the project area has clinics; 100% of communes has schools; 11/14 communes have markets and the percentage of households using electricity is 100%. Most households use well water (dug wells and tubewells) and rainwater, only about 15.4% of the households are supplied with tap water. 3/4 communes have garbage collection points.

2.2.2.2. Social Conditions along the Project Route

a. Residential Characteristics

- In the rehabilitation, expansion sections (coinciding with NH38): the residents concentrated along roads and in crowded areas through the town. The regional concentration of population along the route: km0+000; Km4+200 – Km4+350; Km43+600 - Km44+000; Km44+800; Km38+600 - Km39+800; Km40+200 - Km43+600.
- At the new road sections: the routes mainly pass through agricultural land area. Except for the northern end of Sat Bridge, residents live scatteredly along NH5 and NH38. The other areas are not inhabited.

b. Living conditions and community services

In general, the project area has social and technical infrastructure living and ensure stability. The People's Committee offices, schools, markets, medical stations, etc. are all located in favorable positions for people to access. Most of households are using electricity, many households have tapping water for daily activities. People dump garbage

in the garden or collected by the environment enterprise of urban localities.

c. Residential Areas and Other Objects along Project

Residential areas and other objects are presented in table 2.16 are those who are likely influenced by the project's activities.

Table 2.16. Residential Areas and Other Objects along Project

No.	Objects/ Section	Distance to the project (m)
1	Residential area at Sat Bridge approach roads (Km0+000 – to Sat Bridge)	10
2	Pagoda (Km0+400 – station of Sat Bridge)	75
3	Cemetery (Km0+680)	0
4	Political Improvement Center & The People's Procuracy (Km2+450 to Sat Bridge)	10
5	Residential area of (Km4+200 - Km4+350 to Sat Bridge)	10
6	Sa Lung Village Temple (Km4+550 to Sat Bridge)	100
7	Residential area (Km43+600 - Km44+000)	10
8	Residential area (Km44+800)	30
9	An Thi District Clinic (Km46+100)	100
10	Residential area Km38+600 - Km39+800	10
11	Residential area (Km40+200 - Km43+600)	10
12	Tan Phuc Commune People's Committee (Km43+150)	15
13	Tan Phuc Commune Primary School and Secondary School (Km43+000)	35

Source: survey data along the project route, in Jan-2013.

<u>Screening impacts:</u> Depending on the specific objects, there will be different impacts generated, including (without limitation) the followings:

- *Pollution of air, noise and vibration during the construction and operation in areas with high population density and special areas;*
- *Difficult travelling in construction process;*
- *Affecting cultivation and production during construction;*
- *Affecting the cultural and religious works, etc.*

CHAPTER 3. ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Identification of Environmental Impacts

In order to assess the impact level on subjects, 03 indicators have been used, including impact intensity, impact time and impact scale.

The intensity of an impact (low, medium and high) expresses the importance relating to the consequences that degradation of some factors will cause to the affected object. The intensity is calculated by combination of the environmental value with disturbance (volatility). In which, volatility levels (strong, medium, and low) are expressed via the vulnerability and impact ratio of affected objects; the value of the object shows the importance of the affected object (high, medium and low) established based on assessments of the actual value by the meaning and the social value (public, legal and political meaning).

Duration of impact may be short (short period) if the time of impact does not exceed the construction time of the project; or average duration lasting impact after construction activities termination of the project, approximately 2 years (warranty period of the project); or long duration of action lasting more than 2 years after termination of project construction activities.

The scope impact is understood as the distance or surface area relating to the project, in which the impact factors affecting the objects. Scope of impact is divided as follows:

Pointing nature: when the impact only affecting one object within the affected boundary or adjacent to the project.

- Localities: where the impact affects a number of objects of the same nature within the boundaries of the affected or adjacent to the project.
- Location: where the impact has the impact on one or more objects of the same nature of the project area significantly or when the impact affects an area (region).

Finally, a synthetic indicator, is interpreted as an indicator of the importance of impact (significant level of impact) for a comprehensive review of each combined impact of these directives above. Thus, the effect can be strong, medium, and small or negligible. In case it is impossible to be assessed, the impact of which is yet to be determined.

The project passes the particular areas: rural, semi-urban and urban areas. The impacts identified in Figure 3.1. Impact Assessment Matrix in the phases of the project below.

Figure 3.1. Identification Matrix of Project's Environmental Impacts

NOTE

I1	R1
D1	S1

Negative impact

I1	R1
D1	S1

Positive impact

I Intensity
R Range
1 Low
2 Medium
3 High

D Duration
S Significance
0 Unremarkable
? Undetermined

PROJECT ACTIVITIES			Affected Objects																	
			1. Natural environment								2. Resources		3. Resources are using by human					4. Life quality		
			Air quality	Noise	surface water quality	Sediment quality	Ground water quality	Soil quality			Physical resources	Non-physical resources	Local economy dịa phương	Agriculture	Fishery	Traffic	Community utilities	Local community	Life level	Cutural Education
			1.1	1.2	1.3	1.4	1.5	1.6			2.1	2.2	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3
Acquisition	1	Land acquisition									I1 R2 D1 S1	I1 R2 D3 S2		I2 R2 D3 S2			I2 R2 D3 S2		I2 R2 D3 S2	
	2	House demolition	I2 R2 D1 S2	I2 R2 D1 S2														I2 R2 D3 S2		
	3	Creating the construction site	I2 R2 D1 S2	I2 R2 D1 S2																
Road construction	1	Pavement, roadbed contruction (excavation, filling, soft soil, ramming)	I2 R2 D1 S2	I2 R2 D1 S2	I2 R2 D1 S2	I1 R2 D1 S1								I2 R2 D1 S2	I2 R2 D1 S2			I2 R2 D3 S2		
	2	Construction of culvert system	I1 R1 D1 S1																	
Bridge construction	1	Sub-structure (foundation, bored pile, etc)			I2 R1 D1 S2	I2 R1 D3 S1	I2 R2 D1 S2					I1 R1 D3 S2				I3 R1 D1 S2				
	2	Super-structure			I1 R1 D3 S1	I2 R1 D3 S2														
Other activities	1	Activity of mixing station	I3 R2 D1 S2		I2 R2 D1 S2							I1 R1 D1 S1								
	2	Activity of mixing station	I1 R2 D3 S2	I2 R2 D1 S2	I3 R2 D3 S3			I2 R2 D3 S2										I2 R2 D3 S2		
	3	Activity of equipment and machinery maintenance			I3 R2 D3 S3			I2 R1 D3 S2				I2 R2 D3 S2		I2 R2 D3 S2	I2 R1 D3 S2					
	4	Woker concentration			I2 R2 D1 S2			I1 R1 D1 S1										I1 R1 D1 S1		I1 R1 D3 S1
	5	Activity of material exploitation	I2 R2 D1 S2	I2 R2 D1 S2	I2 R2 D1 S2						I2 R2 D3 S2	I2 R2 D3 S2				I3 R2 D1 S2	I2 R2 D3 S2	I2 R2 D3 S2		
	6	Activity of waste soil and stone disposal	I2 R2 D1 S2	I2 R2 D1 S2								I2 R2 D1 S2				I3 R2 D1 S2	I2 R2 D3 S2	I2 R2 D3 S2		
Operation phase	1	Operation of Vehicle flow	I1 R2 D3 S2	I1 R2 D3 S2																
	2	Appearance of route										I2 R2 D3 S2	I3 R2 D3 S3			I3 R2 D3 S3			I2 R2 D3 S2	
	3	Runoff water			I1 R2 D3 S2			I1 R2 D3 S1				I1 R2 D3 S2								

3.2 Impact Assessment in the Pre-construction Phase of the Project

3.2.1. Analysis of Alternatives

a. Comparison between Alternatives with and without Project Implementation (zero-option)

The core issue of Socio-Economic, traveling needs and traffic safety, and environmental and resettlement issues have been analyzed of comparable performance, and in case the project is not implemented (zero-option). The comparison results are presented in Table 3.1.

Table 3.1. Analysis of Alternatives with and without Project Implementation

Key issues	With project implementation	Without project implementation
Socio-economic	The limit on the transport speed, time for shipping of goods (agricultural products) increased the transport cost, not encouraging socio-economic development of each location and the whole area.	The Project completion will create favorable conditions for cargo operations, circulation (both homeless and time). It stimulates the activity of the regional Economic development, thereby improving people's living standards.
Traveling needs and traffic safety	In the absence of project implementation, vehicle traffic flow through the area continues to increase over time, the traffic was going to be difficult due to the cross section can not meet the traffic demand on the route . Also not safe for vehicles to operate.	After rehabilitation, the project will facilitate travel for work, living and working in the region; improve transport capacity and connectivity between localities in the region; improve traffic safety.
Environment	Because the road surface is rough, narrow and dirty, slow movement of vehicles will increase the problem of dust pollution, noise and the risk of traffic accidents.	– During the construction process, environmental issues will appear such as dust, noise ... This condition will cease upon completion of construction. – After the rehabilitation is complete, cars on the road will run smoothly, reducing congestion means reducing emissions thereby mitigating the environmental problems related to dust and noise from the absence of real project
The issue of land acquisition and resettlement	There is no social problems caused by land acquisition and resettlement	Land occupation will result in involuntary resettlement and other socio-economic issues.

Comments: If the project is implemented, it will bring many benefits for socio-

economic future. During project implementation, a number of issues of environmental and social will arise. However, it is possible to prevent or limit these issues through programs (i) environmental impact assessment (EIA), Environmental Management Plan (EMP), and (ii) Action Plan resettlement (RAP). The proposed project feasibility and implementation of investment project implementation is essential.

b. Compare plans for local routes

b1. The section passing Sa Lung River (Km36+200 ÷ Km38+324)

Two route alternatives have been proposed route for the project, including:

- Alternative 1: Expansion of existing road embankment (NH38);
- Alternative 2: The route section intersects with the 3-leg intersection with the project at the Sat Bridge (Km3+774.39) and is parallel to the existing NH38, approximately 440m to the east, approximately 200m away from Phu Ung temple to the west and joining NH38 at Km38+324.

A detailed description of the route directions and illustrations for each alternative are presented in subsection 1.3. "Geographic location" and Figure 1.2, Chapter 1.

Comparison of advantages and disadvantages between route alternatives are presented in Table 3.2; summary of comparison results is presented in table 3.3.

Table 3.2. A Comparison of Advantages and Disadvantages between Route Alternatives

No	Item	Alternative 1	Alternative 2
I	***Technical***		
1	Construction organization	More complicated due to traffic secure on NH38	Simpler
2	Soft soil treatment	Smaller (24,500m^3)	Bigger (82,300 m^3)
3	Traffic organization in operation phase	Less favorable	Favorable due to: – Reducing the vehicle flow passing the populated areas; – Traffic cross-section> alternative 1
II	***Economic***		
1	Construction cost	Smaller due to recycling of existing roads	Larger due to not recycling existing roads and 2 new bridge must be constructed
2	Development of local economy	Lower	Higher due to acceleration of socio-economical development on along the

No	Item	Alternative 1	Alternative 2
			bypass.
III	***Environment (social and natural)***		
1	Land acquisition impacts	Larger impacts due to the project route passing dense residential areas(32 households are displaced)	The impact is smaller because the route area mainly is agricultural land (5 displaced households)
2	Impacts of air pollution in construction and operation phases	Larger impacts due to the project route passing dense residential areas, difficult for application of mitigation measures	More favorable for mitigation activities
3	Impacts of water pollution due to bridge construction	Without	With - due to construction of 2 new bridges

Table 3.3. Comparison Summary of Route Alternatives

No	Item	Alternative 1	Alternative 2
I	***Technical***	***7***	***5***
1	Construction organization	B	A
2	Soft soil treatment	B	C
3	Traffic organization in operation phase	C	A
II	***Economic***	***4***	***4***
1	Construction cost	B	C
2	Development of local economy	B	A
III	***Environment (social and natural)***	***6***	***5***
1	Land acquisition impacts	C	B
2	Impacts of air pollution in construction and operation phases	B	A
3	Impacts of water pollution due to bridge construction	A	B
	Total	**17**	**14**

Notes: A: point 1; B: point 2; C: point 3.

According to the results recorded in Table 3.3, Alternative 2 was chosen because there are many advantages of investment projects (design and construction) and the environment, especially to reduce the number of households to be relocated, resettled.

b2. The section passing Do Thuong Village (Km43+600 ÷ Km47+600)

Three route alternatives have been proposed for the project, including:

– Alternative 1: the route coincide with the existing roads and the beginning section

at An Thi town bypass;

- Alternative 2A: The route goes to the East of Do Thuong Village, then cutting NH38 and joins An Thi town bypass;
- The route goes to the West of Do Thuong Village, then cutting NH38 and joining An Thi town bypass;.

The description of the route alternative and illustration for each route alternative presented in the sub-clause1.3. "Geographic location" and Figure 1.3, Chapter 1.

The Advantages and Disadvantages between Route Alternatives are presented in Table 3.4; summary of comparison results is presented in table 3.5.

Table 3.4. A Comparison of Advantages and Disadvantages between Route Alternatives

No	Item	Alternative 1	Alternative 2A	Alternative 2B
I	***Technical***			
1	Construction organization	More complicated due to traffic secure on NH38	Simpler	
2	Soft soil treatment	Less than alternative 2B and more than alternative (Alt) 2A (93,200m^3)	Min (31,000m^3)	Max (229,100m^3)
3	Traffic organization in operation phase	Less favorable	Convenient because: – Reducing the vehicle flow through populated areas; – Traffic cross-section> alternative 1	
II	***Economic***			
1	Construction cost	Min due to making use of existing road	Equivalent to Alt.2B	Equivalent to Alt.2A
2	Development of local economy	Lower	Higher due to acceleration of socio-economic development along the bypass route	
III	***Environment (social and natural)***			
1	Land acquisition impacts	Larger impacts due to the project route	Impact is minimum because route	Impact is minimum due to it only passes the

		passing dense residential areas (21 households are displaced)	only passes the agricultural land and occupation is minimum.	agricultural.
2	Impacts of air pollution in construction and operation phases	Larger because passing populated areas	smaller	smaller

Table 3.5. Summary of Route Alternatives Comprison Results

No	Item	Alternative 1	Alternative 2A	Alternative 2B
I	***Technical***	***7***	***3***	***5***
1	Construction organization	B	A	A
2	Soft soil treatment	B	A	C
3	Traffic organization in operation phase	C	A	A
II	***Economic***	***4***	***4***	***4***
1	Construction cost	B	C	C
2	Development of local economy	B	A	A
III	***Environment (social and natural)***	***5***	***2***	***3***
1	Land acquisition impacts	C	A	B
2	Impacts of air pollution in construction and operation phases	B	A	A
	Total	**16**	**9**	**12**

Notes: A: point 1; B: point 2; C: point 3.

According to the results shown in Table 3.5, Alternative 2A has been chosen because there are many advantages of investment projects (design and construction) and the environment, especially to reduce the number of households to be relocated, resettled

3.2.2. Analysis of Impacts in the Pre-construction Phase of the Project

The impact sources related to waste and not related to waste arising from the preparation stage at Table 3.6.

Table 3.6. Summary of Sources of Impacts Generating in Pre-construction Phase

No	Activities	Waste types/ Impact factors	Time	Space
Impact sources relating to waste				
1	Housing demolition	Dust, waste.	1 week	residential areas (Km0+000; Km4+200 ÷ Km4+350)

No	Activities	Waste types/ Impact factors	Time	Space
2	Site preparation	Dust, waste (packaging, paper bark, wood chips)	1 month	Sites (Sat Bridge, Tranh Bridge 1, Tranh Bridge 2, Bun Bridge, Dia Bridge and Tinh Bridge)
Impact sources not relating to waste				
1	Housing demolition	noise	1 week	residential areas (Km0+000; Km4+200 ÷ Km4+350)
2	Land occupation	Land occupation of residential land, agricultural land; tomb relocation; occupation of infrastructure	Permanent or temporary(24 months).	Along the project route and construction sites (Sat Bridge, Tranh Bridge 1, Tranh Bridge 2, Bun Bridge, Dia Bridge and Tinh Bridge)

3.2.2.1. Impact on Air Environment

a. Waste / Waste-generating Activities

a1. Dust

In Pre-construction Phase, sources impacting air environment quality is dust generating from:

- Demolition activity of 275m^2 of houses with grade-4 and 133m^2 of houses with grade-3.
- Activity of grading the construction sites (of Sat Bridge, Tranh Bridge 1, Tranh Bridge 2, Bun Bridge, Dia Bridge and Tinh Bridge).

b. Assessment

b1. Air pollution due to dust from activities housing demolition

Dust emission depends on many factors such as material of construction, size of the project, humidity, weather conditions. Experience supervising construction projects similar shows, Housing demolition activity often create dust pollution exceeds the QCVN0 permissible limits 5:2009 / BTNMT about 1 ÷ 3 times at a distance of about 30 ÷ 40 meters down the way wind from the demolition location if no mitigation measures.

The risk of air pollution due to dust from demolition activities only end after demolition and waste clearing is finished. Time is about 1 week/ area.

Impact level: MEDIUM

b2. Air pollution due to dust from site leveling activities

Construction supervision experience also shows that the air environment away site

leveling from 25 ÷ 35m will be contaminated by dust at levels not serious (about 1.05 ÷ 2 times of permissible limits following QCVN 05:2009/BTNMT). Pollution time extends 1 month at each construction site.

Impact level: MEDIUM

3.2.2.2. Impacts on local community heath

a. Source of impacts

In preconstruction phase, public health can be affected by dust and noise arising from demolition and site leveling of activities of the site. However, the area surrounding the site is not inhabited, impacts on the local community heath should only be considered to housing demolition activities.

b. Assessment

b1. Impacts on local community heath due to dust pollution generating from demolition activities

Dust pollution will affect on the not-displaced population (km0 +000, Km 4 Km 4 +350 +200 ÷). The extent of impact is about 30 ÷ 40 m from the demolition area, down the wind. Dust pollution does not only generate the to respiratory illnesses, but it will also hinder daily life of residents in the area. Unlike the deterioration of air quality environment which will cease after construction and cleanup waste, affecting on the health of the population will last longer than execution time.

Impact level: MEDIUM

b2. Impacts on local community heath due to noise pollution generating from demolition activities

The noise level generated during the pre-construction phase is determined based on:

- Noise level of construction equipment (Table 3.7);
- Comprehensive noise calculation formula:

$$\mathbf{L_{\Sigma} = 10lg} \sum_{i}^{n} 10^{0,1.Li}$$

In which:

- L_{Σ} *is the total noise level.*
- *Li is the noise level of source i.*
- *n the total number of noise sources.*
- *Source: Pham Ngoc Dang 2003. Air environment. Science and Technology Publishing House, 2003*

Table 3.7. Typical Noise Level of Construction Equipment (dBA)

Site clearing		*Soil Excavation & Transport*		Hammer	81÷98
Bulldozer/Grader	80	Bulldozer	80	Crane	75÷77
Forklift truck	72÷84	Clamshell	72÷93	Welder	71÷82
Truck	83÷94	Truck	83÷94	Concrete mixer	74÷88
Grading and compaction		Scraper	80÷93	Concrete Pump	81÷84
Grader	80÷93	*Landscape and cleaning*		Concrete Compactor	76
Roller	73÷75	Bulldozer		Air compressor	74÷87
Pavement spreading		80		Pneumatic tools	81÷98
Spreader	86÷88	Backhoe	72÷93	Bulldozer	80
Truck	83÷94	Truck	83÷94	Vehicles transporting concrete and soil	
Compactor	74÷77	Spreader	86÷88		83÷94
		Project construction		Truck	83÷94

Source: Environmental Protection Committee of U.S. Noise from construction equipment and machinery NJID, 300.1, 31 - 12 - 1971.

The device is used truck and bulldozer, be predicted noise levels from Housing demolition activity from 84.7 ÷ 94.1 dBA. The noise level does not rise continuously, only when operating construction equipment.

Table 3.8 presents the noise arising from the operation of the Housing demolition project occurs in every neighborhood (not relocated) - the noise impact. The noise impact is determined based on:

– The noise attenuation by distance is calculated according to the following formula:

$\mathbf{\Delta L = 20\ lg}\ (\frac{r_2}{r_1})^{1+a}(dB)$ (application to the critical sources)

In which:

– *ΔL: reduction of noise at a distance r2 from the noise source*
– *r1: distance of the typical sound-source level (r1 = 8m)*
– *a: coefficient mentioned the impact of noise absorption by terrain (a = 0.1 - ground grass, no obstruction)*
– *Source: Pham Ngoc Dang 2003. Air environment. Science and Technology Publishing House, 2003.*

– The noise reduction through tree lines are calculated by the formula:

$$\mathbf{\Delta Lcx = 1.5.z + \beta \sum_{i}^{z} B_i}$$

Inwhich: *1.5.z: noise levels reduced due to reflectivity range of tree (z: the number of trees band);*

$\sum_z B_i$ *: is the sum of the width of the tree strip (m);*

$\beta^i \sum_i B_i$ *: noise level is lowered by sound absorbed and diffused in tree strips;*

β: coefficient indicates the influence is sound absorbed and diffused in tree strips. with values in the range (0.1÷0.2).

Source: Pham Ngoc Dang 2003. Air environment. Science and Technology Publishing House, 2003.

In the case of the Project, the average z = 4, tree distance between tree strips is 2.5m; β = 0.15. Thus, ΔLcx = 7,5dBA.

Table 3.8. Noise level impacts generated from activities Housing demolition

No	Objects	Distance (m)	Noise level exceeding permissible limits (dBA) (*)			
			Min 6-21h	Max 6-21h	Min 21-6h	Max 21-6h
1	Residential area (Km0+000; Km4+200 ÷ Km4+350)	10	5.2	14.6	20.2	29.6

Results show that prediction: In the daytime, the residential area will be affected by noise pollution beyond permissible limits for noise levels from 5.2 ÷ 14.6 dBA. At night the noise impact of this object exceeds permissible limits from 20.2 ÷ 29.6 dBA. In the only cause noise impact to residents living first block, the block behind the front row due to the noise level was definitely limited. The effect does not occur continuously, only when operating equipment.

Impact level: MEDIUM

3.2.2.3. Socio-economic impacts

a. Sources of impact

a1. Land Acquisition of residential land

To arrange the items of the project, land acquisition shall be conducted. Residential land in residential areas along the route (km0 +000, Km 4 Km 4 +350 +200 ÷) will be occupied with a total area of 7.160m2. On the residential area occupied, it will demolish the 4 275m2 house, 133m2 of level 3.

a2. Temporary and permanent occupation of agricultural land

The project will permanently occupy approximately 8.89 ha of agricultural land. In addition, the project was temporarily occupied about 3 ha of agricultural land to construction site layout at Sun Bridge, Bridge Picture 1, Picture 2 Bridge, Bun Bridge, the disk and Crystal Bridge. This is the area of agricultural land is being used by local

people.

a3. Relocation of tombs

The project will relocate 13 tombs, the tombs are scattered in the area of agricultural land mainly in Vinh Tuy. Due to the displaced fans should not focus on the relocation project is proposed to relocate the tombs themselves relative to the appropriate location in the local cemetery with funding provided by the project owner. This is also consistent with their aspirations.

a4. Acquisition of technical infrastructure

The project will relocate the technical infrastructure is being used to serve the living and production in the ward / commune of the project, including:

- Relocating 76 electric poles, 37 communication poles;
- Relocating 3052 ditches at the positions of new road to cut through irrigation ditches.

b. Assessment

b1. Impacts on households losing residential land

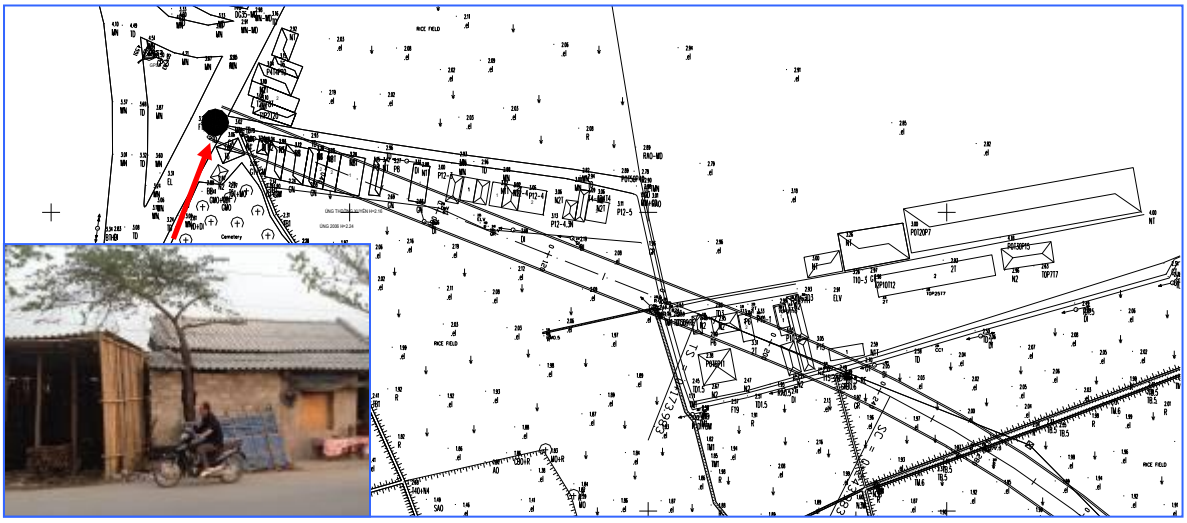
216 households losing residential land, of which 11 households are displaced, in which the majority of households have settled many years and is engaged in agricultural activities. The fields near their reach even adjacent to where they settled. The households affected by the project focus and Thuc Khang and Hung Thinh communes, socioeconomic characteristics of those are described in detail in the resettlement plan (RAP).

When the households are displaced and resettled, they will face the problems that arise due to involuntary resettlement and loss, including:

- Losing their houses and community relations: settled by longtime local when it came to moving, they will lose the village relationships;
- Disturbance of daily life: the new location will have to adapt and get used to the new environment, people are able to go farther the cultivated or students must go farther to school or must change their schools.

Impact level: HIGH

Figure 3.2. Acquisition of residential land



Residential area of Hung Thinh Commune (Km0+000)

Residential area of Thuc Khang Commune (Km4+200 ÷ Km4+350)

b2. Economic damages due to agricultural land acquistion

By rapid assessment method to identify the extent of damage caused by permanent occupation of agricultural land (Table 3.9). Accordingly, the extent of damage was estimated by the product of the following factors: land area occupied, the grain yield,

occupancy time and unit prices of agricultural products published.

Table 3.9. Estimated damages due to agricultural land acquisition

Area (ha)	Productivity damage (ton/year)	Economic Damages (million VND/year)
36 ha of cultivation land	449 ton rice/year	2,153 ÷ 2,916

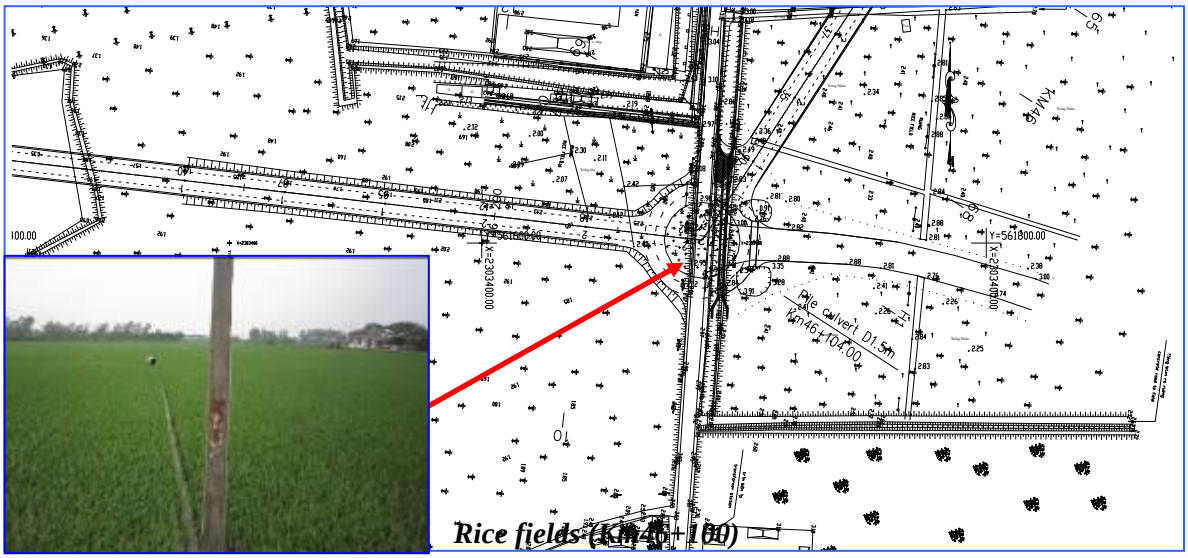
Notes:

- *Food productivity in paddy Hai Duong Province is 6.23 tones / ha / crop (www.khuyennong.gov.vn);*
- *The rice price Hai Duong and Hung Yen from 4,800d ÷ 6,500d/kg; (www.luagao.com, www.haiduong.gov.vn, www.hungyen.gov.vn).*

Based on the method of determining similar cases permanent Agricultural land occupation has been presented above was the extent of the damage was temporarily occupied by 3 ha of agricultural land for the site layout is from 4,306 ÷ 5,831 million. Besides, after the construction, agricultural land temporarily occupied will be renovated to continue farming. Land to be used to take at least 2 years to recover. Thus, in addition to time temporary land occupation (approximately 24 months), pending the restoration, the landowner will incur losses estimated 4,306 ÷ 5,831 million.

Impact level: HIGH

Figure 3.3. Agricultural Land Acquisition



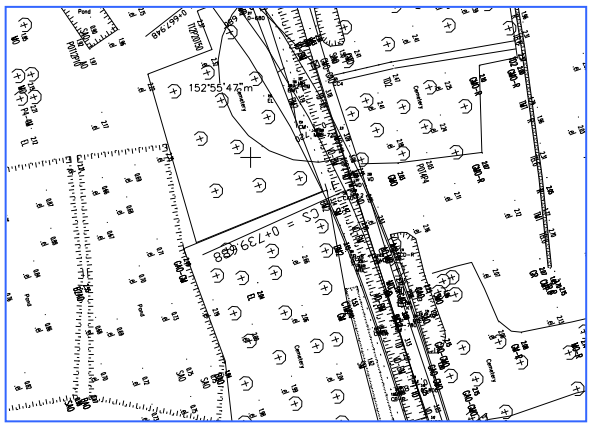
b3. Spiritual impacts to the relatives of tombs

For families of Vietnam, due to the elements and spiritual practices, the relocation of

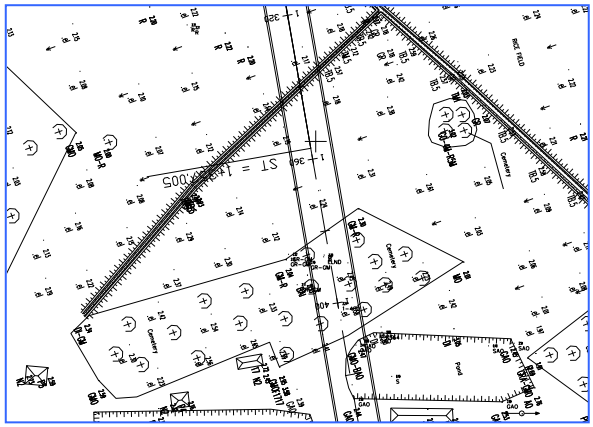
graves often complex and expensive. The cost of the relocation is not merely the cost of the demolition, construction digging new graves, but also the cost of worship, waiting for "good day". Relocation of graves that are not interested in this issue and the compensation is not realistic test out the social impact also caused conflicts between people affected with the construction, even prolonged clearance time.

Impact level: HIGH

Figure 3.4. Tomb Relocation



Vinh Tuy Commune (Km0+700)



Vinh Tuy Commune (Km1+400)

b4. Interruption of daily life and production activities by relocating communication and electric poles - the impact was prevented under construction procedure

According to the construction sequence of transportation projects, the project will newly install electric and communication poles, before cutting the power supply and telephone. After completing and commissioning, project proposal and electric power cuts local postal, telephone and transmission lines and converted old or new. The detailed steps mentioned in the design and cost of this operation belongs to the funding of the project. Therefore, the time of power interruption is negligible. The impact caused by the relocation of electric and communication poles has been excluded.

Impact level: MEDIUM

b5. Interruption of irrigation water sources - effect has been prevented under construction procedure

Canal relocation activities potentially cause disruption of irrigation water, thereby affecting agricultural activities. However, the regulations, the construction project traffic is not allowed to interrupt irrigation water. Thus, for the project, design of canal relocation is a content of investment. Accordingly:

- Canal relocation activities will be conducted during the little rainfall time and completed before rainy periods to minimize the affect sowing season;
- Temporary ditches will be done before construction of cofferdam for prevention of the water at the construction site;
- Construction of irrigation works in the existing flow position. After it is completed the flow shall be shifted to the original location. Temporary ditches shall be backfilled and returned surface as it was.

The content on the content of project investment and is included in the contract for construction contractors. The entire operation takes place in the land acquisition of the project scope. The cost for this activity under the funding of the project and has been included in the total investment. Thus, water supplies virtually uninterrupted by improving irrigation activities. The damage caused by the interruption of irrigation water for agriculture have been eliminated.

Impact level: MEDIUM

3.2.2.4. Impact on environment landscape

a. Waste / waste generation activities

Wastes generated during the project pre-construction phase including:

- Garbage from housing demolition;
- Waste from site leveling.

Details on the quantities, types and compositions of the solid waste generated is presented in Table 3.10.

Table 3.10. Waste generated in Pre-construction Phase

No	Activities	nature	Q.ty	Arising Area	Time
1	Housing demolition	Waste (concrete, brick, wood ..)	1.481m^3	residential areas (Km0+000; Km4+200 ÷ Km4+350)	1 week
2	Site leveling and installation of equipments	Waste (wood, paper, steel ...).	Difficult to quantify	Sites (Sat Bridge, Tranh Bridge 1, Tranh Bridge 2, Bun Bridge, Dia Bridge and Tinh Bridge)	1 month

b. Assessment

b1. The risk of polluting the environment landscape of solid waste

With the compositions including ordinary solid waste, garbage, and waste disposal will not create pollution causing serious environmental degradation. However, if not

collected quickly and appropriately, wastes can be dispersed into the environment, polluting the environment landscape to create conditions favorable for the pest species (rats, cockroaches ...) development.

Impact level: MEDIUM

Impacts in the Pre-construction Phase of the Project are summarized as follows:

Table 3.11. Summary of Impacts in the Pre-construction Phase of the Construction Project

Impacts	Position	Time	Impact level
Life disorder caused by reisdential land acquistion	Km0+000; Km4+200 ÷ Km4+350	Long	High
Income damage caused by agricultural land acquistion	Along the route	Long	High
Ảnh hưởng tâm linh do di dời mộ	Along the route, mainly concentrate at the Vinh Tuy Commune	Long	High
Interuption of socioeconomic caused by relocation of eclectric poles, communication poles and irrigation sources.	Along the route	Temporary	Medium
Impact on lanscape caused by demolition waste.	Near demolition loctions Km0+000; Km4+200 ÷ Km4+350	Temporary	Medium

3.3. Impact Assessment on Objects in Construction Phase

This section analyzes assessment of impacts generated from operations during the construction phase. In the case of the project, the major activities, including: (1) the construction activities of road and at grade intersections, (2) bridges construccttion on the route, and (3) the activities relating to (mining, material transport, work camp, mixing plants, and maintenance of construction equipment).

Table 3.12 summarizes results of identification of impact sources relating to waste and the waste associated with the construction phase.

Table 3.12. Summary of Impacts Gemerating from Construction Phase

No	Impact Generating Activities	Waste types/ Impact factors
Sources of impacts relating to waste		
1	*Construction of roads and at-grade intersections*	

No	Impact Generating Activities	Waste types/ Impact factors
-	Embankment construction	Dust, waste rock and soil
-	Pavement construction	
2	*Construction of bridges in the route*	
-	Substructure construction	Waste soil, bentonite
-	Superstructure construction	Solid waste
3	*Relative activities*	
-	Operation of equipment and machines	Dust and exhausted gas
-	Transportation activities	Dust and exhausted gas
-	Operation of concrete mixing plants	Sewage water
-	Maintenance activities	Sewage water, waste oil and oily waste
-	Worker concentration	Solid waste and domestic sewage water
-	Material exploitation activities	dust
	Sources of impacts not relating to waste	
A.	***Main work-items Construction activities***	
1	*Construction of roads and at-grade intersections*	
-	Embankment construction	Noise, vibration, sedimentation, occupation of traffic corridors
-	Pavement construction	Noise and occupation of traffic corridors
2	*Construction of bridges in the route*	
-	Substructure construction	Sedimentation, noise, vibration, water wall drilling the overflow; encroachment transportation corridor
-	Superstructure construction	Noise
3	*Relative activities*	
-	Operation of equipment and machines	Soil compression
-	Transportation activities	Muddying and factors damaging public utilities
-	Worker concentration	Generating infectious diseases and arising conflicts
-	Material exploitation activities	Noise, landscape, etc.
-	Unsuitable material disposal	spilling

3.3.1. Impact on Air Environment

a. Waste/waste generation activities

Activities giving rise to the waste, potentially affecting ambient air quality, including:

– Earthworks of road-bed and foundation pit rise the dust:

– Relative activities:

- Activities of construction equipment (horizontal construction) generating dust and toxic gases (NO_2, SO_2, CO and HC);
- Activities of material transportation (vertical construction) generating dust and toxic gases (NO_2, SO_2, CO and HC).
- Activities of mixing plant in the construction site generating dust;

b. Impact Assessment

b1. Dust pollution arising from excavation and backfill activities and horizontal construction (activities of the construction equipment)

Excavation and backfill: The amount of dust generated from excavation and backfill activities depends on excavated soil composition, moisture and weather conditions. Forecast levels of dust generated from excavation activities based on:

– The total amount of earthwork (Table 3.13);

Table 3.13. Summarized quantity of Earthwork

No	Item	Quantity (m^3)		
		Excavated soil	Filled soil/sand	Total
I	Roads (including at-grade intersection)	*229.235*	*1.151.543*	***1.380.778***
II	*Bridges*	*10.551*	*18.177*	***28.728***
1	Sat Bridge	2.368	2660	**5.028**
2	Tranh 1 Bridge	1.788	2610	**4.398**
3	Tranh 2 Bridge	1.232	3668	**4.900**
4	Bun Bridge	1.677	4211	**5.888**
5	Dia Bridge	2.008	1800	**3.808**
6	Tinh Bridge	1.478	3228	**4.706**

– Dust generating factors by WHO (Table 3.14);

Table 3.14. Dust generation factor from construction activities

No	Source of pollution	Emission factor
1	Dust due to excavation, the ground cover is blown up (dust).	$1 \div 100 g/m^3$
2	Dust due to unloading of construction materials (soil, rock, sand ...).	$0,1 \div 1 g/m^3$
3	Transportation of sand, earth dropping to dust arising.	$0,1 \div 1 g/m^3$

Source: rapid assessment document of WHO

Calculation results are presented in Table 3.15.

Table 3.15. Dust Load from Excavation and Backfill Activities

No	Work-item	Quantity (kg)		Space [1]	Time [2]	Load (mg/m.s)	
		Min	Max	m	Month	Min	Max
I	*Road* [3]	21	1817	200	2	0.021	1.753
II	*Bridges*						
1	Sat Bridge	6	513	163	10	0.001	0.121
2	Tranh 1 Bridge	5	449	102	6	0.003	0.283
3	Tranh 2 Bridge	6	500	63	6	0.006	0.510
4	Bun Bridge	7	601	62	6	0.007	0.623
5	Dia Bridge	5	388	48	6	0.006	0.520
6	Tinh Bridge	6	480	54	6	0.007	0.572

Note: (1) The scope of bridge construction including 10m from the bridge abutment
(2) Time of foundation pit excavation is by 2/3 of the total execution time
(3) Time of road construction earthwork is about 2 months/200m

Horizontal construction: Horizontal construction activity is understood as the operation of means and equipment used for construction within the clearance area. Forecast of the total volume and dust load, toxic gases arising from the consumption of the machinery and equipment (horizontal construction) based on:

- Quantity of vehicle shifts in construction (Table 3.16);

Table 3.16. Estimated Consumption of Diesel in Construction (horizontal and Vertical Construction)

No	Item	Estimated diesel consumption (ton of diesel)		
		Horizontal [1]	Vertical [2]	Total
I	*Road*	*463*	*983*	*1446*
II	*Bridges*	*178*	*24*	*202*
1	Sat Bridge	40	5	45
2	Tranh 1 Bridge	29	4	33
3	Tranh 2 Bridge	27	4	31
4	Bun Bridge	34	4	38
5	Dia Bridge	21	3	24
6	Tinh Bridge	27	4	31

- *Note: (1) Horizontal construction: operation of construction machinery and equipment;*
- The emission coefficient of the World Health Organization: 1 truck sized 3.5 - 16 tones while consumption of 1 ton of diesel will emit into the atmosphere about

4.3kg TSP; 20S kg SO_2 (S is the sulfur content in diesel, according to QCVN01:2007/BKHCN S=0,05%); 55kg NO_2; 28kg CO and 12kg HC;

– Scope and execution time of each item (Table 3.17).

Table 3.17. Amount of Dust and Toxic Gas of Construction Activity (Horizontal Construction)

No	Work-item	Space *(m)*	Time (*) *(tháng)*	Load (mg/ms)				
				TSP	SO_2	NO_2	CO	HC
I	*Road*	*200*	*2*	0.025	< 0.001	0.317	0.161	0.069
II	*Bridges*							
1	Sat Bridge	163	10	0.041	< 0.001	0.521	0.265	0.114
2	Tranh 1 Bridge	102	6	0.079	< 0.001	1.005	0.512	0.219
3	Tranh 2 Bridge	63	6	0.118	< 0.001	1.516	0.772	0.331
4	Bun Bridge	62	6	0.152	< 0.001	1.939	0.987	0.423
5	Dia Bridge	48	6	0.121	< 0.001	1.547	0.788	0.338
6	Tinh Bridge	54	6	0.138	< 0.001	1.768	0.900	0.386

(*)Dust generated in the horizontal construction operation takes place mainly during the earthwork period

The total quantity of dust and toxic gas from the earthwork and horizontal construction activity: Because of the items will be constructed at the same time in the same range space, the total amount of dust and toxic gas generated within each construction item of the project will be the sum of the quantity of dust and toxic gas generated calculated separately for each activity (Table 3.18).

Table 3.18. Total quantity of Dust and Toxic Gas Generating in Construction

No	Work-item	Load (mg/ms)				
		TSP	SO_2	NO_2	CO	HC
I	*Road*	1.778	< 0.001	0.317	0.161	0.069
II	*Bridges*					
1	Sat Bridge	0.162	< 0.001	0.521	0.265	0.114
2	Tranh 1 Bridge	0.362	< 0.001	1.005	0.512	0.219
3	Tranh 2 Bridge	0.628	< 0.001	1.516	0.772	0.331
4	Bun Bridge	0.775	< 0.001	1.939	0.987	0.423
5	Dia Bridge	0.641	< 0.001	1.547	0.788	0.338
6	Tinh Bridge	0.71	< 0.001	1.768	0.900	0.386

Based on the total quantity of dust, gas generated in the construction of each item to

determine the average concentration at any point in the Sutton model

- Sutton diffusion model.

$$C = \frac{0{,}8E.\left\{\exp\left[\frac{-(z+h)^2}{2\sigma_z^2}\right]+\exp\left[\frac{-(z-h)^2}{2\sigma_z^2}\right]\right\}}{\sigma_z.u} \quad (mg/m^3)$$

In which::

- *C: concentration of pollutants in the air (mg/m^3);*
- *E: amount of contaminants from waste source (mg/m.s);*
- *In case this project, the dominant wind direction is Northeast in winter and Southeast in summer; create the angle with curve of 45^o and 45 ^{o} so the pollutant amount is adjusted in turn is E*=E.sin45^o and E.sin45^o;*
- *z: height of the calculation point (m) (z=1.5m);*
- *h: height of the road surface than the surrounding ground (m) (h=2.m);*
- *u: medium wind speed (m/s) (winter and summer respectively u_{tb}=2.1m/s and 1.9m/s);*
- *σ_z: diffusion coefficient of pollutant in z way (m).*
- Pollution diffusion coefficient values σ_z in vertical way (z) with the stability of the atmosphere in the Project area ass B is determined by the formula:
- $\sigma_z = 0{,}53.x^{0{,}73}$ (m)
- *Where: x is the distance of the point calculated from original sources, in wind direction, m*

Results are presented in Table 3.19.

Table 3.19. Forecast of Extent of Dust and Gas Dissemination from Construction Activities

Item	Criteria	Season	Concentration distribution by distance (*)					QCVN 05. 06 : 2009
			5m	10m	25m	50m	100m	
I. Road and at-grade intersection								
	TSP	Winter	0.136	0.119	0.084	0.058	0.037	**0.2**
		Summer	0.394	0.345	0.245	0.168	0.108	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.005	0.004	0.003	0.002	0.001	**0.1**
		Summer	0.014	0.012	0.009	0.006	0.004	
	CO	Winter	0.012	0.011	0.008	0.005	0.003	**5**
		Summer	0.036	0.031	0.022	0.015	0.010	
	HC	Winter	0.005	0.005	0.003	0.002	0.001	**1.5**
		Summer	0.015	0.013	0.009	0.007	0.004	

Item	Criteria	Season	Concentration distribution by distance (*)					QCVN 05. 06 : 2009
			5m	10m	25m	50m	100m	
II. Bridges								
Sat Bridge	TSP	Winter	0.012	0.011	0.008	0.005	0.003	**0.2**
		Summer	0.036	0.031	0.022	0.015	0.010	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.008	0.007	0.005	0.003	0.002	**0.1**
		Summer	0.023	0.020	0.014	0.010	0.006	
	CO	Winter	0.020	0.018	0.013	0.009	0.006	**5**
		Summer	0.059	0.051	0.036	0.025	0.016	
	HC	Winter	0.009	0.008	0.005	0.004	0.002	**1.5**
		Summer	0.025	0.022	0.016	0.011	0.007	
Tranh Bridge 1	TSP	Winter	0.028	0.024	0.017	0.012	0.008	**0.2**
		Summer	0.080	0.070	0.050	0.034	0.022	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.015	0.013	0.010	0.007	0.004	**0.1**
		Summer	0.045	0.039	0.028	0.019	0.012	
	CO	Winter	0.039	0.034	0.024	0.017	0.011	**5**
		Summer	0.113	0.099	0.070	0.048	0.031	
	HC	Winter	0.017	0.015	0.010	0.007	0.005	**1.5**
		Summer	0.048	0.042	0.030	0.021	0.013	
Tranh Bridge 2	TSP	Winter	0.048	0.042	0.030	0.020	0.013	**0.2**
		Summer	0.139	0.122	0.086	0.059	0.038	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.023	0.020	0.014	0.010	0.006	**0.1**
		Summer	0.067	0.059	0.042	0.029	0.018	
	CO	Winter	0.059	0.052	0.037	0.025	0.016	**5**
		Summer	0.171	0.150	0.106	0.073	0.047	
	HC	Winter	0.025	0.022	0.016	0.011	0.007	**1.5**
		Summer	0.073	0.064	0.046	0.031	0.020	
Bun Bridge	TSP	Winter	0.059	0.052	0.037	0.025	0.016	**0.2**
		Summer	0.172	0.150	0.107	0.073	0.047	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	

Item	Criteria	Season	Concentration distribution by distance (*)					QCVN 05. 06 : 2009
			5m	10m	25m	50m	100m	
	NO_2	Winter	0.030	0.026	0.018	0.013	0.008	**0.1**
		Summer	0.086	0.075	0.053	0.037	0.024	
	CO	Winter	0.075	0.066	0.047	0.032	0.021	**5**
		Summer	0.219	0.191	0.136	0.093	0.060	
	HC	Winter	0.032	0.028	0.020	0.014	0.009	**1.5**
		Summer	0.094	0.082	0.058	0.040	0.026	
Dia Bridge	TSP	Winter	0.049	0.043	0.030	0.021	0.013	**0.2**
		Summer	0.142	0.124	0.088	0.061	0.039	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.024	0.021	0.015	0.010	0.006	**0.1**
		Summer	0.068	0.060	0.043	0.029	0.019	
	CO	Winter	0.060	0.053	0.037	0.026	0.017	**5**
		Summer	0.174	0.153	0.108	0.074	0.048	
	HC	Winter	0.026	0.023	0.016	0.011	0.007	**1.5**
		Summer	0.075	0.066	0.047	0.032	0.021	
Tinh Bridge	TSP	Winter	0.054	0.047	0.034	0.023	0.015	**0.2**
		Summer	0.157	0.138	0.098	0.067	0.043	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.027	0.024	0.017	0.012	0.007	**0.1**
		Summer	0.078	0.069	0.049	0.033	0.022	
	CO	Winter	0.069	0.060	0.043	0.029	0.019	**5**
		Summer	0.199	0.174	0.124	0.085	0.055	
	HC	Winter	0.030	0.026	0.018	0.013	0.008	**1.5**
		Summer	0.085	0.075	0.053	0.036	0.023	

(*)Distance from the edge of road construction area

From the quantitative results of concentration of dust and gases generated from the construction activities and the scope of spreading of these substances, it is observed that:

- In Summer, the atmosphere around construction areas and road intersections will be contaminated by less serious TSP levels (<5 times the permissible limits) and only permissible limits beyond 37m from the edge of the road when existing roadbed earthwork activities, in Winter, the concentration of dust and gas located at the edge of the permissible limits.

- air environment around the construction site of overpass flow contaminated by dust in both Winter and Summer.
- emissions levels many times smaller than the permissible limits.

Impact level: MEDIUM

b2. Dust from transport activities

Vertical construction: Dust load and emissions arising from transportation activities from waste material and the project is calculated similar to the case of horizontal offset (Table 3:20). Distance is the average shipping is 10km. Sutton diffusion model is used to predict the extent of dust and exhaust emissions. Results Table 3:21 shows dust and emissions from motor vehicles transporting several times smaller than permissible limits.

Table 3.20. Dust load Exhaust Gas from Transportation Activities (Vertical Construction)

No	Work-item	Fuel demand *(tấn diesel)*	Scope of transport *(km)*	Time (*) *(tháng)*	Quantity (mg/ms)				
					TSP	SO_2	NO_2	CO	HC
1	Road and bridges	1.007	10	16	0.010	<0.001	0.134	0.068	0.029

(*) Transport activity concentrate mainly on the earthwork period

Table 3.21. Forecasted Scope of Dust and Gas Dissemination from Construction Activities

Item	Criteria	Season	Concentration distribution by distance (*)					QCVN 05. 06 : 2009
			5m	10m	25m	50m	100m	
Road and bridges	TSP	Winter	0.001	0.001	< 0.001	< 0.001	< 0.001	**0.2**
		Summer	0.002	0.002	0.001	0.001	0.001	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.125**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.002	0.002	0.001	0.001	0.001	**0.1**
		Summer	0.006	0.005	0.004	0.003	0.002	
	CO	Winter	0.005	0.005	0.003	0.002	0.001	**5**
		Summer	0.015	0.013	0.009	0.006	0.004	
	HC	Winter	0.002	0.002	0.001	0.001	0.001	**1.5**
		Summer	0.006	0.006	0.004	0.003	0.002	

Dust rolled up from the road surface: Dust re-suspended from vehicle movement cannot be quantified due to lack of input data such as transport volume of each car, the

humidity of material, the covering of material transport, the level of cleanliness of the vehicle (wheel). By the experience of supervising of construction traffic in operating phase on urban routes showed that transport activity of material and waste rock-soil give rise to dust, averagely exceed the permissible limit according to QCVN 05: 2009/BTNMT from 2 ÷ 3 times, on the windy and sunny day, arising dust could exceed the permissible limit to 4 times, if there is no effective preventive measures.

Thus, air environment along the transport routes (see Table 1.5) shall be polluted by dust with a not-yet serious level (< 5 times lower than permissible limit). Dust concentration only reached the permissible limit in the range > 80m from road transport, by the wind direction.

Impact level: MEDIUM

b3. Dust pollution from cement concrete mixing plants

Experience environmental monitoring for construction projects of transport infrastructure that, among the activities taking place at each site, active mixing cement concrete (mixing station, cement silo, hereby grant data ...) are subject to the condition creates air pollution by dust, followed by dust emissions from the sources of data dumps from temporary road construction when passing vehicles. When station operations, downwind, at a distance of approximately 50m TSP concentration 8.85 mg/m3 (over 44 times the permissible limits).

Impact level: MEDIUM

3.3.2. Impacts on local community heath

a. Impact sources

During the construction phase, public health can be affected by:

- air pollution by dust generated from:
  - Excavation and backfill activities and horizontal construction
  - Material transportation activities
  - (Due to the residential area away from the mixing area should not be affected by dust from batching);
- The noise arising from:
  - road and bridge construction activities;
  - Material transportation activities
- Vibration generating from construction activities

b. Impact Assessment

b1. Impacts due to dust

Dust pollution not only affects health (eye problems arise, respiratory), but also affect Economic activities - social. The impact can extend beyond the construction period as a result of the eyes and respiratory diseases of people. The area may be affected by dust pollution residential areas are located along the route refresh (km0 +000, Km 4 Km 4 +350 +200 ÷, ÷ Km44 Km43 +600 +000) and the residential areas along transport route (NH39, 1A, Highway 5, DT200...).

Figure 3.5. Some residential areas may be affected by dust pollution

	
Residential area of Tan Phuc Commune (Km43+600 ÷ Km44+000)	***Residential areas on the transport route from Thai Ha yard to NH39***

Impact level: MEDIUM

b2. Impact by noise

Noise level generated from activity of embankment construction is determined based on:

- Typical noise level of vehicle construction (Table 3.7);
- Formula of calculating the synthetic noise level (see pre-construction phase).

According to the equipments using in each item, synthetic noise level is forecast from these activities (Table 3.22)

Table 3.22. Calculated Result of the Noise Level at the Source in the Construction Phase

No	Item	Main equipment	Noise level (dBA)
I	*Road work*		
-	Excavation and transport.	Bulldozer, clamshell, truck.	85 ÷ 96,6

No	Item	Main equipment	Noise level (dBA)
-	Grading.	Grader, roller.	80,8 ÷ 93,1
-	Paving.	Spreader, compactor, truck.	87,9 ÷ 95
-	Landscape and cleaning.	Bulldozer, backhoe, truck.	80,6 ÷ 93,2
II	*Bridge work*		
-	Construction of structures	Crane, welder, concrete pump and vibrator, pile driver, truck	87,5 ÷ 96,3
-	Landscape and cleaning.	Bulldozer, backhoe, truck.	80,6 ÷ 93,2

Noise impact on sensitive subjects determined based on:

- The noise attenuation by distance is calculated according to the following formula:

$$\Delta L = 10 \lg \left(\frac{r_2}{r_1}\right)^{1+a} (dB)$$ (applied to the road source)

In which:

- *ΔL: reduction of noise at a distance r2 from the noise source*
- *r1: distance of the typical sound-source level (r1 = 8m)*
- *a: coefficient mentioned the impact of noise absorption by terrain (a = 0.1 - ground grass, no obstruction)*

– *Source: Pham Ngoc Dang 2003. Air environment. Science and Technology Publishing House, 2003.*

– The noise attenuation over tree strips (see the pre-construction part)

– The noise reduction through a brick wall: Surround of permanent buildings such as schools, temples ... there's the brick wall fence, give effect of reducing the noise impact level of about 12dBA.

Results are presented in table 3.23.

Table 3.23. Noise Impact Arising from Construction Activities of Project

No	Object/ station	Distance (**) (m)	Exceed the permissible limit according to QCVN 26/2010/BTNMT (dBA)				Nearest construction item
			Min (6-21h)	Max (6-21h)	Min (21-6h)	Max (22-6h)	
1	Residential area (Km0+000; Km43+600 ÷ Km44+000)	10	4.2	15.8	19.2	30.8	Road
2	Residential area (Km4+200 ÷ Km4+350)	10	4.2	15.8	19.2	30.8	Road
		10	6.7	15.5	21.7	30.5	Tranh Bridge 1
3	Residential area	30	0.3	11.9	15.3	26.9	Road

No	Object/ station	Distance (**) (m)	Exceed the permissible limit according to QCVN 26/2010/BTNMT (dBA)				Nearest construction item
			Min (6-21h)	Max (6-21h)	Min (21-6h)	Max (22-6h)	
	(Km44+800)						
4	Ngoc Mai Pagoda(Km0+400) (*)	75	0	11	-	-	Road
5	Political improvement center and The People's Procuracy(Km2+450) (*)	10	7.2	18.8	-	-	
6	Sa Lung Village temple(Km4+550) (*)	100	0	9.8	-	-	
7	An Thi District clinic (Km46+100) (*)	100	0	9.8	8.2	19.8	

(*) Special area

(**) The distance to the edge of the road

(***) With the exception of hospital, other special areas are inactive at night.

Based on the sensitivity to noise, identified two groups affected, including:

- Common area: During the day, the residential area will be affected by noise pollution beyond permissible limits for noise levels from 0.3 ÷ 15.8 dBA. At night the noise impact of this object exceeds permissible limits from 19.2 ÷ 30.8 dBA. In the only cause noise impact to residents living first block, the block behind the front row due to the noise level was definitely limited. The effect does not occur continuously, only when operating the equipment..
- Special area: During the day, except for political training center & control people's hospital, the only other area affected by the use of machinery and equipment with high-level audio source. The greatest noise impact on the region will reach 9.8 ÷ 18.8 dBA. At night, only Security Enforcement District clinic activities, impact on noise levels exceed permissible limits area from 8.2 ÷ 19.8 dBA.

Impact level: MEDIUM

Figure 3.6. Some areas are particularly likely to be affected by noise

Ngoc Mai Pagoda(Km4+440)

An Thi District Clinic (Km46+100)

b3. Vibration Impacts

Because vibration is evaluated by separate events, not the average of the event, so the vibration source is taken as the vibration of one of the largest machinery, construction equipment involved. The vibration emission characteristics of the construction equipment presented in Table 3:24. In particular, the biggest shake Embankment construction arising from the operation of the roller (82dB) and pile construction arising from piling operations (97.5 dB).

Table 3.24. Vibration Level of some Typical Construction Equipment (Distance of 10m)

No	Type of vehicle	vibration level reference (in the vertical direction, dB)
1	Excavators	80
2	Bulldozer	79
3	Freighter vehicle	74
4	Roller	82
5	Air compressor	81
6	Auto hammer (*)	97.5

(*)When using a hammer to pile and 8 tons with energy 48kj to pile length from 7.5 to 15m; generate vibration levels of 12.9 mm / s (97.5 dB) at a distance of 10m (limited the vibration of Germany - DIN 4150 is 2mm / s for projects).

To forecast the level of vibration attenuation with distance, use the formula:

$$L = L_0 - 10\log(r/r_0) - 8{,}7a(r - r_0)\ (dB)$$

- *L is the vibration in dB at a distance "r" meters to the source;*
- *L_0 is vibration in dB measured at a distance "r_0" meters away from the source. Vibration at a distance r_0 = 10m often recognized as vibration source;*
- *a is intrinsic vibration reduction coefficient with clay ground of about 0.5.*

Forecast results are presented in table 3.25.

Table 3.25. Decreasing Vibration Level with Distance from the Construction Activity

Item	Maximum value of vibration at source (r_0=10m) (dB)	Vibration level at the distance (*) (dB)			
		r=10m	r=12m	r=14m	r=16m
Embankment construction	82	53.9	44.6	35.5	26.4
Construction of driving piles	97.5	69.4	60.1	51	41.9
TCVN 6962:2001, ***the permissible level of 75dB from 7 ÷ 19h and the background level from 22 ÷ 6 pm.***					
DIN 4150, 1970 (*Germany*), 2mm/s: *no damage*; 5mm/s: *mortar damaged;*; 10mm/s: possible damage to supporting part; 20 ÷ 40mm/s: damage to the supporting part.					

(*)The distance from the edge of the road

Compare the results predicted with the permissible limit in QCVN 27:2010/BTNMT show that the largest vibration arising from construction earthworks is rollers. The residential areas are located 10m from the edge of the road/bridge at least should not be affected. Impact is negligible.

Impact level: SMALL

3.3.3. Impact to Water, Sediment Environment

a. Impact sources

The following activities created generated waste with potentially affect to water, sediment object in the project area, including:

- Activities for road construction::
  - Mud flow caused by erosion.
- Bridge construction activities:
  - Mud flow generated by erosion.
  - Drilling mud arising from the construction activities of the abutment piles, and piers located in the edge of the flow (Sat Bridge and Bun Bridge);
  - Solid waste scattered in the superstructure construction
  - Solid waste not collected after application;;
  - Construction of bored piles deep in the underground complex of water with the risk of dirty water overflow;
- Activity of construction sites:
  - Waste oil and oil-containing waste activities from waste arising from maintenance, change oil;
  - Sewage water activities arising from the operation of construction camps;
  - Sewage of concrete batching plants;
  - Spillage runoff through dirt re-suspended from the road;

b. Impact Assessment

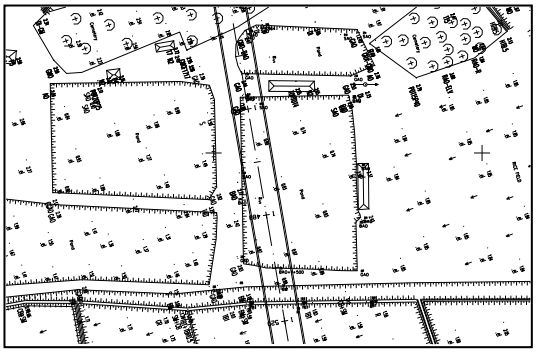
b1. Impacts generated from embankment excavation and backfill activities

b1.1. The risk of quality degradation during the construction of the pond excavation cut through the water pond

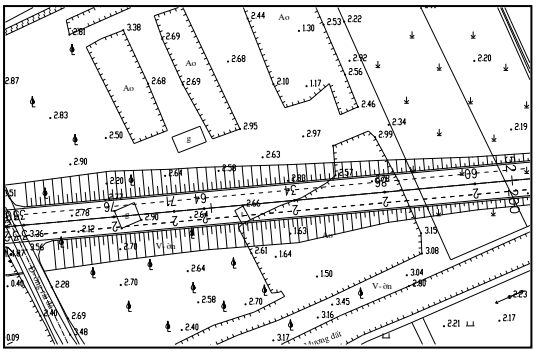
The project route crosses the pond at km0 +600; Km1 +450, +080 Km2, Km2 +200, Km 4 +600, +800 Km44, Km46 +400; Km52 +250. Currently, the pond is owned by households, in addition to water supply, some ponds are used for fish farming. Water and sediment quality in the pond water will be seriously affected in terms of water use for the purpose of aquaculture by TSS, turbidity arising from the start to finish construction of the road from the abortion dredging organic soil, mud and nail until the completion of the road.

Impact level: MEDIUM

Figure 3.7. Some ponds along the route



Pond (Km1+450)



Pond (Km52+250)

b1.2. The risk of soil spills and erosion and sedimentation during construction products earthwork and construction of the drainage system across

Embankment During construction, asphalt pavement barely, barely grassed slopes or stone, the rain will cause erosion. On the basis of the project area rainfall, slope and soil composition, application of soil erosion hill no grass on the embankments that are not reinforced 2.5 cm / year and piled soil in construction of the bridge abutment is 0.4% (Nguyen Thi Ngoc. ecosystem and environment. Agriculture Publishing House, 1997), predicted relative soil erosion potential arising in the construction sector (Table 3.26).

Table 3.26. Predicted Annual Amount of Soil Erosion, Corrosion by Rainfall in the Earthwork Land by the Items of Project

No	Item	Area of Slope/ linear meter (m^2)	Foundation Pit earthwork	Total of potential soil erosion (ton / year)	Potential soil erosion per meter (ton / year)
I	*Roadwork*	4 x 2	-	-	0,27
II	*Bridges of the project*				
1	Sat Bridge	-	5028	27	-
2	Tranh Bridge 1	-	4398	24	-
3	Tranh Bridge 2	-	4900	26	-
4	Bun Bridge	-	5888	32	-
5	Dia Bridge	-	3808	21	-
6	Tinh Bridge	-	4706	25	-

The project route crosses the ditch for agricultural activities of the people's communes in the region. The product if sediment erosion by rain water down the drain will affect water supplies for irrigation due to increased suspended solids sediment by diffusion of water masses. On the other hand, due to the small flow cross section than TSS pollution,

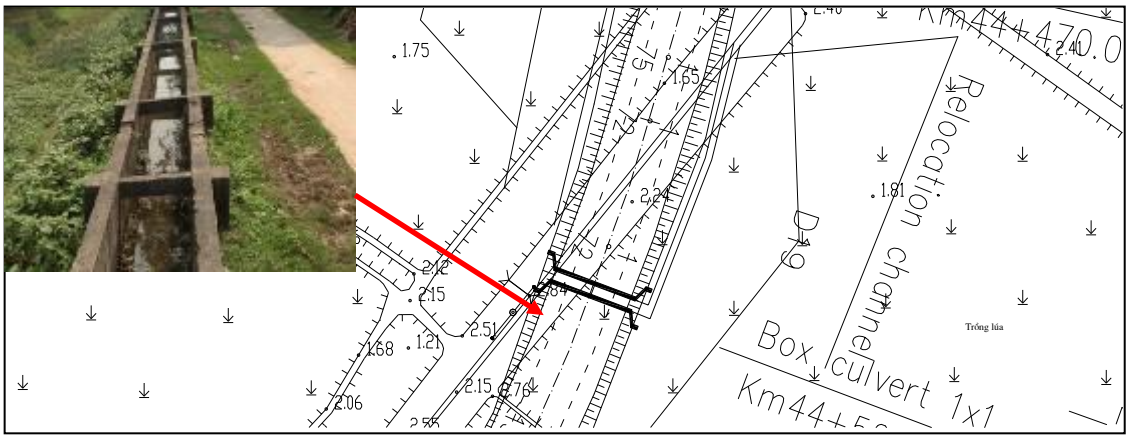
water in the ditch is also affected by aspects of water loss due to shallow muddy river bed sediment.

The potential risks during construction of roadbed earthwork.

Impact level: MEDIUM

Figure 3.8. Some of the Irrigation Canals along the Project

Irrigation Canal Km43+650



Irrigation Canal Km44+470

b2. Impacts generated from bridge construction activities

b2.1. The risk of contamination of water, sediment and ecosystem Sat River and Bun River by digging and construction of bored piles and adjacent flow

As stated above, Excavation and backfill activities from the pit will give rise to soil erosion at the bridge with an estimated volume of 6 ÷ 45 ton / year. Soil erosion by rain and spills from the excavation pit area if the spill flows down the rivers (Sat River, Cuu An River, Bun River, Quang Lang River and Dien Bien River) will cause deterioration of water quality due to increased levels of TSS in the water.

In addition, the foundation of the abutments Bun Bridge and Sat Bridge will be

constructed by bored piles technology that uses bentonite. Pursuant to the pile size and quantities of each abutment piles, piers determine the amount of soil and bentonite and bentonite spills incurred during the construction process (Table 3.27).

Table 3.27. Drilling mud arising from bored pile construction activities

No	Item	Mixed bentonite soil(1) (m^3)	Spilling Bentonite (2) (m^3)	Summary
1	Sat Bridge	1,255	502	1,757
2	Tranh Bridge 1	960	384	1,344
3	Bun Bridge	550	220	770
Total		**2,765**	**1,106**	**3,871**

Notes

(1) Is determined by the volume of soil drilling;

(2) During construction piles using bentonite by means of reverse circulation construction will be about 60% of the original bentonite is reused through circulation tank, infiltration into the soil outside the fraction remaining in the borehole nearly 40% is lost in the form of liquid spill.

The amount of bentonite mixed soil slurry is liquefied form by continuous pumping of water during drilling. Under construction, construction activities abutments with construction technology piles using bentonite to be carried out either by land or encirclement steel to ensure no spills and contaminants into the environment and all although the soil and bentonite and bentonite liquefied spills must be collected and handled according to the recommendations of the following forms:

- For the piers (abutments) on land: land and although bentonite and bentonite liquid has spilled to pretreatment at a beach. Let it dry and rough transport down to dump at designated places;
- For piers inside or adjacent to flow: although land and bentonite and bentonite spill liquid will move up or move the dump barges or give up the beach on the shore to dry and then transported move to dump at designated places.

However, in many cases, do not adhere to rules of construction, drilling mud spilled into the environment, even being discharged directly into the environment. And bentonite and bentonite soil if spilled on water penetration and Bun River Sun River will increase the suspended solids in the river water. Aquatic life in the area will die due to asphyxiation. Due to poor mobility, benthic organisms are not only at risk of choking deadly but can be destroyed by burying.

Impact level: MEDIUM

b2.2. The risk of water pollution, sedimentation of solid waste in the river by the bridge superstructure construction

When the bridge superstructure is under construction it appears solid waste spillage risk flow down below. Generally, solid waste includes the following categories: waste concrete, cement, iron and steel scrap wood chips even, plastic, wrapping equipment, household garbage. As the penetration of water into the river floating objects such as plastic, wrapping equipment, household waste will pollute the landscape, covering the water. The other solids accumulate on the surface of the solid sediment creating a favorable environment for pests, degrade water quality and ecology of the river sediment (Sat River, Cuu An River, Bun River, Quang Lang River and Dien Bien River).

b2.3. The pollution risk of surface water, the river sediments by solid waste not collected after construction

Includes steel ring surrounded the abutment / pier and construction materials of the temporary flow, while coastal distributed under construction, the construction division bracket on ... the bridge. These materials are not only likely to cause long-term contamination of the river sediments that can obstruct navigation operations (on Sat River). This risk is only lost when the reconstitution is done perfectly.

Impact level: MEDIUM

b2.3. The risk of groundwater contamination by surface water tran dirty on the cliff drilling pile construction

Layers of water of good quality and high reserves encountered at depths of about 25m. This is the source of drinking water for the local population in the project area. The foundation Sat Bridge, Bridge Painting 1 and Bun Bridge will be constructed using bentonite bored piles technology. When carrying out the construction of bridge abutments located in the edge of the flow and will use steel sheet pile to form a mob to prevent water and layout of machinery and equipment to carry out the construction of the siege. Water exists in the siege during the construction process for small, containing dirt from the pile construction, such as oil, grease ...

To protect the bottom floor geology are not collapsed from the impact of construction activities taking place at the top, will use the tube wall. The diameter of the pipe in the wall will be larger borehole diameter from 5 - 10cm. The length of the tube submerged in soil wall will be approximately 5m 7m -. During construction, the dirty water will spill over the fins on his gap between wall and drill down deeper plot. When infiltrated into the groundwater contaminants in the local complex will be absorbed and contaminate local groundwater in place piles and can also be dispersed in the

groundwater from the construction site piles.

The effect appeared during construction of bored piles at abutments and piers of Sat Bridge, Tranh Bridge 1 and Bun Bridge located in and adjacent flow.

Impact level: MEDIUM

b3. Impacts generated from site activities

b3.1. The risk of penetrating oil and waste oil in motorcycle maintenance station from the layout of the site

Oil and waste oil generated at the site is available from three sources:

- *Waste oil from routine change oil transportation facilities and equipment:* Waste oil waste oil is expected on every media (7 liters / replace) and cycle instead (117 shift/ change time). According to the calculation results, the amount of all vehicle construction project is 59,740 shifts, then the quantity of waste oil is 3,574 liters, equivalent with 298liters of waste oil / month. Waste oil will be contained in the camps where the motorcycle gathering in the site layout;
- *Water for machine maintenance:* Vehicle maintenance activities may take place at the yard motor in the field supply of 11 m3 / day wastewater containing oil (table 3.28). Oil content in the permissible limit according QCVN 40/2011/BTNMT, column B when poured into the water used for irrigation (C_{max} = C x Kq x Kf);

Table 3.28. Wastewater Flow and Load from the Maintenance Operation of Machines

Waste type	Discharge (m^3/ day)	Concentration of contaminants		
		COD (mg/l)	Oil (mg/l)	SS (mg/l)
From equipment maintenance	2	20 ÷ 30	–	50 ÷ 80
Cleaning of machinery	5	50 ÷ 80	1.0 ÷ 2.0	150 ÷ 200
Cooling of machinery	4	10 ÷ 20	0.5 ÷ 1.0	10 ÷ 50
Total	**11**	**30 ÷ 49**	**0.6 ÷ 1.3**	**81 ÷ 124**
QCVN 40:2011/BTNMT, cột A		***C=50***	***C=5***	***C=50***
QCVN 40:2011/BTNMT, cột B		***C=100***	***C=10***	***C=100***

Note: A specified column C values of the parameters of pollutants in industrial wastewater is discharged into the receiving water is used for drinking water supply purposes; column B specified C value of the pollution parameters in the industrial waste water discharged into the receiving water is not used for water supply purposes.

- *Oily solid waste in the motor operating and maintenance activities:* Solid waste generated from oil change oil operations, equipment maintenance and component

with a rag and oil, machine casing ... However, this amount is very small and also collectors. It is difficult to quantify this waste due to their dependence on the number of machines and equipment are used, the contractor's intention to proceed whether maintenance of machinery and equipment in the field or not ... Experience showed that they were not great. This type of waste is generated every day in the road works area.

For some reason the waste oil from the project on the water penetrate the river caught will cause water pollution. Oily rag after some time will settle to the bottom, in addition to causing sediment pollution, investment exit rag slowly and diffused into the body of water, create wine oil on the surface of the water, pollute the water. Oil is also a source of toxic emissions to the aquatic organisms in the water. Through the food chain, the oil will accumulate from low-level organisms (algae, the phytoplankton) to higher-level organisms (fish species, fish...).

Besides, due to the Project area is dense system of irrigation canals and be connected to the penetration of water into the rivers, oil spills and emit fields through regional irrigation system irrigation. Water pollution by oil causing damage not only to objects adjacent farming, but also in more distant objects.

The risk of pollution lasted the duration of the construction to serve, even if no longer lasting measures to collect oil and clean oil cloth when detected they appear in the river bed rivers.

Impact level: HIGH

b3.2. The risk of water penetration living sewage from the worker camp area

Domestic sewage from worker camps, including water from water used for preparing meals (V_{NA}) and from water used for washing, cleaning (V_{TG}). Based on the level of water applied to the construction workers in the field in standard 20TCN 4474 - 87 "norms water used for preparing meals" is 25 liters / person / day and by standard 20TCN33 - 85 "norms water used for washing "is 45 liters / person / day and 80% of water use will be discharged into the environment, the amount of sewage in the environment is 2.8 m3 (corresponding to 50 workers).

Based on the load factor of the contaminants in urban sewage of the World Health Organization, WHO, 1993. Volume 1. "The rapid assessment method of environmental pollution" has identified the pollutant load in the environment resonate with 50 workers (table 3.22)) and the concentration of the contaminant (table 3.23) in wastewater activities of the project construction workers.

Table 3.29. Load Factor and Amount of Contaminants in Urban Sewage

No	Contaminant	Load factor (g/person/day)	Load (kg/day)
1	BOD_5	45 ÷ 54	4,5 ÷ 5,4
2	Total solids (TS)	170 ÷220	17 ÷ 22
3	Coliform	$10^6 \div 10^9$	$10^8 \div 10^{11}$

Table 3.30. Concentration of Pollutants in Sewage

No	Parameter	Pollutant concentration (mg/l)		Cmax (QCVN 14:2008/BTNMT)
		Untreated	Through septic tanks	
1	BOD_5	281,2 ÷ 337,5	62,5 ÷ 125	60
2	TSS	437,5 ÷ 906	31,2 ÷ 134,5	1.200
3	Total Coliform (MNP/100ml)	$0,6.10^7 \div 0,6.10^{10}$	–	5.000

Note: $C_{max} = C. K$

- *C_{BOD} = 50mg/l, C_{TSS} = 100mg/l (applied column B, Table 1, QCVN 14:2009/BTNMT - water not used for drinking water supply)*
- *K = 1.2 - the basis of production of less than 500 people..*

It can be seen, as soon as sanitary wastewater was pre-treated by septic tanks, sewage contaminants in the from worker camps still exceeded Cmax by QCVN 14:2008/BTNMT with K = 1.2 with manufacturing facilities under 500 people many times when waste water type B according QCVN 08:2008 / BTNMT (table 3.30). It is noted that if the septic tank BOD_5 concentration is about 4.5 times higher; COD - about four times; and TSS - about 14 times. This type of waste generated daily in worker camps in the 24 months of construction for road jobsite and 12 construction months for Go bridge site.

If this waste is allowed running into surface waters in the rivers (Sat River, Cuu An River, Bun River, Quang Lang River and water is contaminated wastes at risk of eutrophication, toxicity or death to aquatic ecosystems.

Impact level: MEDIUM

b3.3. The risk of penetration of the active sewage water from concrete station

At the construction site will be arranged for batching capacity 50m3 / h. According to norms, 50m3/gio capacity, countries will need to wash aggregate 87m3 and 10m3 to mix concrete, 80% water after each wash aggregate will be reused. Thus, for each batch will give rise to 20.88 m3 of sewage water with high pH (>12).

With demand for construction concrete project is 10.711m^3 identified:

- Water Demand: 5.870m^3;
- The amount of sewage water generated: 3.797m^3;
- The amount of suspended solids in the sewage water generated: 3,04tấn (estimate the amount of solid waste floating in the sewage water from mixing up 0,08%).

When mixing concrete, in addition to the amount of water used to mix, but it requires a large amount of water to wash the aggregate rise sewage water with suspended solids and high pH. Thus, if not well managed and to penetrate into surface water, sewage water from the operation of cement concrete mixing plants will increase the pH of water and water pollution by TSS, and affect ecosystem of water in the river (Sat River, Cuu An River, Bun River, Quang Lang River and Dien Bien River).

Impact level: MEDIUM

b3.4. The risk of spilling dirt from the surface of by storm water runoff

Storm water runoff through the construction area will be brought under the surface dirt, mud within the site can also stream and storm water runoff from escaping. The amount of storm water runoff through surface of construction site are calculated according to limited rainfall intensity (TCXDVN 51/2008):

Q = q. F. c. N

Of which:

- *Q: calculating discharge (m^3/s);*
- *q: rain intensity (l/s.ha);*
- *F: water abyss surface area (ha), (for the Project jobsite F =0,5ha);*
- *c: flow coefficient, (for project construction sites: c = 0,32 with P = 2; c = 0,34 with P = 5; c = 0,37 with P = 10; c = 0,4 with P = 25; c = 0,44 with P = 50);*
- *N: distribution coefficient of showers, (for the site surface, N = 1);*

Rainfall intensity calculations (q) is defined by the formula: q= A(1+ClgP)/(t+b)n

In which:

- *q: rainfall intensity (l/s.ha);*
- *t: calculating raining time (minutes); in the case of storm water runoff on the surface of t there is no drainage system in the range of 8 ÷ 12 minutes, averaging 10 minutes;*
- *P: rain cycle repeated calculations (in);*
- *A,C,b,n: parameters determined by the local rainfall conditions (Appendix II, TCXDVN 51/2008, Hung Yen area: A = 760; C = 0,59; b = 20 and n = 0,83).*

The result of the calculation of storm water runoff at the site shown in Table 3.31.

Table 3.31. Storm Water Runoff Through the Construction Area of Project

Calculating repeated cycle of rain (P)	2	5	10	25	50
Rainfall intensity q (l/s.ha)	53	64	72	82	90

Calculating repeated cycle of rain (P)	2	5	10	25	50
Water discharge Q (m^3/s)	17	18	19	21	23

When the field surface runoff, rainwater washed capable of many things including dirt down the outside of the lower areas, including water resources. With a variety of waste components on the surface of the site, surface water in the river (Sat River, Cuu An River, Bun River, Quang Lang River and Dien Bien River) are at risk of contamination by oil, organic matter, solids, heavy metals and floating vegetation. The impact appears to rainy period of the year (May to September).

Impact level: MEDIUM

Figure 3.9. Several rivers cut through by the route

Sat River (Ke Sat)

Cuu An River (Tranh Bridge 1)

Cuu An River (Tranh Bridge 2)

Bun River

Quang Lang River

Dien Bien River

3.3.4. Impact on Soil Environment

a. Impact Source / Source-generating Activities

These activities generate waste and impact factors likely to influence the soil environment (residential land, agricultural land), including:

- The mud caused by erosion at construction sites: As stated in Section 3.2.3, "The impact on water and sediment environments," rainfall would cause erosion at the base of the road under construction is not reinforcement. In the rainy season, soil erosion potential volume generated per meter Embankment construction is expected to be: 0.27 m3 (to the new NH38). This soil has been liquefied by the rain, came down easily lower school lands two routes.
- Operation of construction equipment and machines: A range of machinery with large capacity will be used for construction of the project along the item and are gathering at parking machines in the road works area. Construction activities on the site and surface movement of transport vehicles along the external land zoned for the project will create pressure on the lower surface.

b. Assessment

b1. Agricultural land burying

Agricultural land is very sensitive to the deposition conditions. When topsoil 10cm rice, crops, particularly rice premature damage even premature death. With the amount of soil erosion potential in road construction if sediment down the farmland, according to the degree of harm (10cm government) and the range is affected by the width of about 1.35 m on each side. Potential impacts during construction Embankment Road (approximately 16 months), focused on rainy period (May ÷ September).

The agricultural lands surrounding the dump material will be buried by the spill. Despite the limited scope of influence than the product of sediment erosion due to rain, but the potential impact is greater extent than caused by the buried material is structured to not only kill plants but also alter the physical properties of the soil. Time potential impact extends throughout the construction phase Embankment (about 16 months). Due to the specific location of the dump material may not clarify the step up investment projects should not determine the type and location of land affected.

Impact level: MEDIUM

b2. Impact on Community Activities caused by muddiness

Soil erosion potential when spilled down the residential land area is lower road construction location (residential areas km0 +000; Km2 +450, Km 4 Km 4 +350 +200

÷, ÷ Km44 Km43 +600 +000) when the rain would have caused swamp of mud and chemicals. Lay of not only adversely affect the environmental landscape but also obstruct the community activities. Potential impacts during the rainy inertia (May ÷ September).

Impact level: MEDIUM

b3. Impact caused by operation of construction machines

Construction activities on the site and surface movement of transport vehicles along the external land zoned for the project will create soil compaction availability. Although there are public or Service, but in the course of construction, it is difficult to avoid entirely the means of construction encroaching into agricultural lands adjacent corridors cause soil compression. Becomes compacted soil degradation, pet bottles broken by structure, porosity and permeability reduction. Placements probability is high compaction of arable land and along the road works area.

Impact level: MEDIUM

3.3.5. Impact on Traffic and Traffic Safety Issue

a. Impact sources

The following activities create impact factors can affect the operation of road transport and waterways, including:

- Construction activities of the intersection with the flyover approach roads at NH5, dike (Km4+300); access road to Phu Ung vestige (Km5+025), NH38, PR204, PR200, access road to Dien Bien River bank (Km52+390) and NH39;
- Activities of paving the section coinciding with NH38 (Km33+963 ÷ Km38+400; Km43+600 ÷ 47+600);
- Material transportation activities by road way using national highways, provincial roads and local roads causing slippery and damaging the public utilities;
- Construction of 1 pier of Sat Bridge inside the water flow.

b. Assessment

b1. Congestion and unsafe traffic due to activities of paving and construction of interchanges

Encroachment corridor traffic during the construction period coincides NH38 (Km33 +963 +400 ÷ Km38, Km43 +600 ÷ 47 +600) and the intersection with the Highway 5 bridge, embankment (Km 4 +300); road to Phu Ung vestige (Km5 +025), NH38, PR204, PR200, Dien Bien River Coastline (Km52 +390) and NH39 to arrange items

such as construction materials Posts, motorcycle construction brings current risk of traffic jams even unsafe traffic on the cross road, NH38 and NH39 especially because this is the route the traffic density is very crowded, many truck and continuous operation during day and night. Additionally increasing the quality of the project vehicle involved in the construction of these nodes makes traffic congestion worse. Potential impacts during the construction of interchanges.

Impact level: HIGH

b2. Increased risk of traffic accidents due to transportation activities from spillage of material causes muddy, slippery

These material transport vehicles, waste from mines / dumps materials and construction areas will glue the tires on soil adhesion. And ROI dust on the road and in the water will also be liquefied. Liquid mud on the road surface creating slippery conditions and increase the risk of lost traffic safety. Collisions occur not only between road vehicles and construction equipment, but also can occur between the vehicles together. The risk of slip appear on the shipping route (Highway 5, NH39, PR200 ... see table 1.5).

Impact level: HIGH

b3. Community facilities damaged by road transport in the lower

In step up investment projects can not be determined because the exact distance or inter-village link is used to convey materials and waste from mines / dumps the material Highway, the road from the provincial and regional construction and waste area to the impact on community facilities in transit are only forecasts. As mentioned which uses inter-village or venture far to haul it impacts on community facilities primarily:

- Damage, degraded during construction;
- Damage entirely if not recover after the construction.

Road damage, indirect losses caused to local people or daily use. Frustrating this took place during the construction period and longer lasting yet not be refunded or at least its original state as.

Impact level: MEDIUM

b4. The risk of accidents on the water by means of system activities of float system

Currently on Sat Sat River Bridge construction area with water media (mainly barge) transport of building materials and a small boat back and forth. To proceed with

construction of 01 offices in Sun River flow, will need at least 01 permanent barge construction to serve. Increased water crafts from project operations, as this may increase collisions between media at the river bridge construction. Accidents glass vessel sink can cause threats to human life and property.

Impact level: HIGH

3.3.6. Impacts due to Material Exploitation

During the feasibility study phase, detailed planning for borrow-pit area as well as materials transport route were only estimated. In the extraction process materials and material transport by road, in addition to the effects arising during transportation of materials such as dust (Section 3.2.1), affecting traffic and damaged community facilities (Section 3.2.5) has been presented above, mining can occur as impacts:

- impact on the ecological environment around the mining areas: To conduct mining need peeling layers of vegetation leading to reduced biodiversity in the hills, increased erosion. However, in the mining area, exist only secondary vegetation such as grass and shrubs, plants and animals are not endangered species needs to be protected, the impact on the environment is small ecological.
- Changing Landscape: The landscape will be changed in opencast mining, damaging the aesthetic value of the natural environment of the surrounding area. In the case of the Project, the pits are now provincial government has plans and activities. Exploitation activities from material therefore may have an impact on the local landscape with small scale;
- environmental impact of air, noise, vibration: mining materials can cause air pollution by dust and noise, vibration (in the case of mine used to break the ice)...

Mining operations will generate much impact on the surrounding environment, to avoid the impact of this project will not only open new mines in the mine purchase materials / materials have been licensed and are operating 2 provinces in the area and the surrounding areas. Thus, the impact of mining materials is limited only during transport.

Impact level: SMALL

3.3.7. Impacts of waste rock and soil dumping

Waste rock and soil should be disposed of as organic soil and plant roots arising from the excavation and soil roadbed arising from soft soil treatment area. Rock type does not meet the material requirements of the project and should be discarded, no toxic ingredients. This is a good source material can leverage to leveling the civil sector is

not high demand for the material. Like Excavation and backfill activities from transportation and material / waste, in addition to the effects arising during transportation, the rock types in the area can pour out the overflow area adjacent causing buried or filling of wetlands:

- For the summer, Trang Liet commune: This is located in the residential area of land area, soil and rock types from the spill area needs leveling can cause muddy areas of adjacent residential dump over that affect communities living in the area;
- For the remaining positions: Surrounded by land area is used by local people for agricultural purposes, soil type spill can cause buried damaged agricultural land the income of the people (similar in case of spillage and digging area for temporary storage of materials.

Impact level: MEDIUM

3.3.8. Impact by Concentration of Workers

a. Impact sources

With a concentration of about 50 workers in each construction site for about 24 months will create the risk of generating following problems:

- Arising infectious diseases;
- Arising conflicts.

b. Assessment

b1. The risk of disease transmission

Unsatisfactory sanitation condition in temporary houses in the jobsites will be the risk of diseases spreading such as dengue fever, eye diseases, etc. among workers, then spread into the surrounding residential areas. In addition, there is the possibility of the risk of spread of infectious diseases such as HIV / AIDS have indiscriminate sex with prostitutes by workers from other provinces and back to infected workers from local residents. However, last seen in the area are mostly agricultural areas, services are at risk of disease transmission such as prostitution societies without publicity, or do not see the manifestation of these activities.

Impact level: MEDIUM

b2. The risk of Conflict

If the labor force will not be easy to propagate good order and security violations locally. In addition, the project area is, with local village culture tradition locally, due to differences in lifestyle and culture among workers and residents in the area should

be easy to play student conflict, especially the youth. The collision and material disputes, stolen property of the citizens and businesses of construction, the loss of materials and equipment, crops ... are the causes of conflict, conflict, loss local social security.

Impact level: MEDIUM

3.3.9. Impact on the Landscape

a. Waste/waste generation activities

Wastes generated during the construction phase, including project:

- Waste rock and soil from the training activities and the construction of the bridge substructure
- Discarded Stuff, solid waste from building construction activities;
- Solid waste from operating activities of worker camps;

Details of the types and composition of solid waste generated is presented in Table 3.32.

Table 3.32. Solid waste/ Discarded Stuff Generating in Construction Phase

No	Activities	Waste arising			
		Types	Composition	Position	Time
1	Project construction	Discarded Stuff, solid waste	Waste rock, soil bentonite time, seconds, scrap wood, concrete, rubish ...	Along the project	24 months .
2	Living Workers.	Solid waste	Bottles, cans, food waste, organic matter	site	24 months .
3	Concrete batching plant	Sewage water	Sediment (suspended solids).	site	24 months.

b. Impact Assessment

The risk of environmental landscape pollution by solid waste

- *Waste soil and stone:* Waste soil and stone are only generated from construction of digging and excavating items and bored pile, including (i) Roadbed Excavation; (ii) Construction of sub-structures of bridges. Table 3.33 synthesized the volume of waste soil and rock construction items above which is arisen and disposed.

Table 3.33. Volume of Waste Soil and Stone to Dispose

No	Item	Volume of waste soil (m^3)						Time (month)
		Excavation and filling balance			Bentonite mixed soil (3)	Bentonite overflow (4)	Total	
		Excavated soil	Re-use(1)	Waste soil (2)				
I	Roads and at-grade intersections	230,350	207,315	23,035	-	-	23,035	16
II	Bridges of the project	11,355	10,220	1,135	1,805	722	3,662	8-15
	Total	**241,705**	**217,535**	**24,170**	**1,805**	**722**	**26,697**	-

Note:

- *(1). Reuse of land for the road based on the Demonstration Project; work for the remaining estimated 90% of the excavated soil arising;*
- *(2). Soil type should be emptied after digging and leveling;*
- *(3). Is determined by the volume of drilling in the ground;*
- *(4). In the process of construction of bored piles using bentonite by means of reverse circulation construction will be about 60% of the original bentonite is recycled through the recirculation tank, in addition to the small penetration into the soil in the remaining holes nearly 40% is lost in the form of liquid spill.*

As a result, the entire project will generate approximately 26,697m^3 of waste soil and rock, which is discharged after balance of excavation and filling. In which, waste soil accounted for the highest percentage of 90.5% (24,170m3), then bentonite-mixed soil 6.8% (1805m3) and spilled bentonite solution 2.7% (722m3).

- *Construction Solid waste:* It is generated from each item of project, including construction activities of superstructure and sub-structure of bridges, impletion of road portion, intersection… Component of these types includes crushed residue, wood chips, coal slag, mortal residue and residual concrete... The forecast of waste in each item construction is almost upper formable because it depends on many factors. Supervision experience shows that its volume is not big but it exits daily during the construction stage.
- *Domestic Solid Waste:* There shall be arranging 06 construction sites in Project area with 50 workers in each construction site. On average, a person discharges 0.5kg of solid waste per day, which is 25kg produced by the workers per one construction site. The components of this waste contain many kinds of organic substances, which are easy to be decomposed like waste food and difficult to be decomposed like waste cans, plastic, paper... This is waste that is produced every day during the construction stage.

With ingredients including normal solid waste, waste and garbage will not create

pollution caused serious environmental degradation. However, if not collected quickly and appropriately, these wastes can be dispersed into the ambient environment, polluting the environment and landscape and to create conditions favorable for the pest species (rats, cockroaches ...) development.

Impact level: MEDIUM

Impacts in construction phase are summarized in the following table:

Table 3.34. Summary of the impact in construction phase

Impact	Location	Duration/frequency	Impact level
Air pollution caused by dust and impact on community heath	– Along the new section; – Residential areas (Km0+000; Km4+200 ÷ Km4+350; Km43+600 ÷ Km44+000)	2 years	Medium
	Along the transport roads (NH39, QL1A, QL5, PR200...)	2 years	Medium
	Surrounding location of mixing station.	2 years	Medium
Impact on community caused by noise pollution	– Residential areas (Km0+000; Km43+600 ÷ Km44+000; Km4+200 ÷ Km4+350; Km44+800) – Ngoc Mai Pagoda(Km0+400); Polictical training center and The People's Procuracy(Km2+450), Sa Lung Communal house (Km4+550); An Thi District Clinic (Km46+100)	2 years	High
Impact on community caused by vibration	Surrounding location of roadbed construction and driven piles (Tranh Bridge No.2, Dia Bridge, Tinh Bridge)	2 years	Small
Pollution of surface water	At the ponds, which the route passes through (Km0+600; Km1+450; Km2+080; Km2+200; Km4+600; Km44+800; Km46+400; Km52+250)	2 years	Medium
	Irrigation canals	2 years	Medium
	Sat River, Cuu An River, Bun River, Quang Lang River and Dien Bien River	Long term	High
Pollution of ground water	Vị trí thi công cọc khoan nhồi tại Sat Bridge, Tranh Bridge 1, Bun Bridge	8 ÷ 15 months	Medium
Impact on soil environment	Đất nông nghiệp dọc tuyến	2 years	Medium
	Đất thổ cư (residential areas Km0+000;	2 years	Medium

Impact	Location	Duration/frequency	Impact level
	Km2+450; Km4+200 ÷ Km4+350; Km43+600 ÷ Km44+000)		
	Công trường	2 years	Medium
Obstruct and cause traffic unsafely	Secions are speaded asphalt concrete on the NH38 (Km33+963 ÷ Km38+400; Km43+600 ÷ 47+600) and intersections.	2 years	High
	On the roads of material transportation	2 years	High
	01 pier of Sat Bridge is installed in the river flow	3 months	High
Impacts due to worker concentration	06 construction sites	2 years	Medium
Impact on landscape	At the locations of construction and construction sites	2 years	Medium

3.4. Impacts in the Operation Phase

Table 3.35 summarizes impact sources related and not related to waste in operation phase

Table 3.35. Summary of Impact Sources Arising in Operation Phase

No	Related to Wastes	Type of Waste that can arise
1	Operation of vehicle engines	Dust, toxic gas(CO, NO_2, SO_2, VOC).
2	Operation of Vehicle flow	Dust whirled from road surface
No	**Not related to Wastes**	**Impact Factors**
1	Vehicle flow activities	Noise, vibration
2	Appearence of new route.	Separation, fragmentation of agricultural land. Partial flood.
		Strengthen operation capacity.
3	Appearence of a new route.	Change of hydrologic hydraulic regime

3.4.1. Air Environment

a. Waste/waste generation activities

- Activities giving rise to the waste, potentially affecting quality of air environment, including:
- Operation of vehicle engines;
- Operation of vehicle flow.

b. Assessment

b1. Air pollution caused by dust

Dust and Exhaust generated from operation of vehicle engines (CO, NO2, SO2, HC)

Forecasting flow of dust and exhaust emission flow from combustion of fuel of vehicle flow running on the roads is based on the following basics:

- Data from vehicle flow forecast in year 2035 (table 3.36) with a vehicle amount at rush hour calculated by 8% of the total vehicle amount day and night.
- Pollution coefficient announced by World Health Organization (WHO) (see Table 3.37);
- National Technical Standard on petrol and diesel (QCVN 1:2007/BKHCN) with content of sulphur in petrol and diesel applied in traffic at S = 0,05%.

The result of calculation is mentioned in table 3.36.

Table 3.36. Summary of Traffic Demand

No	Vehicle	Unit	Section	
			Boi Khe	Truong
1	Motorcycle	Cars/day	11,356	7,811
2	Car	Cars/day	2,511	3,231
3	Small bus	Cars/day	68	162
4	Large bus	Cars/day	608	352
5	Light truck	Cars/day	468	300
6	Medium	Cars/day	2,103	1,956
7	truck with 3 axles	Cars/day	2,070	2,957
8	truck with > 3 axles	Cars/day	493	670
	Total	Cars/day	**19,677**	**17,439**

Source: Feasibility Study Report

Table 3.37. Air Pollution Coefficient for Transportation Means of WHO

Vehicle	Unit (U)	TSP (kg/U)	SO_2 (kg/U)	NO_x (kg/U)	CO (kg/U)	HC (kg/U)
1. Car (small car and pass.car)						
- Engine <1400 cc	1000km	0.07	1.74S	1.31	10.24	1.29
	ton diesel	0.80	20S	15.13	118.0	14.83
- Engine 1400-2000 cc	1000km	0.07	2.05S	1.33	6.46	0.60
	ton diesel	0.68	20S	10.97	62.9	5.85
- Engine >2000 cc	1000km	0.07	2.35S	1.33	6.46	0.60
	ton diesel	0.06	20S	9.56	54.9	5.1
Average	**1000 km**	**0.07**	**2.05S**	**1.19**	**7.72**	**0.83**
2. Truck						
- Gasoline running truck > 3.5 ton	1000km	0.4	4.5S	4.5	70	7
	ton diesel	3.5	20S	20	300	30
- Small truck (diesel) < 3.5 ton	1000km	0.2	1.16S	0.7	1	0.15
	ton diesel	3.5	20S	12	18	2.6
- Big diesel vehicle 3.5 -16 ton	1000km	0.9	4.29S	11.8	6.0	2.6
	ton oil	4.3	20S	55	28	2.6
- Very big truck (diesel)>16 ton	1000km	1.6	7.26S	18.2	7.3	5.8
	ton	4.3	20S	50	20	16
- Big Bus (diesel) >16 ton	oil	1.4	6.6S	16.5	6.6	5.3
	1000km	4.3	20S	50	20	16
	ton oil					
Average	**1000km**	**0.9**	**4.76S**	**10.3**	**18.2**	**4.2**
3. Motor bicycle						
- Engine <50cc. 2 stock	1000km	0.12	0.36S	0.05	10	6
	ton diesel	6.7	20S	2.8	550	330
- Engine >50cc. 2 stock	1000km	0.12	0.6S	0.08	22	15
	ton diesel	4.0	20S	2.7	730	500
- Engine >50cc. 4 stock	1000km		0.76S	0.30	20	3

Vehicle	Unit (U)	TSP (kg/U)	SO_2 (kg/U)	NO_x (kg/U)	CO (kg/U)	HC (kg/U)
	ton diesel		20S	8	525	80
Average	**1000km**	**0.08**	**0.57S**	**0.14**	**16.7**	**8**

- *Source: WHO. 1993. Assessment of source of air, water and land pollution. A guide to rapid source inventory techniques and their use in formulating environmental control strategies. Part one: Rapid inventory techniques in environmental pollution.*
- *S: is sulphur concentration in the fuel*

Table 3.38. Result Forecast of Emission Flow from Vehicle Flow at Rush Hour

No	Section	TSP	CO	NO_2	SO_2	HC
		(mg/ms)				
1	Boi Khe	0.123	9.207	0.837	< 0.001	1.387
2	Trương	0.132	7.645	0.821	< 0.001	1.186

Dust whirled from the Tire during vehicle operattion on the road

Based on the traffic flow forecast (Table 3.36) and emission coefficient of dust whirled from road surface from the World Health Organization (Table 3.39) have identified dust flow whirled from the tire during the operation of vehicles on the road, the during peak hours (Table 3.40).

Table 3.39. Emission Coefficient of Dust Whirled from Road Surface

No	Type of road	Unit (U)	TSP (kg/U)
	Paved road		
1	Urban road (width <10m, <500 vehicles/day)	1000 km	15
2	Urban road (width >10m, 500 ÷ 10.000 vehicles/day)	1000 km	10
3	Highways (>10.000 vehicles/day)	1000 km	4.4
4	Expressway (>50.000 vehicles/day)	1000 km	0.35

Source:: WHO, 1993. Assessment of source of air, water and land pollution. A guide to rapid source inventory techniques and their use in formulating environmental control strategies. Part one: Rapid inventory techniques in environmental pollution.

Table 3.40. Dust Flow whirled from the Tire

Section	Vehicle Volume at rush hour (vehicle/h)	Emission Coefficient of Dust Whirled from Road Surface (kg/1.000km.vehicle)	Dust Flow of Dust Whirled from Road Surface (mg/m.s)
Boi Khe	1,574	4.4	0.693
Truong	1,395	4.4	0.614

Total flow of dust and exhaust generated from operation of vehicle flow

Due to dust and toxic gases generated simultaneously in the same range of space, a total of dust and toxic gases emission flow when operating vehicle on the road will be sum of the dust and toxic gases emission arising from the engine and dust whirled from the road (table 3.41)

Table 3.41. Total Flow of Dust and Exhaust generated from Operation of Vehicle Flow

Section	TSP *(mg/ms)*	SO_2 *(mg/ms)*	NO_2 *(mg/ms)*	CO *(mg/ms)*	HC *(mg/ms)*
Boi Khe	0.816	< 0.001	0.837	9.207	1.387
Truong	0.746	< 0.001	0.821	7.645	1.186

Using the Sutton model (details are presented in construction phase) have determined the concentration of dust and emissions arising from the vehicle operation (Dust whirled from road) (table 3.42).

Table 3.42. Forecast Result of Concentration of Dust and Exhaust generated from Vehicle Operation in 2035

Year	Location	Flow (mg/ms)	Distribution of Concentration as per Distance (mg/m^3) (1)					permissible limits (2)
			5m	10m	25m	50m	100m	
Boi Khe Section								
2035	*TSP*	Winter	0.062	0.055	0.039	0.027	0.017	**0.3**
		Summer	0.181	0.158	0.112	0.077	0.050	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.35**

Year	Location	Flow (mg/ms)	Distribution of Concentration as per Distance (mg/m^3) (1)					permissible limits (2)
			5m	10m	25m	50m	100m	
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.003	0.002	0.002	0.001	0.001	**0.2**
		Summer	0.007	0.006	0.005	0.003	0.002	
	CO	Winter	0.704	0.616	0.437	0.300	0.193	**30**
		Summer	2.039	1.784	1.267	0.869	0.560	
	HC	Winter	0.106	0.093	0.066	0.045	0.029	**5**
		Summer	0.307	0.269	0.191	0.131	0.084	
Truong Section								
2035	*TSP*	Winter	0.057	0.050	0.035	0.024	0.016	**0.3**
		Summer	0.165	0.145	0.103	0.070	0.045	
	SO_2	Winter	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.35**
		Summer	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
	NO_2	Winter	0.003	0.002	0.002	0.001	0.001	**0.2**
		Summer	0.007	0.006	0.005	0.003	0.002	
	CO	Winter	0.584	0.511	0.363	0.249	0.160	**30**
		Summer	1.693	1.482	1.052	0.722	0.465	
	HC	Winter	0.091	0.079	0.056	0.039	0.025	**5**
		Summer	0.263	0.230	0.163	0.112	0.072	

(1) Distance from the edge of the road

(2) Permissible limits according to QCVN05:2010/BTNMT and QCVN06:2010/BTNMT

Compare the results predicted with the permissible limits in QCVN05: 2009/BTNMT show that, until 2035, at the distance of 5 meters from the edge of the road:

– No apearance of dust pollution in both of winter and summmer; dust concentration is smaller than permissible limit at the distance of 5 meters from the edge of the road

– The concentration of dust arising from fuel combustion of operation of vehicle flow is less than the permissible limit

Impact level: SMALL

3.4.2. Impacts on local community heath

a. Impact sources

In operation phase, community heath may be affected by noise, vibration generated from traffic flow on the road.

b. Assessment

b1. Noise Pollution

Model ASJ 2003 is used to predict average equivalent noise level (Leq) per hour (dBA) at the received objects along the route, This model is developed by "Acoustic Society of Japan" (ASJ) and is being widely used in Japan. The prediction order of model ASJ Model 2003 is applied for Project as follows.

- Prediction method and calculation formula:

Noise level caused by a transport means is calculated by the following

$$L_{AE} = 10\lg\left(\frac{1}{T}\sum_{i=1}^{n} 10^{0,1L_1}\Delta t_i\right)$$

In which:

LAE: noise exposure level over one time unit (one vehicle);

Δti: a certain period of time set to calculate LAE;

Li: source noise level in a period of time Δti.

Average equivalent noise level of the vehicle flow is calculated by the following:

$Leq = L_{AE} + 10\ lgN - 10\ lg\ (T/t_0)$

In which:

N: traffic volume;

Leq: average equivalent noise level, dBA;

T, t0: time in second (t0 = 1 second).

- Calculation process has been programmed
- The noise level calculation has been programmed on PC version
- Power level is calculated the following formula, applied for continuous vehicle flow

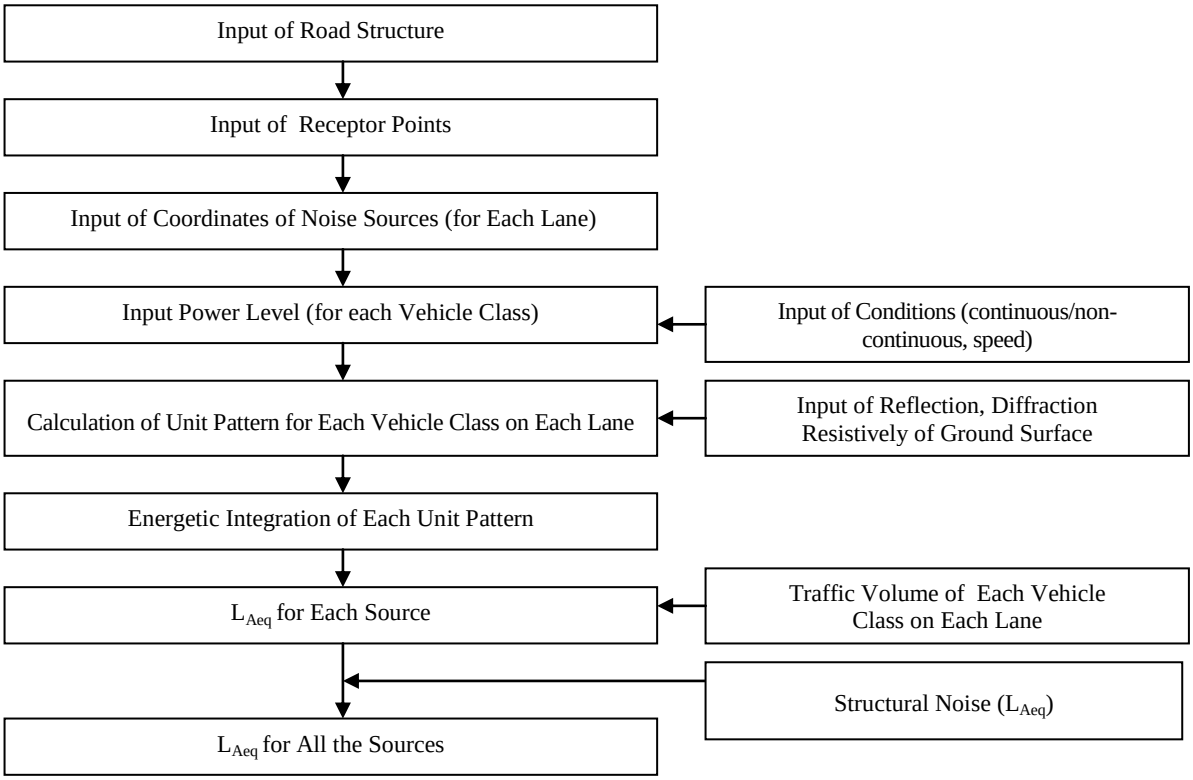
L_{WA}= 46.7 + 30log10V (for small vehicles as passenger car, motorcycle, small truck, car)

L_{WA}= 53.2 + 30log10V (for big vehicles as bus, heavy truck)

V: vehicle's speed.

- Input of Model
    - Vehicle's flow at rush hour, calculated by 8% of the total vehicle traffic volume per day.

- Speed of traffic flow at rush hour, calculated by 60% of design speed 48km/h.
- The prediction order of model ASJ Model 2003 is applied for Project as follows:



The forecast results on noise level during operation phase are presented in Table 3.43 and Figure 3.10 ÷ 3.11

Table 3.43. Prediction Results of Noise Reduction (dBA)

Section	Noise Reduction Depending on distance (*) (dBA)				
	0m	5m	10m	25m	50m
Boi Khe	75.9	75.3	74.5	73.5	72.0
Truong	75.2	74.7	73.9	72.9	71.3

(*) Distance from right of way

Figure 3.10. Prediction Results of Noise Reduction on Boi Khe Section

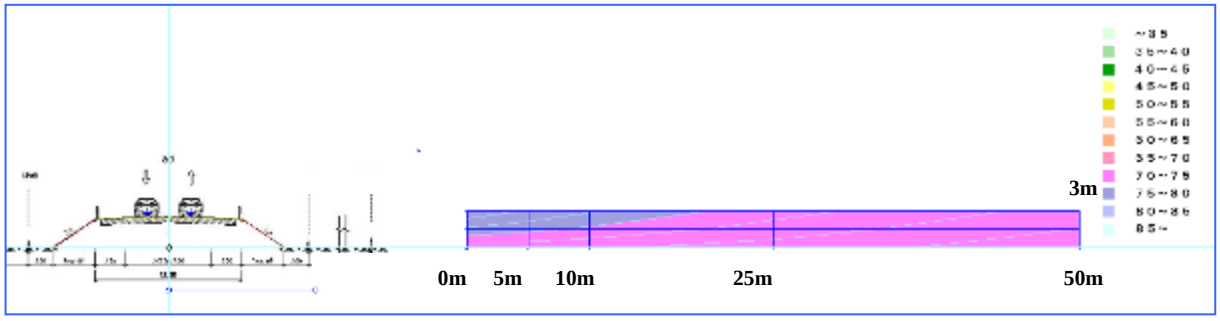
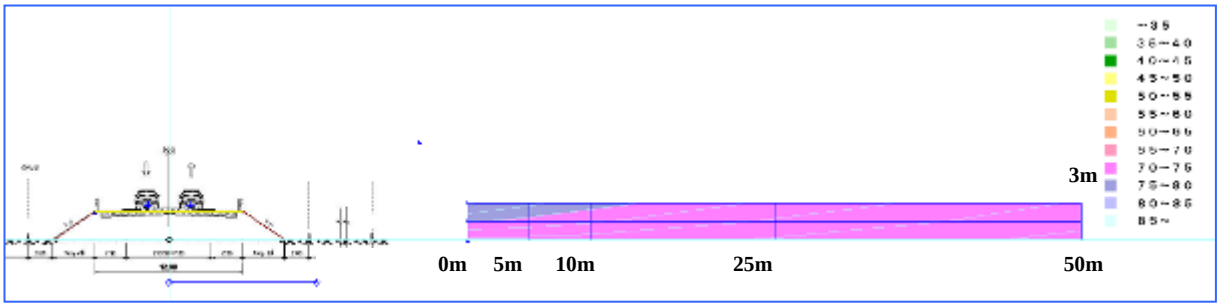


Figure 3.11. Prediction Results of Noise Reduction on Truong Section



The noise impact on sensitive objects factor considering

noise degradation level through the range of tree (reduction of 7.5 dBA - see the pre-construction phase) and noise degradation level through the brick fence (reduction of 12dBA - see the pre-construction phase) are shown in Table 3:44.

Table 3.44. Noise Level Impact on Residential Area and Special Area in Operation Phase

No	Objects	Distance (*) (m)	Impact Noise Level (dBA)
1	Residential areas at the approach road of Sat Bridge (Km0+000)	10	67
2	Ngoc Mai Pagoda(Km0+400) (**)	75	<52.5
3	Political Training Center and The People's Procuracy (Km2+450) (**)	10	55
4	Residential area (Km4+200 ÷ Km4+350)	10	67
5	Sa Lung Communal House (Km4+550) (**)	100	<52.5
6	Residential areas (Km43+600 ÷ Km44+000)	10	67
7	Residential areas (Km44+800)	30	<66
8	An Thi District Clinic (Km46+100) (**)	100	<52.5
9	Residential areas Km38+600 ÷ Km39+800	10	67
10	Residential areas (Km40+200 ÷ Km43+600)	10	67
11	People Committee of Tan Phuc Commune (Km43+150)	15	<55
12	High and Secondary School of Tan Phuc Commune (Km43+000) (**)	35	<54

(*) Distance from the edge of the road

(**) Special areas

Compared the forecast result with permissible limit in QCVN 26:2010/BTNMT, there is no sensitive object affected by the noise from the operation of vehicle flow in operation phase.

Impact level: SMALL

b2. Vibration Pollution

The worst vibration level measured in Project implementation period is about 61dB correlating with vehicle flow's speed of about 60km per hour. When vehicle flow's speed increases by 10km/h, the vibration level will increase by 3dB. Therefore, the forecast source vibration level in 2035 is 67 dB.

Forecast of the vibration degradation as per distance is based on the method presented above (details of the methods have been presented in the construction phase). Results are shown in Table 3.45.

Table 3.45. Prediction Results of Vibration Reduction as per Distance (dB)

	Source vibration level (dB)	**Distance (m) (*)**			
		10m	**15m**	**20m**	**25m**
In 2035	67	39,3	16,3	0	0
TCVN 7210:2002; 70dB (6 ÷ 22h); 63.8dB (22 ÷ 6h)					

(*) Distance from the edge of the road

Comparing with permissible limit according to TCVN5949:1998 of vibration due to vehicle of road transport, at the distance of 10 meters from the edge of the road, the vibration arising from the operation of vehicle flow is smaller than permissible limit. Thus, impacts due to vibration has been eliminated from the source.

Impact level: SMALL

3.4.3. Impacts due to Embankment of the Route with High Level

a. Impact Source

Appearance of the road with speed of 80km/h, which cuts through the residential area (Km0+000; Km4+200 ÷ Km4+350) and agricultural areas.

b. Assessment

b1. Community Separation – Impacts are required to be prevented

In the design phase, the alignment of the project have been selected according to bypasses alternatives and adjusted partially to minimize cutting through the residential

areas, to prevent the risk of community separation. In addition, in the feasibility study, the traffic signs, road markings have been arranged to prevent the separation risk between community and agricultural areas and to ensure the resident's travel normally along the both sides of the route.

Impact level: SMALL

b2. Fragmentation of Agricultural Land

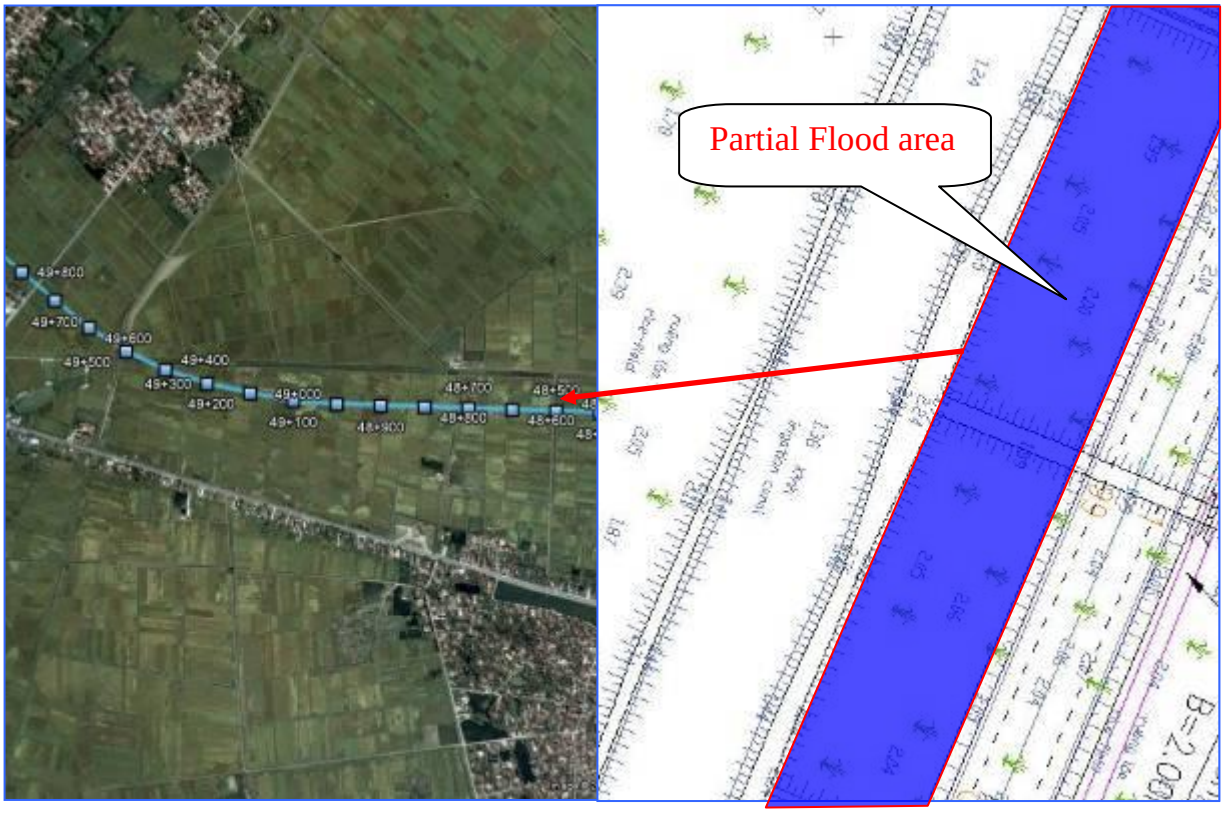
Because the route cuts through farming areas causing fragmentation, it is very difficult for the farmer living on one side to go across to the other side of the expressway daily to cultivate. In addition, the agricultural area of the household after fragmentation is not large enough, which will create the difficulty to apply them in machinery, motorized equipment into production on it compared to a paddy field of the same area but not fragmented.

Impact level: MEDIUM

b3. Partial Flood

At the An Thi Bypass, section from Km47+100÷Km49+, the alignment runs parallel with irrigation canal and away from about 18 meters (from the foot of slopes). Appearing high embankment will cause to obstruct drainage capacity of the paddy fields located between irrigation canals and roads. In the rainy season, water in irrigation canals will overflow causing partial flood in these paddy fields, the reducing drainage ability is the same meaning reduced productivity. Impacts are required to be mitigated

Figure 3.12. The Areas having the Risk of Partial Flood



Impact level: MEDIUM

3.4.4. Impact on Hydrologic Hydraulic Regime

a. Impact sources

Appearance of piers in the river flow of Sat River and Cuu An River.

b. Assessment

b1. Change of hydrologic hydraulic regime

In theory, the arrangement of the piers in the natural flow will create changes in hydrologic hydraulic regime and riverbank erosion as appearing overflow water, changing velocity of main flow, increasing general and partial erosion, etc. However, in most cases, the arrangement of the piers in the natural flow is inevitable by the economic and technical reasons. In this case, the bridge was designed to ensure the safety of themselves as well as it does not create significant changes of the overflow, direction and velocity of main flow, do not cause river bank erosion compared to existing status. These content was presented in "hydrological calculation report" of the project, are appraised by the authorities of the Ministry of Transport. The impact is negligible.

Impact level: SMALL

Impacts in operation phase are summarized in the following table:

Table 3.46. Summary Impacts in Operation phase

Impact	Location	Duration/frequency	Impact level
Air environment pollution due to dust, noise and vibration pollution	Along the Project's route	Long-term	Small
Separation of community	At the locations cut through agricultural land	Long-term	Small
Fragmentation of farming areas		Long-term	Medium
Partial flood	An Thi Bypass, Section from Km47+100 ÷ Km49+400	Long-term	Medium
Change of hydrologic hydraulic regime	Sat River and Cuu An River	Long-term	Small

3.4.5. *Positive Impacts*

3.4.5.1. Benefits due to enhanced circulation

After the project put into operation, traffic activity on NH38 will take place smoothly, minimizing traffic congestion. The appearance of the bypasses will meet the transport need, and helps the partial lane distribution, vehicles will avoid densely populated areas to mitigate the risk of accidents in these areas.

3.4.5.2. The benefits of the community that can not be quantified

On the point of view of state management, when evaluating economic efficiency of the Project is mainly based on the analysis of economic - social on the point of view ensure that community benefit is the most, and it necessary to pay attention to the interests of the investor, to combine the benefits of short and long-term of the country.

- Social Benefits: contribute to the development of local society and economy by enabling the exploitation of development potentials in the localities and areas, enhancing market economy, etc

- Impact on community: The Project would bring benefits not only to the users of the viaduct expressway (drivers and passers) but also to the manufacturers, businesses, services providers, consumers, people living around the Project area
- Other influences: Save time for transportation of goods and passenger, reducing the waiting time of people and the means, advantages vision problems will significantly reduce the number and level of traffic accidents, saving the cost of operation, periodic and routine maintenance. The quality of the route exploitation is enhanced to reduce fuel consumption which lead to reduce the level of emissions that cause air pollution.

3.5. The impact of the Risks and Incidents

3.5.1. Technical Incidents

The construction of the supper structure of bridges shall create many potential technical Incidents causing collapse to the works, especially when scaffolding is installed. Technical accidents (if occur) will be disasters threatening not only labourers' lives, but also road and waterway transportation vehicles under bridges.

3.5.2. Risk of Fire and Explosion

In construction stage, petroleum is used for activities of construction equipments. Major component of petroleum is carbuahydro (96 ÷ 99%), which is able to evaporate very quickly on the surface. Thus, it easily cause burning and explosion, especially when it is mixed in the air and catches spark.

3.4.3. Labor Safety

Occupational accidents can happen in any activities in the construction process with the employer if you fail to comply with on labor safety procedures.

The group main causes of occupational accidents include:

- Deficiencies in the design of technological measures: deficiencies in design technology measures such as measures to support shuttering, anti-erosion measures earthen walls ... may lead to collapsed construction, labor accidents;
- shortcomings in the organization of construction: irrational allocation of shifts, work arrangements are not in the correct order, overlapping, use of non-standard materials, cut the construction process ...;
- Technical shortcomings: machinery, vehicles, tools and a complete lack of structure or damaged as lack of safety, lack of cover, lack of preventive warning system ...;

- Violation of procedures and technical safety;
- The risk caused by: transport by car accidents, slip fall on scaffolding, electrical accidents ... On rainy days increasing the risk of accidents is high due to the slippery ground, prone to electrical problems, subsidence-prone ...

3.5.4. Risk of Boat Incident

In the project area there are natural incidents such as storms. In the storm, in addition to heavy rain, there are high wind and lightning thunderstorms also. These are natural incidents that can cause problems at construction sites, in particular:

- In the rain and storm season, the high velocity of flow will increases collision incident between means and bridge piers of Sat Bridge.
- Boat accidents not only cause damage to people, possessions and goods, but also affect the stability of the bridge (in case of collision with a pier).

3.5.5. Incident Caused by Detecting Mines

After land acquisition and prior to starting construction, the entire project site will undergo mine clearance. This activity has the threats of explosive incidents, threatening human lives and property.

3.6. Commenting on the Level of Detail, the Reliability of the Assessment

3.6.1. The Level of Detail of the Assessment

Identify the impact of the project has been built on the basis of access at each operation of the project in three phases of pre-construction, construction and operation of the Project in the receiving environment project with the specific conditions nature, natural resources and socio-economic areas. If implementation of the project will appear the impact of temporary land occupation permanently and occupied and encroached infrastructure; affect ambient air quality, noise, vibration, water quality, land ; impact on traffic; impact by focusing workers and waste management control issues; incidents due to collapsed and flooded ... In the case of non-implementation of the Project will not appear, but the impact but limited to the socio-economic development of the project communes.

The level of detail is also reflected in the calculation of emission sources based on data on vehicles, machinery, materials used; applied technology; personnel comply with project and according to the standards, standards and norms prescribed in the legislation of Vietnam, international organizations, experience in construction of the building society.

3.6.2. Reliability of the Assessment

3.6.2.1. Reliability of the Assessment

List and the matrix method is used to determine the impact object and the object affected, and indicate the level of impact, according to set requirements minimized. Methodology and method is the basis of scientific and realistic.

Forecast-based waste facilities, machinery, materials used; applied technology; personnel comply with the norms set by the State of Vietnam, the international organization.

Predicting the impact and scale of the impact is determined based on the sensitivity of the receiving object and the size of waste source. Assess the level of contamination is done by the method of comparison between the predicted results with VNS environment since 1998 and the Environmental QCVN 2008 as well as international standards provisions applicable to countries development. Methodology is reasonable. However, because there are many small changes in the implementation of the contractor's construction and the weather changes ... In addition, a number of quantitative and semi-quantitative methods applied in the report is the fast method, together with the input of relative quantitative level, the results of high-precision . Therefore, the monitoring results from the pre-construction of construction and during construction will add less predictable impact and adjust the impact has been predicted.

3.6.2.2. Calculation Methods

a. For emissions to air pollution

Using Sutton model applied to the source line to predict the pollution level in the estimated amount of dust and waste gases typical for traffic projects in regional meteorological conditions made for Project both during construction and during operation of the project is the traditional method. The results predict the concentration of contaminants in the operational phase has been verified with real data measured at the time of setting up the project. In general, the observed and predicted data is relatively consistent. The results predict the toxic emissions from the operation of vehicles on the road in the forecast is reliable. However, due to a number of input parameters such as meteorological conditions are taken as the average annual values should the relative forecast results. The observed changes in ambient air quality in the operational phase to the actual car will adjust forecasting results and appropriate behavior.

b. For noise pollution emissions

ASJ–Model 2003 was used to forecast noise level generated from the traffic flow on the viaduct expressway and on the urban road. The ASJ Model–2003 allows to predict noise level for various types of noise source, as well as noise levels at sensitive receptors along the alignment (residential areas, schools, hospitals). The model is considered providing highly reliable results.

The ASJ Model 2003 was developed mainly by "the Acoustic Society of Japan" based on many complex formula according to A-method (A-method is also called "Precision Method"), and B-theory of acoustic diffusion (B-method is also called "engineering method"), in which process of description and calculation of noise intensity is based on a sequence of fixed sound frequency per unit of time, changing in the range of 1 minute to 30 minutes. The process of sound wave dispersion calculation in ASJ Model 2003 is described and separated on the basis of process of sound echo with regression equations. The input parameters of vehicle flow are separated by various lanes and that flow is considered unchanged in number of regular vehicles on the road.

Basic calculation equation is based on division of each vehicle flow into different sections, at one of which the total sound intensity is calculated with receptors and each of vehicle. Total sound intensity is divided and calculated for one meter area of road surface on the basis of matching pursuit algorithm. Calculation is reasonable and reliable. However, the noise forecast excludes features of topography and sample vehicle, so it is necessary to verify in practice.

CHAPTER IV. MEASURES FOR PREVENTION, MITIGATION OF ADVERSE IMPACTS; RESPONSE TO ENVIRONMENTAL INCIDENTS

4.1. Measures for Prevention, Mitigation of Adverse Impacts of the Project on the Environment during the Pre-Construction

4.1.1. Mitigation of Impacts on Ambient Air

4.1.1.1. Control Dust of Housing Demolition

a. Description of mitigation measures

- Moistening: When demolition work on hot dry days;
- Screening by canvas: canvas surrounded the house demolition area to prevent dust dispersed into surrounding areas;
- Transporting waste: Type not be reused will be handled through a contract with the company environment functions.

b. Location and implementation time

- Location: At the places of house demolition (Km0+000; Km4+200 ÷ Km4+350);
- *Implementation time:* 1 week/ area.

4.1.1.2. Dust control during site leveling

a. Description of mitigation measures

Moistening: Spraying water at least 02 times / day. Water taken from the river, near the location of the channel.

b. Location and implementation time

- *Location:* In six construction sites (Sat Bridge, Tranh 1 Bridge, Tranh 2 Bridge, Bun Bridge, Dia Bridge and Tinh Bridge).
- *Implementation time:* 1 month.

4.1.1.3. To assess the effectiveness of mitigation measures and residual impacts

Measures to reduce high effective and feasible by simple techniques, inability dust emissions, residual effects are negligible.

4.1.2. Mitigation of Impacts on public health

Measures to minimize the public health impact of dust pollution was presented in Section 4.1.1. "Mitigation of Impacts on air environment." Do not bulldoze area

residents should be in this section will only present the measures to minimize noise pollution due to the demolition of public health.

a. Description of mitigation measures

The goal is to minimize the noise impact of pollution in residential areas, will be carried out simultaneously following measures:

- *No demolition waste and transport at night: from 22:00 to 6:00*.
- Use equipment with low noise emissions.
- Limit operators and equipment

b. Location and implementation time

- *Location:* In the residential areas (Km0+000; Km4+200 ÷ Km4+350);
- *Implementation time*: 1 week.

4.1.3. Mitigation of Socio-economic impacts

4.1.3.1. Impact mitigation due to Residential Land Acquisition

a. Description of mitigation measures

In order to mitigate the adverse impacts of resettlement, in addition to the implementation of the plan for compensation, assistance and resettlement, it is also required to consider the aspirations of displaced persons (DPs).

a1. Implementation plan for compensation, assistance and resettlement

The most effective mitigation measures are implementation plan for compensation, assistance and resettlement. In this measure, the compensation policy is composed in the manner of taking priority of the donor (WB) with the compensation and support which will be done for all impacted persons in the compensation list prior to the date of land acquisition and price is based on the replacement cost.

- Responsibility of the units in relation to land acquisition and resettlement and implementation budget.
  - Following Document No. 1665/TTg-CN on 17/10/2006 of the Prime Minister on the implementation of land acquisition for transportation project construction, land acquisition will be separated as sub-projects by Hung Yen Provincial People's Committee. Hung Ha District People's Committee (Hung Ha DPC) will implement these sub-projects under direction of Hung Yen Provincial People's Committee through the *Board of compensation, assistance and resettlement* of Hung Ha DPC which is established with its chairman shall

be a leader of the district and members must be staff from the affected communes, and representatives of the affected.

- The Project Owner shall assist the Chairman of the Board compensation, assistance and resettlement to make plans for compensation, assistance and resettlement; securing adequate budget for timely payment of compensation, assistance and resettlement (cost for land acquisition is from State Budget Fund).

– General plan of compensation, assistance and resettlement

- The general plan of compensation, assistance and resettlement of the project has been made in to a resettlement action plan (RAP). The overall objective of RAP is to determine the compensation and resettlement program for the project to ultimately limit the number of people and assets affected by the project to ensure that all affected people will be compensated for damage with replacement cost; and, there will be recovery measures to help them improve or at least maintain the standard of living and their ability to generate income as before the project.
- The plan of compensation, assistance and resettlement is briefly shown in the summary table of compensation, assistance and resettlement policies, and matrix of rights.
- Measures to mitigate the impacts of land acquisition will be applied during land acquisition period and completed before starting construction.

a2. Consideration of aspirations of displaced people

– Taking consideration in arrangement of resettlement areas near the former place for the involuntary displaced households.

– Compensating by money so that, the displaced households can do on their own with supervision of their resettlement process to ensure that their compensation money is spent for its intended purpose.

b. Objects and implementation time

– *Applicable objects:* displaced households.

– *Implementation time:* completed before commencement of the project.

4.1.3.2. Regarding Impacts due to Permanent Acquisition of Agricultural Land

a. Description of mitigation measures

Households whose agricultural land is permanently acquired face not only income damage, income loss, but also the difficulties in production recovery or earning new

income sources. Therefore, it is not enough to be compensated by the cost replacing the acquired land area. Measures for production support and income restoration plan shall be established and implemented to ensure that the households who are taken their land can restore their minimum income like before the acquisition. The specific measures include:

- *Compensation:* total area of permanently acquired agricultural land, as well as trees and crops on the land will be compensated with the price calculated at the time of inventory.
- *Support for living stabilization*:
  - For households who lost 30 ÷ 70% of their production land: support for six months for non-displaced households and 12 months for displaced ones;
  - For households who lost more than 70% of their production land: support for 12 months for non-displaced households and 24 months for displaced ones.
- *Support for agricultural land in residential areas:*
  - For garden/ pond land in residential areas: support more with 30 ÷ 70% of the price of the adjacent land plot;
  - For agricultural land in residential areas: support more with 20 ÷ 50% of the price of the adjacent land plot.
- *Support for career change and job creation:* the households who lost their agricultural land will be supported for career change and job creation in cash with 1.5-5 times higher than the compensation for the agricultural land.
- *Recruitment:* for some simple jobs with low technical requirements, the project's Owner encourages the contractor to recruit local labors, in which households losing their agricultural land will be preferred.

b. Objects and implementation time

- *Applicable objects:* households whose land for rice growing and ponds along the route are permanently acquired.
- *Implementation time:* completed before commencement of the Project.

4.1.3.3. For the impact of temporarily occupied agriculture land

a. Description of mitigation measures

The aim is to compensate for losses due to temporary occupancy of agricultural land to construction site layout will apply measures:

- *Compensation under the agreement:* Project owner agreed to rent the land owner under the agreement. Land rent will be charged for the time the temporary land occupation for construction and land recovery timeout (about 2 years).
- *Revert*: When not in use, the temporary borrow area will be cleaned and renovated and restored the original commitment before handover to owners.
- *Implementation commitment*: Unified commitment to clean, renovate or revert to serve other purposes. This commitment will be notarized at the CPC to ensure legal.

b. Objects and implementation time

- *Applicable objects:* The owners of agricultural land temporarily occupied.
- *Implementation time:* Prior to start Project's construction.

4.1.3.4. For the impact of the relocation of graves

a. Description of mitigation measures

The aim is to limit the social impact by moving 13 graves, measure:

- *Announcement early:* Early Notification clearance time for at least 6 months relative to their graves conducting necessary rituals.
- *compensation, support*: Compensation and reasonable funding for the relocation, transportation and burial of new graves.

b. Objects and implementation time

- *Applicable objects:* Relatives of the graves were relocated.
- *Implementation time:* Prior to start Project's construction..

4.1.3.5. For impact by reducing the amount of infrastructure (irrigation ditches, poles and telephone poles)

a. Description of mitigation measures

The purpose is to prevent unnecessary impacts disturb the socio-economic activities by reducing the amount of infrastructure, project committed to the following:

- *Perform proper design process*: The relocation of infrastructure systems (power, telephone, irrigation ditches) will be carried out and completed before the construction works of the project. While building new infrastructure, the old buildings are still in use to ensure not disrupt production activities and community activities of the people. After completion of construction of new facilities, electricity, telephone and irrigation water will be transferred from the old building

to the new building. Then the old building will be demolished to hand over the construction project. As for drainage, culverts will be constructed in the old ditch. After you have completed sewer, water diversion channel on the initial position and the land reverted to temporarily ditch.

- *Provide adequate funding*: This project will ensure adequate funding to provide relocation and improvement system power drain (already included in the total investment of the project).

b. Objects and implementation time

- *Applicable objects:* The ditch was improved, 76 electric poles, 37 communication poles.
- *Implementation time:* Prior to start Project's construction..

4.1.3.6. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

Experience has shown, with any scale that, when occupied land and create lasting social impact, especially when incurred relocation and resettlement, land acquisition, although this service the national interest and the public and shall comply with compensation compensation plan, support and resettlement consent of the person affected. Practical experience shows that, if the Council land acquisition compensation and resettlement perform the following, the contradictions in society will be freed many:

- extensive propaganda about economic policy and development policy of the state compensation to the affected people as well as the rights and obligations of their;
- Disclosure of compensation rates for each detail of each affected property. Publicity exact amount of compensation for each household;
- policies to support needy families and family policies;
- policies to reward those who perform hand over earlier than schedule out;
- There are plans to create jobs and job training for those households affected when they ask;
- There are plans to help families lonely, sick ... in dismantling transported to a new place;
- For unskilled workers (usually low-skilled labor, employment instability): Career Organization, opened the class apprenticeship training just learning culture in place to meet the needs of employers in the area. There are no qualified workers through job training age will negotiate with the workers getting their base to do the job less

demanding qualifications such as protection, parking, and odd ... learn more at these facilities. However, not once can solve all of this work so there will be further driven as open-field training and educational support to create a workforce with the legacy degrees;

- Instructions on how to spend money compensation: A residential unit after receiving a large amount of compensation has not cleared oriented funds have been used properly creates waste and risk new evils arising burden to society. Thus, there will be specific instructions on the use of capital, especially investment guide business or saving way to fit each specific audience in order to stabilize the long life long;
- Explicit information about the project, construction schedule for local and affected people, policies and schemes of compensation and resettlement;
- Create mechanisms for affected persons in the proposed democratic aspirations as well as support the compensation at complaints mechanisms, responses;
- The settlement of administrative procedures related to the relocation issue is also of concern because there are still many obstacles that life cannot be put into place, such as for changing business forms, business license sales, transfers to their children, doing household ... Creating favorable conditions in the administrative stage is imperative to get the attention of the leaders to help stabilize their lives after being recovered land;
- Project to ensure timely and adequate budget for land acquisition and resettlement.
- Also, in the case of the Project, (i) the provision of land by the local running out, so the arrangement of relocated households resettled in place by their aspirations and provide timely funding their own resettlement is feasible and the optimal measures. (Ii) measures to mitigate the impact of infrastructure encroachment is the commitment of the project, in accordance with the construction uninterrupted manufacturing operations, funding for this work has been established and included in the total investment of the project.

4.1.4. Mitigation of Impacts on Environmental Landscape

a. Description of mitigation measures

- *Performing proper categorization and disposal:* upon demolition, waste will be categorized. Those which can be reused as crushed scrap, milled wood will be collected for fuel.
- *Collecting and selecting temporary gathering points:* the wastes generated shall be

collected and gathered at some points on the construction site. The project will sign a contract with the environmental unit in charge of waste collection, treatment and transportation.

b. Location and implementation time

- *Location:* the house demolishing area (Km0+000; Km4+200 ÷ Km4+350).
- *Implementation time:* during the demolishing time (1 week) and preparation of construction site (1 month).

4.1.4.1. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

The waste categorization, collection and treatment will limit the amount of soil, rocks dumped at disposal areas. The waste collection is reasonable and solid waste treatment measure is consistent with the requirements of the Decree No. 59/2007/ND-CP. The proposed measures are feasible, effective and residual impacts are insignificant.

4.1.5. Request for Completing Preparatory Work for Official Construction

a. Description of mitigation measures

For the purpose of providing information about the project, the environmental protection measures of the project for the local community where the project is located in order to get social consensus, the following measures will be applied:

- *Disclosing information:*
  - After the EIA report of the project has been approved by the Ministry of Transportation, the project's owner will establish, approve and publicly post the environmental management plan at the headquarters of the People's Committee of the communes for community consultation. Contents of the environmental management plan shall comply with Article 22 of Decree No. 29/2011/ND-CP dated 18 April 2011 of the Government on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment. Thereby, local people will update the project's information and participate in inspection and supervision of implementation of the project's environmental protection measures.
  - Along with the environmental management plan, the project will publish information on project scale and scope of construction on the mass media, flyers, signs to get to know the community and not violating construction safety.

b. Location and implementation time

– *Location*:

  o Disclosing information in communes/ towns in the project area.

  o Installing signs at the boundary of land acquisition and construction site.

– *Time*: before official construction

4.2. Measures for Prevention, Mitigation of Adverse Impacts of the Project on the Environment during Construction

4.2.1. Mitigation of Impacts on Ambient Air Quality

4.2.1.1. General Regulations

The measures aim to provide the required contents applicable to construction activities in order to comply with legal requirements on environment protection during construction.

– *Requirements for vehicles:* Vehicles ensure emission standards "TCVN 6438 - 2005 - Road vehicles. Maximum permitted emission limits of exhaust gases." Through the contracts, the project's owner requires the contractor to apply this standard to manage construction vehicles.

– *Requirements for applicable standards:* Limit 0.3mg/m3 of QCVN 05:2009/BTNMT - National technical regulation on ambient air quality is the criteria applicable to safety of dust concentration at sensitive objects with dust generation activities of the project during the construction phase.

4.2.1.2. Dust Spread Control in the Activities of Excavation, Backfill and Storing Materials

a. Description of mitigation measures

With the aim to prevent and mitigate dust spread from digging access road to bridges, the following measures shall be applied:

– *Spraying water the areas with dust spread:* Spraying water to prevent dust spread. Water shall be taken from surface water in rivers, canals and ponds near the construction site.

Technical solutions:

1. Spraying water at least 02 times a day.

Using standard nozzle instead of normal ones to make the surface equally wet and prevents muddy condition. Spraying water in multiple times instead of once in large quantities.

– *Preventing dust spread at temporary storage yards*: Temporary soil storage years with volume of over 20m^3 will be covered to prevent dust spread.

Technical solutions:

1. *Covering canvas is made of thick nylon fabric and towards sensitive objects (residential areas, schools, temples, etc).*
2. *The canvas is 30cm higher than the yard's surface.*
3. *The canvas should be reinforced with pile driven in the ground at least 20cm deep not to fall.*

b. Location and implementation time

– *Implementation location:* The construction of the road along the route, the temporary dump materials, waste land;

– *Implementation time:* applied during construction of the road on sunny days, dry.

4.2.1.3. Control of Emission from Construction Vehicles (Horizontal contruction)

a. Description of mitigation measures

With the aim of mitigating dust pollution, toxic gases emitted from construction machines in the project area, the following measures shall be applied:

– *Using vehicles that meet emission standards* as defined in the general regulations.

– *Setting transportation areas:* Vehicles are only allowed to be used in the construction scope as regulated (site clearance, service road).

b. Location and implementation time

– *Implementation location*: Entire scope of the project and at the site.

– *Implementation time:* within 24 construction months

4.2.1.4. Regarding Dust Generated during Transporting Waste Materials or Soil

a. Description of mitigation measures

With the aim of mitigating air pollution due to dust generated from vehicles, the following measures shall be applied:

– *Using vehicles that meet emission standards and transportation requirements:*

  o Vehicles must ensure emission standards as defined in the general regulations.

  o Transported materials must be covered to prevent dust spread.

– *Controlling and managing the environment at which vehicles enter/ exit the construction site:* Each construction site has a number of gates for transportation.

Vehicles are only allowed to enter at these gates.

– *Cleaning roads near the entrance to construction sites:* vehicles, before transporting, shall be cleaned from mud, soil on tires at the exit gates by mechanical methods.

b. Location and implementation time

– *Implementation location*: construction sites and transport materials.

– *Implementation time:* Within 24 construction months

4.2.1.5. Regarding Dust Generation of Cement Concrete Mixing Plant

a. Description of mitigation measures

– *Preventing dust spread in the mixed material storage area:* The aggregate storage yards for mixing concrete (sand, gravel, etc.) will be covered with canvas to avoid dust spread. The canvas shall cover all the yard, except one side to moving the materials up to conveyors. The canvas is buried in the ground to avoid flying.

– *Preventing dust spread when dumping materials*: When ben trucks dump materials at the yard, dust shall be generated; immediately spray water for moisturizing.

– *Preventing dust spread from the crushing operation:* Not crushing stones on construction sites. Standard stones/ gravels for concrete mixing shall be purchased at the establishments licensed to operate and supply on site.

– *Preventing dust spreading on conveyors:* mixing materials (sand and gravel) will be moistened before moving up the conveyors to the mixer.

– *Preventing dust spread in the silo:* By design, the silo of cement concrete mixing plant has dust filter. Depending on the capacity and technical specifications, we can use electrostatic dust filter or cloth dust filter. These equipments can filter more than 90% of dust. In the construction phase, the contractor will be required to regularly maintain this equipment to filter the dust effectively.

b. Location and implementation time

– *Implementation location*:

  - The concrete mixing plants inside the construction sites.
  - Residential areas close to the construction sites.

– *Implementation time:* 24 months of construction.

4.2.1.6. Dust pollution monitoring

a. Description of mitigation measures

Environmental monitoring during construction: Selection and implementation of monitoring dust at the densely populated or potentially affected places by dust accumulation. If the dust concentration is beyond the permissible limits, implement additional measures including: Considering the level of dust emissions of each activity, enhance control measures from the largest dust activity until the dust at sensitive objects reaches the permissible limits.

b. Location and implementation time

– *Implementation location*: Monitoring locations are presented in Chapter 5.

– *Implementation time:* Maintenance activities during Excavation and backfill.

4.2.1.7. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

The proposed measures are based on the principle of mitigating dust from the source not only reduce dust effectively, but also reduce the dust pollution (if any) at sensitive objects, being residential areas. The proposed measures are highly feasible and effective. To increase the feasibility of the proposed measures, the cost of implementation will be included in total investment of the project and content made to the contractor as well as supervision content of consultant will be based on bidding terms; under terms in the economic contract, the project will implement control measures to require contractors as well as the supervision consultant to follow the contract.

4.2.2. Mitigation of Impacts on Community due to Noise Pollution

4.2.2.1. General Regulations

With the aim of providing the required contents applicable to construction activities to comply with legal requirements on environmental protection in construction activities; offering implementation contents to ensure noise reduction without spending additional cost.

– *Requirements for applicable standards:* Limit on 70dBA and 55dBA during the day QCVN 26:2010/BTNMT - National technical regulation on noise is the criteria applicable to safety of noise of impacts generated from the project's operation during the construction phase.

– *Complying with regulations on construction organization: including*:

  o Arranging machinery / vehicles generating noise at a location with suitable

distance so that the noise spread to residential areas not exceed 70dBA and schools, temples, etc. no more than 55dBA. Rapid decrease noise level is calculated on the principle of a double increase in the distance, the noise level reduces 3dBA.

- All vehicles parked at the site will stop the engine;
- All construction equipments and machines will be checked every 3 month on the noise level and make the necessary repairs and adjustments to ensure safety and not cause noise exceeding standards under the guidance of United States Environmental Protection Agency. Noise from construction equipments and machines - NJID, 300.1, 31 – 12 – 1971;
- Prioritizing the use of machines and vehicles with low sound emission source object to construction near sensitive to noise;
- Drivers must be well educated to act properly as shutting down vehicles when not necessary and avoid unnecessary noise action as pressing the air horn when not needed while the driving vehicles.
- Normally, the fixed equipments such as generators will be place far away from residential areas, if not they will be placed in the tight box to reduce the noise (recommended the brick box).

4.2.2.2. Regarding Activities Generated Noise during Construction

a. Description of mitigation measures

- *Complying with general regulations.*
- *Controlling source noise level,* including:
  - Limiting construction in night time, if construction at night using only the machinery and equipment sound power levels low.
  - When drilling for piers constructed Painting 1 Bridge near residential areas (Km 4 Km 4 +200 ÷ +350) for about 100m layout will make the day
  - During the day when the construction is executed at the site 200m from residential areas, select equipments/ machines with low sound sources;
  - Vehicles used for transportation will be limited at the speed of 5km per hour.
- *Monitoring noise level:* Monitoring noise level at these sensitive objects - concentrated residential areas. When the measurement result shows that the noise level in this area beyond the permissible limits on daytime, strengthening measures to control noise at source and comply with the general provisions for the

construction activities that cause noise in order to set additional measures, even temporarily stop working to adjust the measures until the noise level at sensitive objects reached the permissible limits on daytime, then continue construction work.

b. Location and implementation time

– *Implementation location*:

  o Along the construction route;

  o Sensitive objects are residential areas Km0+000; Km4+200 ÷ Km4+350; Km43+600 ÷ Km44+000, Km44+800, Ngoc Mai Temple (Km0+400), Political Improvement Center and The People's Procuracy (Km2+450), Sa Lung Temple (Km4+550), An Thi district clinic (Km46+100).

– Implementation time: 24 construction months.

4.2.2.3. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

The reduction of the noise at sensitive objects is highly effective through the implementation of the general regulations as well as measures to reduce noise at source and monitoring noise at receiving objects to take appropriate corrective measures. In order to ensure the feasibility of the proposed measures, the contents of the proposed measures for contractors as well as supervision contents for consultant will be included in bidding terms; according to the terms of economic contracts, the project will implement control measures to require contractors as well as the supervision consultant to follow the contract.

4.2.3. Mitigation of Impacts on Surface Water Environment and Sediment

4.2.3.1. Đối Regarding Impacts Generated from the Construction of Routes, Access Road to Bridges

a. Control of risk of sedimentation or soil spillage during excavation of road foundation, horizontal drains and material storage

a1. Description of mitigation measures

With the aim of controlling risk of surface water pollution and reduced irrigation capacity in the irrigation ditches and located adjacent to or land routes cut through by sedimentation and erosion during excavation of road foundation, horizontal drains and material storage, especially for the ponds partly acquired.

– *Limiting the construction scope:* The construction area is limited within land acquisition scope. The temporary organic soil yard will be re-used or soil for construction of road foundation shall be stored in this area. Arranging soil/ material

yard at least 50m away from water sources during road construction.

- *Organizing reasonable construction:* In case of rain, temporary yard will be covered with geotextile to prevent rain from causing erosion. The road foundation shall be executed and calculated to be compacted before the rain.
- *Placing mud-collecting barriers:* At the construction cut through the ponds and canals, placing barriers to keep sediment just let the water run out. Mud barrier is placed between the construction location and water sources. The barriers are made of geotextile, buried deep into the ground at least 10cm and reinforced to avoid falling. Mud was stopped before the barrier will be cleared so that it will not be spilled and allow water to drain easily, this kind of mud shall not be used for road foundation, but treated as disposed soil. In rainy season, the barriers should be regularly maintained at least every two day to be operated effectively. The barriers will be removed after the ground has been cleaned.

b2. Location and implementation time

- *Implementation location:* Along the project, particularly in the pond water Km0+600; Km1+450; Km2+080; Km2+200; Km4+600; Km44+800; Km46+400; Km52+250, ditches along some such Km43+650, Km44+470.
- *Implementation time:* these measures shall be implemented during excavation and backfill (16 months).

4.2.3.2. Regarding Impacts Generaged from Construction of Bridges

a. Control of bore mud during construction of bridge abutment, pier with bored piles technology that use bentonite

a1. Description of mitigation measures

With the aim of preventing the risk of surface water pollution in the project area and damage to wetland ecosystems because bore mud - soil mixed with bentonite and bentonite spilled in the construction of bored piles using bentonite of bridge abutment, piers, especially for piers adjacent to the flow edge.

- *Complying with general regulations:* It is strictly forbidden to dispose to the surrounding environment the bore mud – soil mixed bentonite and bentonite spilled during the construction of bridge abutment, pier with bored pile technology that uses bentonite.
- *Making partitions to prevent the spillage into the surrounding environment:* Making steel partitions in the flow direction (for the pier on the flow edge) and soil partitions on land. The partitions must be higher than the ground so that dirt cannot

be spilled out. Area of the partition frame must be large enough to implement the entire construction process of the pile of foundation and abutment.

- *Strictly following soil mixed bentonite and bentonite spill treatment:* Under construction process, each pile will have pit storing bentonite for reuse. After each construction of one pile, holes need to be filled. Therefore, soil and bentonite arise when drilling holes will be collected and buried in the pits. Bentonite spill and a soil mixed residual bentonite will be transferred into temporary yard, near the foundation construction area, abutment within the land acquisition, preliminary drying for easy transport. Then treated as ordinary solid waste, details are presented in the waste management section below.

a2. Location and implementation time

- *Implementation location:* In the construction sites of all piers and abutments of Sat Bridge and Bun Bridge;
- *Implementation time:* the measures shall be implemented and maintained during the bored pile construction of each abutment/ pier and all abutments/ piers of Sat Bridge and Bun Bridge.

b. Regarding risk of spillage of solid substances during superstructure construction of bridges

b1. Description of mitigation measures

With the aim of preventing risk of pollution of surface water, wetland ecosystems and damage to irrigation, the measures for prevention and processing solid substances dropping during construction of bridges shall be implemented as follows:

- *Treating garbage, waste during construction of bridges:* It is strictly forbidden to dispose garbage, waste arising from the construction activities to surface water flow. Arranging trashes, temporary dump near the construction area for collecting garbage and waste. Then, moving to the centralized waste storage area of the site for further treatment as stated in the "waste management" section below.
- *Cleaning the concrete slabs before assembling:* The joint position of the beams, concrete slabs will be cleaned on land before assembling by breaking and pieces of excess concrete (mavia). These pieces of concrete are waste collected and treated as mentioned in the "waste management" section below.

b2. Location and implementation time

The said measures shall be applied on the construction site of bridges throughout the construction of the superstructure of bridges (4-8 months).

c. Clearance, restoration of river beds and banks at bridge construction area

c1. Description of mitigation measures

With the aim of preventing the risk of long-term pollution of river water environment during bridge construction, the following measures shall be applied.

- *Cleaning river bed upon construction:* Removing all the temporary works including iron, steel, cofferdam, excess concrete by equipments such as excavators, bucket, crane, etc. After removal, waste will be collected and treated as solid waste at the site. Details are presented in the waste management section below.
- *Removing and stabilizing the riverbank after construction:* Removing all scattered rocks, cofferdam around piers, along the river and the bridge area and reinforced the banks in accordance with the design.

c2. Location and implementation time

The said measures shall be applied on (Sat Bridge, Bun Bridge, Tranh 1 Bridge, Tranh 2 Bridge, Dia Bridge and Tinh Bridge) right upon completion of construction.

d. Regarding Impacts on Groundwater

d1. Description of mitigation measures

- *Construction of cofferdam for stopping dirt water invading at the well casing*: the cofferdam surrounding the support pier of casing shall be installed during the time of drilling of each pile and maintained in the whole process of pile construction to prevent surface dirt water invading into the casing and into the drilling pits.

d2. Location and implementation time

- *Implementation location:* Sat Bridge, Bun Bridge, Tranh 1 Bridge.
- *Implementation time:* during the construction of bore piles.

e. *Regarding Impacts Generated from the Activities of the Construction Site*

e1. Regarding risk of loss of waste oil and water pollution by oil in oily discharge from motor maintenance station on the construction site

e1.1. Description of measures

With the aim of controlling and managing waste oil as hazardous waste in accordance with current regulations and preventing oil in wastewater from motorbike maintenance station on the site; the following measures shall be applied:

- *Managing waste oil:* Machine oil shall be periodically replaced, stored in labeling

barrels and placed in the roofed house with high floor to avoid flooding and waterproof, having barrier bank to easily collect in case of spilling outside. Waste oil will be further treated as described in the "waste management" section below.

- *Controlling oily waste from construction site activities:* On each construction site, the wastewater generated from operation and maintenance of machinery and equipment shall not be discharged directly into surface water. Wastewater will pass through a drainage system with partitions and sedimentation basin to collect the oil film and TSS before flowing into the rivers, canals. The partitions are made of geotextile that let water flow through and keep the oil film. Partitions should be regularly maintained to be operated effectively. Oil film is collected on the barrels for treatment under Circular No. 12/2011/TT-BTNMT 14/04/2011 on hazardous waste management.

e1.2. Location and implementation time

said measures shall be applied on construction sites of construction sites of the project during the construction period

e2. Regarding domestic waste from worker's site huts on the construction site

e2.1. Description of measures

With the aim of preventing risk of water eutrophication and toxicity of wetland ecosystems on rivers, canals due to waste from the site huts on each construction site, the following measures shall be applied:

- *Treating washing wastewater:* Washing wastewater will be reused for moisten road surface or the places where dust can spread on site.
- *Treating domestic wastewater:* On each site, in addition to washing wastewater reused as mentioned above, the wastewater from canteens will be pre-treated not to create pollution sources forming organic matters in natural water by the decomposition of uneaten food. Wastewater from the canteens will be directed to the shallow sand tank (about 70cm deep), about 10m2 wide to avoid absorbing down the underground water system after through manholes with nets for collection of solid substances and waste in holes. After permeable through the sand to flow into the drainage system of the site before joining the flow. Replace the sand every week. 3m3 of sand replaced each week can be considered waste after preliminary washing and treated as waste soil.
- *Using portable toilets:* Using portable toilets at each site. Waste from portable toilets will be collected under economic contracts with the urban environment company of the Hung Ha District. The contract will be carried out before the project is prepared for

construction.

e2.2. Location and implementation time

The said measures shall be applied on construction sites of construction sites of the project during the construction period.

e3. Regarding sewage of rich TSS and high pH generated from the operation of concrete mixing plant on the construction site

e3.1. Description of measures

With the aim of preventing impacts to the wetland ecosystem in the ponds and reduced capacity of the irrigation canals by waste generated from the operation of cement concrete mixing plant on each construction site, the following measures shall be applied:

- *Treating aggregate washing water and wastewater of cement concrete mixing plant:* the aggregate washing water on site and wastewater from the plant will be re-used to moisten the road surface on construction sites or the places where dust can spread on site. Aggregate washing water and wastewater will be directed into the mixing tank at least two compartments, each compartment has a capacity large enough so that sediment can settle for the amount of water discharged from one batch of concrete. Placing a barrier of iron net for waste collection before the entrance gate of sedimentation tank. Upon sedimentation, water will be reused. Sediment will be collected and treated as construction waste. The sedimentation tank and guiding ditch are arranged on site and be prepared concurrently with the construction, maintained them work well during the entire construction period through the clean-up and maintenance of partitions regularly to ensure the ensure that garbage, rocks, sand and sediment will be retained and released into the canal with no contaminants. Garbage and sand deposits will be treated as waste and waste lands described in "waste management" subsection. After completing the construction, up to the line and they have not before handing over land to the owner.
- *Checking pH at the joint to natural flow:* Checking the pH every day in case of concrete mixing operations at the joint to the discharged water from the construction site to ponds, canals. If the pH is greater than 12, increase pumping water into a tank from mixing plant to dilute.

e3.2. Location and implementation time

The said measures shall be applied on construction sites within 24 months.

e4. Regarding risk of pollution from rainwater runoff on the surface of the site

e4.1. Description of measures

With the aim of controlling dirt penetrated into natural waters by rainwater runoff on the surface of the site. In addition to measures of "Making temporary drains for collection of water runoff during the construction near sensitive objects" as section a, subsection 4.2.3.2, the following measures shall be also applied:

- *Drainage on site:* the elevation of the site will be designed to ensure the collection of rain water on the surface of the site, not flowing through the area with surface contaminants such as petroleum store and does not cause flooding. Surface drainage system on construction sites includes ditches, canals and manholes. Rainwater shall be collected and directed to the ditch through manholes with nets for garbage collection. After water in manholes shall be over flown through the grass before flowing into the water in the canals.
- *Clean the surface of the ground:* Collecting the dirt on the ground to prevent the contamination of the surrounding water.
- A crushed stone layer should be paved on the surface of the construction site; this layer shall either reduce dust or being able to filter the dirt on the surface as raining.

c2. Location and implementation time

The said measures shall be applied on construction sites of the project during the construction period, especially in the rainy season.

4.2.3.3. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

Most measures are highly effective because they are established on the basis of prevention eliminating the risk of increasing levels of water pollution by TSS, floating objects. The measures are also highly feasible because the area is large enough, the amount of waste is not much. Water flowing from canteens to the environment only through preliminary treatment to capture the decomposed organic substances is a appropriate and feasible measure because the construction of wastewater treatment in aerobic tank in the field is not feasible due to large expenditures on construction and demolition after construction and create unpleasant odors on site. However, the water flow were pre-treated and joint into drainage flowing through the grass field before jointing into surface water have increased cleaning efficiency of organic matters in wastewater. Many measures comply with regulations on work safety, sanitation and construction organization. Therefore, the implementation contents for the contractor as

well as the supervision consultant will be included in bidding terms; under the terms of economic contracts, the project will implement inspection measures to ask the contractor as well as supervision consultant to follow the contract. The feasibility of the proposed measures, thereby, are sure.

4.2.4. Regarding Impacts on Soil Environment

4.2.4.1. Regarding Risk of Soil Spillage and Sedimentation of Eroded Soil Due to Rain during Excavation and backfill

a. Description of mitigation measures

In order to prevent risk of burying arable land or causing slippery, muddy soil in residential areas due to soil spillage or mud sediment due to rain during excavation and temporary storage of materials, rocks, the following measures shall be applied:

- *Finishing construction and compacting tightly:* in the rainy season, from May to September, finish construction on each foundation and compacting to avoid erosion by rain, check the foundation before the rain, if case of erosion, reinforcing more.
- *Collecting and transporting immediately waste soil/rock to leveling area:* Collecting soil / rock on the dump within the permissible limits. Waste soil shall not be stored at each yard until finish construction, but gradually moving towards the designated leveling position. Especially, in the rainy season, from May to September, immediately transport to the leveling positions as defined; the rest shall be continued covering from rain.
- *Creating proper dumping sites:*
    - Dumping sites are not allowed at the residential areas or areas with high concentration of economic activities of which elevation is lower than the construction site elevation.
    - Within the site clearance, separate dumping sites will be arranged within the organic soil stored for reuse and waste soil waiting for transportation to the filling positions as defined. Area of each dump area shall not exceed $25m^2$ and stored soil shall not higher than 1.5m to facilitate covering to avoid erosion in case of rains and dust dispersion in strong winds. The temporary dumping sites of soil and waste soil shall be surrounded with fences made of geotextile. The geotextile fence shall be buried on the ground of 15cm to 20cm deep and supported by the poles driving deep down firmly.
- *Installing of mud barrier:* Not only in the rainy period, the installation of mud barriers for prevention of sedimentation and soil spill to surrounding area shall be

implemented. Mud barrier are installed at the outer edge of the land acquisition border to surrounding land, according to the section of the route not to interfere the construction. Barrier made of geotextile, buried deep into the ground at least 10cm and reinforced to avoid falling. After finishing each section, the barrier is taken up, cleaned and re-used for the next stage.

- *Cleaning areas with spilled soil:* In the event of the mud spill to agricultural land along two sides of the new route, these areas will be cleaned and returned to the original state.

b. Location and implementation time

- *Implementation location:* At the construction areas near agricultural lands and residential areas along the project.
- *Implementation time:* shall be applied during excavation and backfill of road bed, foundation pit and area of material storage

4.2.4.2. Prevention and Treatment of Soil Compression

a. Description of mitigation measures

- *Preventing the risk of soil compaction:* limit the scope of construction in the scope of site clearance and service roads by piles. Vehicles are allowed to operate within this limit only.
- *Handling in case of negligence:* In case of negligence, vehicles encroach beyond the limited scope; loosen land by plowing the abused land at least 0.3m deep.
- *Disposing land acquired temporarily after construction:* After construction, in the area which construction sites are located and service roads on site, in addition to cleaning surfaces, loosen land by plowing it at least 0.5 m deep before handing over to the owner.

b. Location and implementation time

The said measures shall be applied on construction site and agricultural land along the project.

4.2.4.3. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

Mitigation measures developed on the basis of causes and impacts for the purpose of reducing immediately from source simultaneously with the processing of the consequences will be highly effective. Simple techniques are simple, suitable to the contractors' capacity. Residual impacts are acceptable.

However, it is inevitable that vehicles shall encroach beyond the defined boundary. In this case, the project is committed to restoring this land as stated above. On the other hand, during construction, contractors often avoid implementing many environmental measures if not directly influence the construction contents due to concerns about the progress and increased costs. Therefore, to increase the feasibility of the proposed measures, implementation costs will be calculated to be included in total investment of the project and the implementation contents will be included in the bidding terms. In terms of economic contracts, the project will monitor and ask the contractor to comply with the contract, ensure the feasibility of the proposed measures.

4.2.5. Regarding Impacts on Transportation

4.2.5.1. Regarding the Risk of Road Traffic Disruption during paving the section coincide with the existing road and construction of intersections.

a. Description of mitigation measures

With the aim of preventing and limiting traffic disruption on the existing road paving the section coincide with the existing road and construction of intersections, the following measures shall be applied:

- *Complying with general regulations:*
  - AC Paving on each side one, just finishing construction safety aside for vehicles traveling, then continue the remaining parts.
  - Do not gather the construction machines of the project on the existing road.
  - Do not let the temporary storage area as material, soil/ rock as waste. They are arranged within the site clearance of the project and at least 7m away from the existing road. In the case of sedimentation or soil spillage on the existing road, immediately cleaning and clearing.
  - Every day, during the construction of intersections, the existing road within the project and in a wide range from the edge of the project road on the two sides will be cleaned. This wide range will be defined by field supervisor based on stains of t the project's vehicles causing on the existing road.
  - The drivers of the project and the construction workers must understand and comply with regulations on traffic safety and alcohol and drug use.
  - Coordinating with local traffic police control of the car on the road.
- *Placing signs:* Signs on guarding the construction area will be located on two sides along the existing road in the driving position easily observed by the drivers and at a minimum distance of 150m. Traffic signs are stable under normal traffic conditions as well as when there are high winds and reflective panels for drivers

easily recognizable at night. Scratches, lacerations, punctures on reflective panels will be remedied soon to always promote its reflective effects. After the end of intersection construction, all guarding signs will be removed.

- *Installing guide posts and signal lights:* The piles are placed to limit the scope of the construction of the existing pavement. is the piles are 75cm high at minimum with wide base to ensure no damage by travelling vehicles. All the piles are arranged in white and reflective panels to ensure a clear view both day and night. Pile stable under normal traffic conditions as well as when there are high winds. On the marker lights are blinking A (low flashing lights), B (fast flashing lights) will be supervising engineer for approval prior to use according to the actual conditions.
- *Traffic guidance:* Guiding the traffic to ensure rational flow of traffic during AC paving of existing road surface. Traffic guide men shall be arranged equipped with flags to guide the traffic movement in and around the construction area.

b. Location and implementation time

Apply implemented in the construction period coincides with NH38 (Km33+963 ÷ Km38+400; Km43+600 ÷ 47+600) the intersection with the flyover approach roads at NH5, dike (Km4+300); access road to Phu Ung vestige (Km5+025), NH38, PR204, PR200, access road to Dien Bien River bank (Km52+390) and NH39 during the construction phase of the project.

4.2.5.2. Regarding the Risk of Road Traffic Accidents and Damage to Public Facilities during Transportation of Materials, Waste Soils and Rocks

a. Description of mitigation measures

In order to prevent and control the risk of unsafe traffic caused by the spilled material causing slippery on the national highways and provincial roads and the risk of damage to the local road with low solid level when the road is used to transport material or soil/ rock.

- *For the provincial road and national highway:*
  - *Arranging reasonable transportation time*: during peak hours from 6am-8am and 4pm-6pm;
  - *Not transporting over the maximum speed*;
  - *Cleaning*: Spilled soil, rocks shall be cleaned immediately, ensuring not slippery in case of rain.

- *When inter-commune roads are used for transportation:*
  - *Asking permission from local authorities*: Obtaining written consent from local authorities on temporary use of inter-communes for the right transportation purposes.
  - *Organizing reasonable transportation*: Not transporting materials and soil types in the winter time people using contemporary and holidays. Project responsibility to learn, but this time around and is committed to avoid shipping but this time with a particular region;
  - *Implementation of sanitary measures and return to original state*: Make sure you clean, safe in the process of using and maintaining the road, make sure people go back to normal, safe and restored to its original state before assigned to the local board.

b. Location and implementation time

The measures shall be implemented on transportation routes National highway, provincial roads, NH5, NH1A, NH39, PR200... during the construction (24 months).

4.2.5.3. For the risk of unsafe water transport due to the operation of floating

a. Description of mitigation measures

To prevent the loss of waterway traffic safety, the measures applied:

- Put signs: Signs realms construction sector is expected on a minimum distance of 300m, where all means of easily observed. Traffic signs stable in normal traffic conditions as well as when there are high winds and reflective panels for easy identification at night. It scratches, lacerations, punctures on reflective panels will be remedied soon to always effective reflective of it. After the end of construction, all signs will be relocated realm.
- Put buoys and lights: buoys are placed to limit the scope of application of the execution time. All buoys are red, white and ensures clear view both day and night. Lights on a blinking buoy type A (little blinking lights), type B (many flashing lights) will be supervising engineer for approval prior to use based on actual conditions.
- Traffic Guide: Guide to traffic to ensure appropriate transport indication. During construction of the layout generation will stand bearer realms and command signals for vehicles at locations near the construction.

b. Location and implementation time

The mitigation measures to be implemented during construction of Bridge Sat (15 months).

4.2.5.4. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

In fact, it is difficult to eliminate the impact of traffic, especially in areas where traffic density is high and in the river transportation operations. The measure is based on the construction of the content, the traffic conditions (water and land) every area and level of impact can minimize traffic congestion, especially to ensure absolute safety traffic. Residual impact is not significant.

Measures to minimize impacts from transportation activities recommended materials simple, feasible and highly effective. However, to ensure residual impacts are acceptable, the project will work with local government publicly announced plans to transport people bidders findings of non-compliance to the Project this project in conjunction with the construction company requires strict implementation of mitigation measures have been approved as well as additional measures as appropriate.

The mitigation measures for the utility community are committed to the project. Progress of the project depends on implementing this commitment. Feasibility of the proposed measures, therefore, are considered as quite high. Residual impact is negligible.

4.2.6. Regarding Impacts of Waste Rock and Soil

a. Description of mitigation measures

To prevent the risk of spills and soil at the dump, to apply measures:

- Compaction: rock poured out at the beach will be compacted, this has limited the ability erosion and spill out of the surrounding area while enabling local space for civil works .
- Use barrier: In the pouring process, the rocks are un-compacted, preventing sediment barrier is used to prevent the overflow of land areas around

b. Location and implementation time

The mitigation measures to be implemented in the area of land that position during the dumping of waste soil.

c. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

The mitigation measures for the utility community are committed to the project. Progress of the project depends on implementing this commitment. Feasibility of the proposed measures, therefore, are considered as quite high. Residual impact is negligible.

4.2.7. Regarding Impacts due to Concentration of many Workers

a. Description of mitigation measures

- *Managing workers:* Project offers conditions in camps, water, electricity will ensure that workers living in camps in the health care field during construction. Registration of temporary residence for workers; education construction workers respect cultural, religious, and local beliefs prohibit drinking while performing construction, prohibits gambling in public school and scheduling (hours and hours of leisure) for workers.
- *Coordinating with local authorities:*
  - Coordinate with local authorities, including the Committee of the Vietnam Fatherland Front and the women for the purpose of promoting public understanding of social evils, prostitution, and HIV epidemics in the region...
  - Coordinate and work closely with local community hygiene as well as symptoms of the disease appear in the region;
  - Coordinate and cooperate with local authorities in preventing and combating social evils;
- *Employing local labors:* Use the unskilled workers, both women and men, local to do the job easy. For some jobs require training, the contractors will be selected from among local workers hired to train for new skills so they can do a good job.

b. Location and implementation time

The measures are implemented during the construction of the project (24 months).

c. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

Mitigation measures by the concentration of workers are also the regulations on work safety and sanitation project in the construction process should be included in the bid contract. This legally is binding to facilitate full implementation of the proposed measures.

4.2.8. Waste Management and Treatment

4.2.8.1. Establishing and Implementing Waste Management Plan during Construction

a. Description of mitigation measures

- *Establishing waste treatment plan:* The project will be responsible for materials management and waste generated during the construction of a waste management plan (QMP). QMP built for regular waste (construction waste, waste) and hazardous waste (waste oil). During the construction phase, QMP will be the construction units to use as a construction material for detailed procedures for managing and reporting on waste generated and moved to the materials used for the project. QMP is one of the test objects according to the requirements stated in the environmental monitoring program.
- *Managing waste:* waste is organic soil, excess concrete mortar, soil and bentonite balance after the re-use and is stored temporarily in the dump or switch to leveling in the waste dumps will be identify and deal with a local following in the steps of the project.
- *Managing garbage and domestic waste:* Garbage and solid waste activities after collection will be categorized and stored at each site. Through economic contracts, the project will require the contractor to handle all kinds of waste according to Decree 59/2007/ND-CP dated 09/04/2007 on solid waste management and in accordance with local economy.
- *Managing waste oil and oily waste:* collected and stored according to the instructions of the staff are trained in hazardous waste management in the construction field. Waste oil will be collected and handled in accordance with Circular 12/2011/TT-BTNMT dated 04.14.2011 on hazardous waste management.

b. Location and implementation time

- The measure of "establishing waste treatment plan" "managing waste" and "managing garbage" is implemented within 24 months at 05 site positions of the project.
- The measure of "managing domestic waste", "managing waste oil and oily waste" is implemented within 24 months on 06 construction sites.

4.2.8.2. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

Develop and implement waste management plan during construction of project commitments and regulations on work safety, sanitation and organization of construction of a transportation project. Therefore, the project to ensure the

implementation of previous commitments the state management agencies in each local environment and perform content for contractors as well as content supervision consultant will be taken on a Terms recordings; under economic terms in the contract, the project will implement control measures to require contractors as well as the supervision consultant to comply with the contract. The feasibility of the proposed measures, so be sure.

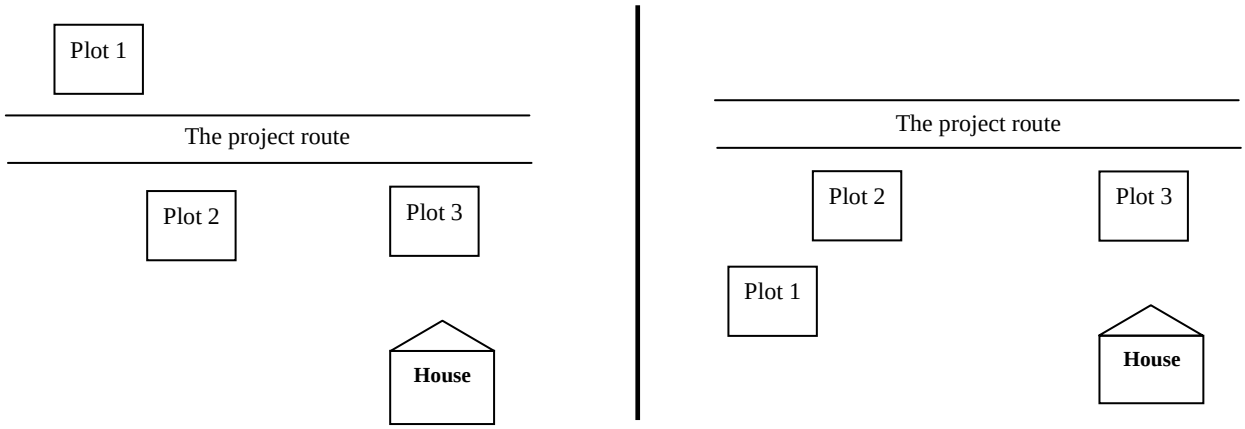
4.3. Measure for Prevention, Mitigation of Adverse Impacts of the Project on Environment in the Operation Phase

4.3.1. Mitigation of Impacts Causing Fragmentation of Production Land

a. Description of mitigation measures

Encouraging localities consideration and arrangement of land plots properly: the measures aiming to mitigate the impacts of fragmentation of agricultural land. The project will encourage localities to consider and arrange fragmented plots properly so that an owner only cultivates their land to one side of the road (figure 4.1).

Figure 4.1. Sitemap of Mitigation Measures of Impacts Causing Agricultural Fragmentation



Potential impacts - households must cross the roads to do farming at all plots

Mitigation measure - Household receive new plot and not have to cross the roads

b. Location and implementation time

The measure is implemented on the divided agricultural land.

c. Assessment of the Efficiency of Mitigation Measures and Residual Impacts

The said mitigation measure is a part of design contents of the Project, so it is highly feasible and preventive division at source. Residual impacts are insignificant. However, the measure depends on the ability of land change and land use planning of each locality.

4.3.2. Minimize impacts of local flooding

a. Description of mitigation measures

To minimize the impacts of agricultural land flooded, in addition to measures to enhance cross culverts with suitable apertures have been incorporated in the project design, the project will work with local land use organic dig the way to exalted to the field and to encourage local use conversion to perennial.

b. Location and implementation time

The plot is located between irrigation canals and roads in the area bypass through the An Thi town Km47+100 ÷ Km49+400;

4.4. Measures for Prevention and Response to Risks and Incidents

4.4.1. Response to Technical Incidents

With the aim of preventing technical incidents when assembling girders, the following measures shall be applied:

- The construction unit must submit the construction organization methods to the project's owner for consideration. The project's owner shall consider details of such plans based on specialized regulations and approve the most optimal and safest plan. The construction activities must strictly comply with the construction process as approved.
- The project's owner shall establish plan on vehicles and equipments for addressing technical incidents, including rescue team; organization and plans (leaders, implementation order) and necessary address to be contacted in case of emergency, including hospitals in Hai Duong and Hung Yen.
- The prevention measures shall be implemented during the construction of bridges.

4.4.2. Prevention of Fire/Blasting Incidents

The following measures shall be applied:

- Petroleum, oil used for construction equipments shall be stored in separated warehouses, away from potential sources of ignition; these warehouses are equipped with temperature monitoring devices and fire-alarming devices.
- Arranging extinguishers, fire water tank, and oxygen tank regularly on the site. Fire prevention/ fighting facilities shall be regularly inspected and maintained.
- Training, propagating to enhance workers' awareness and capacity of fire safety.
- The measures shall be implemented during the construction (24 months).

4.4.3. Prevention of Industrial Safety Incidents

With the aim of preventing accidents during construction, the following measures shall be applied:

- The project's owner shall set out labor safety regulations during construction.
- Establishing and implementing regular health check programs for officers and employees.
- Training and providing information on acquisition health.
- Workers are fully equipped with necessary protective equipments;
- Establishing adequate communication system to ensure labor safety during the project implementation.
- The project's owner shall establish rescue plans in case of acquisition accidents, including rescue team; organization and plans (leaders, implementation order) and necessary address to be contacted in case of emergency, including hospitals in Hai Duong and Hung Yen provinces.
- Measures for prevention and response to environmental incidents shall be conducted for the project during the construction (24 months).

4.4.4. Preventing incidents boat accident

Will apply the following measures:

- Equip signaling system: System signals will be located at the base Sat Bridge;
- Coordinate with authorities local waterways: To ensure safe navigation;
- Timely rescue organization: If the incident occurs, including the coordination of the local health authority.
- *Location*: Sat Bridge.

4.4.5. Demining

- According the Decision No. 96/2006/QD-TTg of the Prime Minister on management and performance of the tasks of sweeping bombs, mines and explosive materials and Circular No. 146 2007 TT-BQP Of September 11, 2007, guiding the implementation of the prime ministers Decision No. 96 2006 QD-TTG of May 4, 2006, on management and performance of the tasks of sweeping bombs, mines and explosive materials; demining work will be carried out in and around the construction site to ensure safety in the process of demining and safety confirmed by defense office handles explosive materials through economic contracts with the Project Owner.
- The area, depth and safety corridor of sweeping bombs, mines and explosive

materials for Project is implemented to Decision No.95/2003/QĐ-BQP issued by Minister of Defense dated August 7th, 2003 on promulgating "technical process of detecting and dealing with bomb, mine, explosive materials".

- *Implementation time*: Prior to start Project's construction.

CHAPTER V. ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM

(Environmental monitoring and management program implemented on guideline of Circular No.26/2011/TT-BTNMT, A separate EMP will be established)

5.1. Environmental Management Program (EMP)

5.1.1. Objectives

The purpose of The Environment Management Program of Project is to set out a program to manage environmental issues in the preparation and construction of the works and during the operation phase of the project; including:

- Provide a management plan for implementation of the environment impact mitigation measures which have been approved environmental management agencies and converted into the terms of the Specifications of the Project;
- Ensure a sound management of waste, provide rapid response structures to environmental issues and incidents and urgently manage and deal with environmental problems;
- Continuously collect the information about changes of environmental quality in implementation of the Project, in order to timely detect additional negative environmental impacts and propose proper measures to prevent and mitigate environmental pollution, according to the TCVN 2001, 2002; QCVN 2008, 2009, and 2010.
- The information collected in the course of environmental management of the Project must have following basic properties:
  - The accuracy of the data: the accuracy of the monitored data is assessed by the similarity between the data and the fact;
  - The characteristic of the data: data collected at a monitoring point represents a certain space;
  - Homogeneity of data: data collected at different locations at different times of the Project area has the ability to be compared with each other. The comparability of the data is called the homogeneity of the data;
  - The ability of continuous tracking over time: to be performed in compliance with environmental monitoring programs which was identified during the project implementation;

- The synchronization of data: data include enough information about that element itself and relative elements.

5.1.2. Summary of Environmental Management Program

The Environment Management Program of the Project is summarized in Table 5.1.

Table 5.1. Brief of Environment Management Program of the Project

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
I	**Preparation phase of the Project**						
-	Occupation of residential land	216 households losing residential land, among which 11 households has to face relocation and involuntary resettlement.	Compensation according to Resettlement Action Plan (RAP), including: - Compensation for land, buildings at market price; - In-site resettlement; - Resettlement support;	Expenses for land acquisition is included in total cost.	To be completed before starting construction of the Project	District LA Council	PMU3 and independent supervision divisions.
-	Occupation of agricultural land	The Project shall occupies 8.89ha of agricultural land permanently and 3ha agricultural land temporarily Income from agriculture on occupied land area is damaged.	Compensation according Compensation, Support and Resettlement Plan, including: - Land acquisition at market price; - Supporting households; - Supporting with agricultural land in residential areas; - Supporting of changing profession and creating employment; - To employ for simple jobs of the Project.	ditto	ditto	ditto	ditto
-	Irrigation canal relocation	Project shall relocate 3,052m irrigation canal Interrupting irrigation water source for fields in the Project Area and the vicinity.	To implement impact preventive measures, including: - To construct in right schedule and design process; - To ensure sufficient and timely funds for execution	ditto	ditto	ditto	ditto
	Grave relocation	Project shall relocate 13 graves affecting spiritual life of the deceased people's relatives.	- To notify prior to LA time at least 6 months. - To compensate and support expenses reasonably for removal, transport and burying the graves	ditto	ditto	ditto	ditto
-	Building demolition	Dust pollution generated from Building demolition area exceeding permissive limit by 1 - 3 times in 30 - 40m distant. Affecting residential areas (Km0+000; Km4+200 ÷ Km4+350)	To implement dust control measures: - To spray water for moisturizing; - Covering with canvas; - Transport of waste.	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for observation are presented in table 5.10	1 week of demolition	Contractor, under contract with the Project Owner.	PMU3 and independent supervision entities.
		In day time, residential areas will be affected by noise pollution with noise level exceeding permissive limit by 5.2 ÷ 14.6dBA. In night time, the noise level affecting these objects exceeds the permissive limit by 20.2 ÷ 29.6dBA	To implement noise control measures including: - To demolish and transport wastes in night time: 22 to 6.00. - To use equipment with low noise emission level.	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for observation are presented in table 5.10	ditto	ditto	ditto
		Landscape is contaminated due to wastes generated from demolition	Proposed measures, including: - Classification and suitable treatment. - To collect wastes and select temporary gom dumping sites.	Expenses for implementation of mitigation measure is included in total cost of the Project.	ditto	ditto	ditto
-	Leveling site	Dust pollution generated from demolition area exceeds permissive limit by 1.5 – 2.5 times in 25 - 35m distant.	To implement dust control measures: To spray water to moisturize: to spray water at least twice daily.	Expenses for implementation of mitigation measure is included in total	1 month of leveling	ditto	ditto

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
				cost of the Project.			
		Environmental pollution caused by wastes generated from jobsite preparation (rubbish, waste paper, etc.)	Proposed measures, including: - Suitable classification and treatment. - Collection and selection of suitable temporary stockpile.	Expenses for implementation of mitigation measure is included in total cost of the Project.	ditto	ditto	ditto
II	**Construction phase**						
1	***Air environment***						
-	Earthwork and horizontal leveling	- In summer, air environment surrounding road and intersection construction areas will be polluted by TSP at not serious level (< 5 times of permissive limit), only reaching the permissive limit outside the roadside in 37m distant;	Proposed measures in preventive manner, including: - Spraying water to moisturize surface of filling/excavated area. - To prevent dust generation in temporary stockpiles - To use equipment with ensured exhaust standard and regulate moving area	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for standard nozzle are presented in table 5.12 Expenses for observation are presented in table 5.10	Embankment and foundation pit construction	Contractor, specified in the contract.	PMU3; Environment supervision consultant Competent state agencies (MONRE; DONRE; and Environment police).
-	Material transport activity	Bụi cuốn từ đường: Nồng độ bụi vượt GHCP từ 2 ÷ 3 lần, vào ngày gió to, trời nắng bụi phát sinh có thể vượt GHCP đến 4 lần. Nồng độ bụi chỉ đạt GHCP ở phạm vi > 80m tính từ tim đường vận chuyển, xuôi theo chiều gió.	Proposed measures in preventive manner, including: - Sử dụng phương tiện đảm bảo tiêu chuẩn khí thải and đáp ứng các yêu cầu trong vận chuyển (che chắn vật liệu…); - Kiểm soát and quản lý môi trường nơi phương tiện ra vào khu vực thi công - Làm sạch đường khu vực gần các cửa ra vào khu vực thi công	ditto	24 construction months	ditto	ditto
-	Concrete mixing plant's activity	Dust content exceeds permissive limit by many times, Dust content only reaches permissive limit in about 50m distant from the mixing plant along wind direction.	Proposed measures in preventive manner with adjustment through observation results, including: - To prevent dust emission in mixing material storage area. - To prevent dust emission when dumping materials. - Not to grind stones in the mixing plant - To prevent dust emission in the convey line. - To prevent dust emission in silo.	Expenses for implementation of mitigation measure is included in total cost of the Project.	24 construction months	ditto	ditto
2	***Impact caused by noise pollution***						
-	Noise generation road and bridge construction activity	When operating noise emitting equipment for construction , it will affect below objects: - Residential areas will be affected by noise level exceeding the permissive limit by 0.3 ÷ 15.8dBA in day time and 19.2 ÷ 30.8dBA in day time;	Proposed measures in preventive manner, including: - To apply general principles: o To arrange noise generating equipment in suitable distance. o Stop engine of any vehicle parking in the jobsite; o In day time when constructing in about 200m distant from	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for observation are presented in table 5.10	24 construction months	ditto	ditto

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
		- In day time, except Politic Training Center & People's Procuracy, other objects are only affected when equipment using high noise level, noise level exceeding permissive limit by 9.8 ÷ 18.8 dBA. At night, An Thi district health center will be affected by noise with noise levels exceeding the permissive limit by 8.2 ÷ 19.8 dBA	residential areas, low noise level equipment will be selected; o To prioritize equipment with low noise emission level; o Drivers are well trained have proper action, avoiding unnecessary noises; - Earth drilling near Tranh bridge 1 residential area will be implemented in in day time. - Environment monitoring				
3	***Water, sediment environment***						
3.1	Road construction						
	Earthwork	- The risk of surface water, sediment contamination in ponds at km0 +600; Km1 +450, +080 Km2, Km2 +200, Km 4 +600, +800 Km44, Km46 +400, +250 Km52 caused by soil spillage and deposition of eroded products with TSS and turbidity. - - The risk of soil spillage and erosion product deposition during earthwork and construction of the transverse drainage system	Proposed measures in preventive manner, including: - To Prevent soil spillage out of LA limit: Set of barrier to prevent spillage beyond land clearance. - Slope protection - Post-construction cleanup and compensation	Expenses for implementation of mitigation measure is included in total cost of the Project.	Maintaining the measure until handover (24 months)	ditto	ditto
3.2	Bridge construction						
-	Excavation and filling and earth drilling inside and adjacent to water flow	- Potential risk of drilling mud spillage into Sat river and Bun river, Tranh bridge 1, causing water pollution with TSS and turbidity. Aquatic system is affected by water contamination, causing death - Underground water contamination risk due to polluted surface water enters the drilling wall	Proposed measures in preventive manner, including: - - Bentonite from bridge substructure construction activities shall be prohibited from disposal to surrounding environment and shall be collected into temporary site compounds, to dry, then treated as normal solid waste. - When earth drilling, surface water preventing enclosure will be set up to prevent underwater pollution.	Expenses for implementation of mitigation measure is included in total cost of the Project.	To implement and maintain the measure throughout earth drilling process	ditto	ditto
-	Superstructure construction	The risk of water pollution due to solid waste falling into river flows (Sat River, Cuu An, Bun River, Quang Lang river and Dien Bien river). The quality of aquatic systems is impaired by pollution of water and sediments	Measures Proposed in preventive manner: using nets underneath to collect falling solid waste. The waste is stored in dust bin and be treated as solid waste	Expenses for implementation of mitigation measure is included in total cost of the Project.			
-	To arrange temporary works inside river flow	The risk of contamination of surface water, river sediments by solid waste that is not collected.	To clean up the river after construction by collecting temporary works, solid waste inside flow and stabilize river banks	ditto	Superstructure construction time	ditto	ditto
3.3	Jobsite activities						

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
-	Equipment maintenance activities	The risk of oil pollution by waste and maintenance waste water	- Proposed measures in preventive way: waste oil, oily waste from maintenance activities are managed and handled in accordance with Circular 12/2011/TT-BTNMT. - Primary depositing treatment to discard TSS in maintenance waste water	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for depositing pit and hazardous waste bin are presented in table 5.12	24 construction months	ditto	ditto
-	Site huts activity	Domestic waste from construction camps from entering the surface water in the river (Sat River, Cuu An, Bun River, Quang Lang River and Dien Bien rivers) will cause organic pollution	Proposed measures in the direction of prevention: waste is collected in tanks, waste water is treated through the sand tank, to use movable toilet in jobsite.	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for deposition pit, waste bin and movable toilet are presented in table 5.12	24 construction months	ditto	ditto
-	Cement concrete mixing plant	Contamination of water, river sediments due to sudden increase in TSS and pH of the river water.	Proposed measures in preventive manner: - - Wastewater from concrete mixing plant are preliminary treated by deposition process, then is re-used to moisturize the jobsite; - Convergence Location with the natural flows will be tested pH daily.	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for deposition pit are presented in table 5.12	24 construction months	ditto	ditto
-	Rainwater runoffs	The risk of contaminants entering storm water runoff of surface water pollution in the river Nguy cơ thâm nhập chất bẩn nước mưa chảy tràn gây ô nhiễm nước mặt tại các sông	Proposed measures in preventive manner, including: - Drainage system on site will be designed to ensure rainwater collection on the jobsite surface, so that rainwater will not overflow the area having contaminants such as petroleum storage and not cause flood. - To check convergence location to collect waste. - To clean the jobsite surface everyday. - To consider spread a chip stone layer on the soil ground to prevent erosion of dirt into water bodies, while reducing dust generation.	Expenses for implementation of mitigation measure is included in total cost of the Project.	Through construction phase, especially in rainy season (May ÷ September)	ditto	ditto
4.	***Soil environment***						
-	Earthwork, storage of materials, waste soil.	Degradation of rice farming land due to covering agricultural land by spilled soil. Deposition of eroded soil caused by rain in residential land will hinder community activities	Proposed measures in preventive manner, including: - Construction section by section of embankment và compaction to avoid erosion caused by rain, while checking filling embankment before each rain; - Waste soil will be collected to stockpiles in jobsite extent and enclosed by fence to prevent spillage. In case of spillage, agricultural land areas will be cleaned and restored.	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for depositing mud fence are presented in table 5.12	24 construction months.	ditto	ditto
-	Operation of construction equipment	Construction equipment can occupy agricultural land adjacent to LA ROW causing soil compaction	Proposed measures in preventive manner, including: - To limit construction extent by stakes. - Ploughing to fix soil compaction	Expenses for implementation of mitigation measure is included in total cost of the Project.	24 construction months.	ditto	ditto

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
5	***Traffic and public utilities***						
-	Pavement and intersection construction	- There is the risk of traffic jam and unsafety on NH38 (Km33+963 ÷ Km38+400; Km43+600 ÷ 47+600) and intersections with NH5 bridge approach road, dyke road (Km4+300); access road to Phu Hung temple site (Km5+025), NH38, PR204, PR200, Dien Bien river bank road (Km52+390) and NH39 - Ảnh hưởng đến hoạt động đi lại, sinh hoạt của người dân hai bên đường	Proposed measures in preventive manner, including: - To Comply with safety regulations in construction including not to arrange material stockpile, construction equipment on traffic corridor. - Within the scope of construction , to place signs, marker posts, and signal lights for traffic diversion and traffic safety. In case of necessity, traffic management person will be arranged. - To ensure transportation during construction; - To organize traffic management during construction.	Expenses for implementation of mitigation measure is included in total cost of the Project.	24 construction months.	ditto	ditto
-	Transport on national highways, provincial roa roads	It can cause traffic accident on the haul roads such as NH5, NH39, PR200 ... due to transport activity causing falling of materials , resulting in muddy, slippery road surface.	Proposed measures in preventive manner, including: - To perform transport on the route out of rush hours and at the correct speed, - To collect falling material and clean the road.	Expenses for implementation of mitigation measure is included in total cost of the Project.	24 construction months.	ditto	ditto
-	Transport on low-grade roads	Inter-commune, inter-hamlet roads will be damaged, degraded, indirectly causing damage to local people who use the roads daily.	Proposed measures in preventive manner, including: - To agree with local authority on using temporary roads for transport; - To ensure hygiene, safety during usage, and restore to initial condition before handover back to local authority.	ditto	ditto	ditto	ditto
	Construction acitivity of 01 pier of Sat bridge inside water flow	Accident risk due to operation of floating system	- To Place warning signs, buoys, signal lights - To guiding traffic in upstream and downstream of bridge -	ditto	ditto	ditto	ditto
6	***Impact caused by disposing waste soil***						
	Disposing waste soil	The risk of spillage of soil causing coverage on Agricultural land and make residential area muddy	- Compaction - Use fence to prevent depositing mud	Expenses for implementation of mitigation measure is included in total cost of the Project. Expenses for depositing mud fence are presented in table 5.12			
7	***Impact caused by worker concentration***						
-	Activity of concentration of workers	- Area surrounding population may contract diseases and infectious diseases such as dengue fever, eye disease and even HIV. - The Project impacts workers, local communities, travelers risk arising due to conflict ..	Proposed measures in preventive manner, including: - - Periodic health examinations for workers. - To implement measures to manage workers, including facilitating the hygienic accommodation, temporary residence registration, and communication of prevention to workers. - To coordinate with local authority to communicate infectious disease prevention methods and measures to prevent social evils and ensure	Expenses for implementation of mitigation measure is included in total cost of the Project.	24 construction months.	ditto	ditto

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
			security and order. - - Prioritize using local labors for simple jobs.				
8	***Waste and waste treatment requirement***						
-	Activities during construction of the Project	Solid waste and waste water cause contamination of landscape and surrounding area	Proposed measures, including: - To develop waste management plans for both ordinary waste and hazardous waste. - Waste is dump is stored in temporary stockpile and then moved to leveling site. - Garbage and life wastes are classified, stored and handled in accordance with Decree 59/2007/ND-CP and in accordance with local practice. - Waste oil and oily waste are collected into separate containers and handled in accordance with Circular 12/2011/TT-BTNTM	Expenses for implementation of mitigation measure is included in total cost of the Project.	24 construction months.	ditto	ditto
III	**Operation phase**						
	Agricultural land segmentation impact						
-	New section passing agricultural land area.	The project alignment crosses agricultural land plots cause fragmentation of farming land.	To encourage local communities to arrange suitably land plots so that one owner only farm on one side of the road.	Local government shall arrange	Before the project is operated	Local government	Local government
	Impact of local flooding						
-	Appear on filling embankment	Local flood in bypass of An Thi town in Km47+100 ÷ Km49+400 section, the alignment is parallel with irrigation canal, decreasing drainage capacity , that means decrease of productivity	Mitigation measure including: - To increase transverse culvert - To use organic soil from embankment cutting to raise elevation of the field and work with local authority to convert the land use purpose into p tree planting land.	Expenses for implementation of mitigation measure is included in total cost of the Project	Investment project establishment step	Design consultant, according to Contract with the Project Owner	PMU3 and Tư vấn thẩm tra
IV	**Environment incident**						
	Superstructure construction	Technical incident causing collapse of the works, threatening lives of construction .	To follow safety rules; To set up suitable construction plan, while planning coordination with relevant parties upon incident	Expenses for implementation of mitigation measure is included in total cost of the Project	24 construction months	Contractor, specified in the Contract	PMU3 and Construction supervision consultant
	Petrol storage	Explosion incident in vehicle maintaining area, petrol storage and supply place for vehicles	To follow rules on fire & explosion safety; to have compliant petrol storage warehouse. To arrange fire extinguishers, water tank, fire sand tank in jobsite.	ditto	ditto	ditto	ditto
	Construction activity	Working accident can happen anytime during construction if the workers' working is not following safety rules.	To set up rules on working safety and response plan upon accident.	ditto	ditto	ditto	ditto

No.	Project activity	Environmental Impact	Environment Protection works and measures	Expenses for implementation of Environment Protection works and measures	Implementation period and completion time	Implemented by	Supervision by
		In stormy season, high flow velocity increase possibility of collision between means of transport with each other and with Sat bridge pier	- To arrange signaling system - Timely responding	ditto	ditto	ditto	Ditto
	Demining	Potential risk of explosion, threatening people's lives and assets	Demining will be implemented in and surrounding construction area and confirmed to be safe by military unit specialized in handling explosive materials under an economic contract signed with the Employer	ditto	ditto	ditto	ditto

Technical characteristics of the environmental treatment utilities

(1) Sediment prevention fence

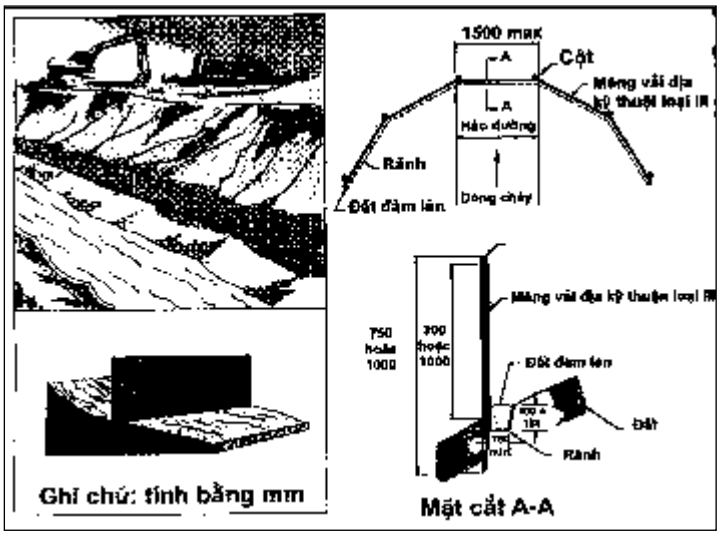
The geotextile barrier is used to trap sediment substances while water still flowing through. It consists of a geotextile membrane fixed on wooden or metal piles. Geotextile barrier is easy for moving on the extent of work progress. The barrier is maintained by removing sediment substances. On completion of the work, this barrier is reclaimed and the ground is stabilized.

Residual mud barriers consist of several sections, which are installed at the following locations:

- In the temporary dumping sites (filling soil and unsuitable soil and stone). Stoppers are arranged as a surrounding fence;
- Along the foot of the slopes where the route passing through canals and residential areas (see Table 5.1).

Residual mud barriers will be installed prior to construction of work items in this area. Technical specifications of the barriers is shown in Figure 5.1.

Figure 5.1. Residual Mud Barrier



(2) Toilets, mobile waste baskets, hazardous waste containers

At each site, there will be:

- 01 portable toilet compartment 03;
- 02 domestic waste plastic basket of 200 liters, with a lid;
- 01 hazardous waste plastic containers 100 liter, with a lid.

(3) Wastewater treatment and drainage system

Inside the construction site, a wastewater treatment and drainage system will be installed, including:

- Treatment of wastewater from areas of washing aggregate, concrete mixing and washing concrete mixers: water from aggregate washing areas and concrete mixing areas will be directed to a sedimentation tank which has at least two compartments with minimum size 2m x 2m x 5m, making sure to collect all wastewater from 01 batch of concrete. In front of the inlet, there will be an iron grid for garbage collection. Treated water in the tank will be reused. Sediment will be collected and processed as for construction waste.
- The system of collecting and draining trenches of wastewater shall have minimum size of 50cm x 50cm x 30cm is well compacted and lined with geotextile to prevent erosion.
- Sedimentation tanks and drainage ditches shall be built in the pre-construction phase and regular maintained to ensure good operation in the construction phase of the project. After construction, they will be filled with soil, then covered with organic soil of about 1 meter thick to use for agricultural purposes.

5.1.3. Roles and Responsibilities for Environmental Management

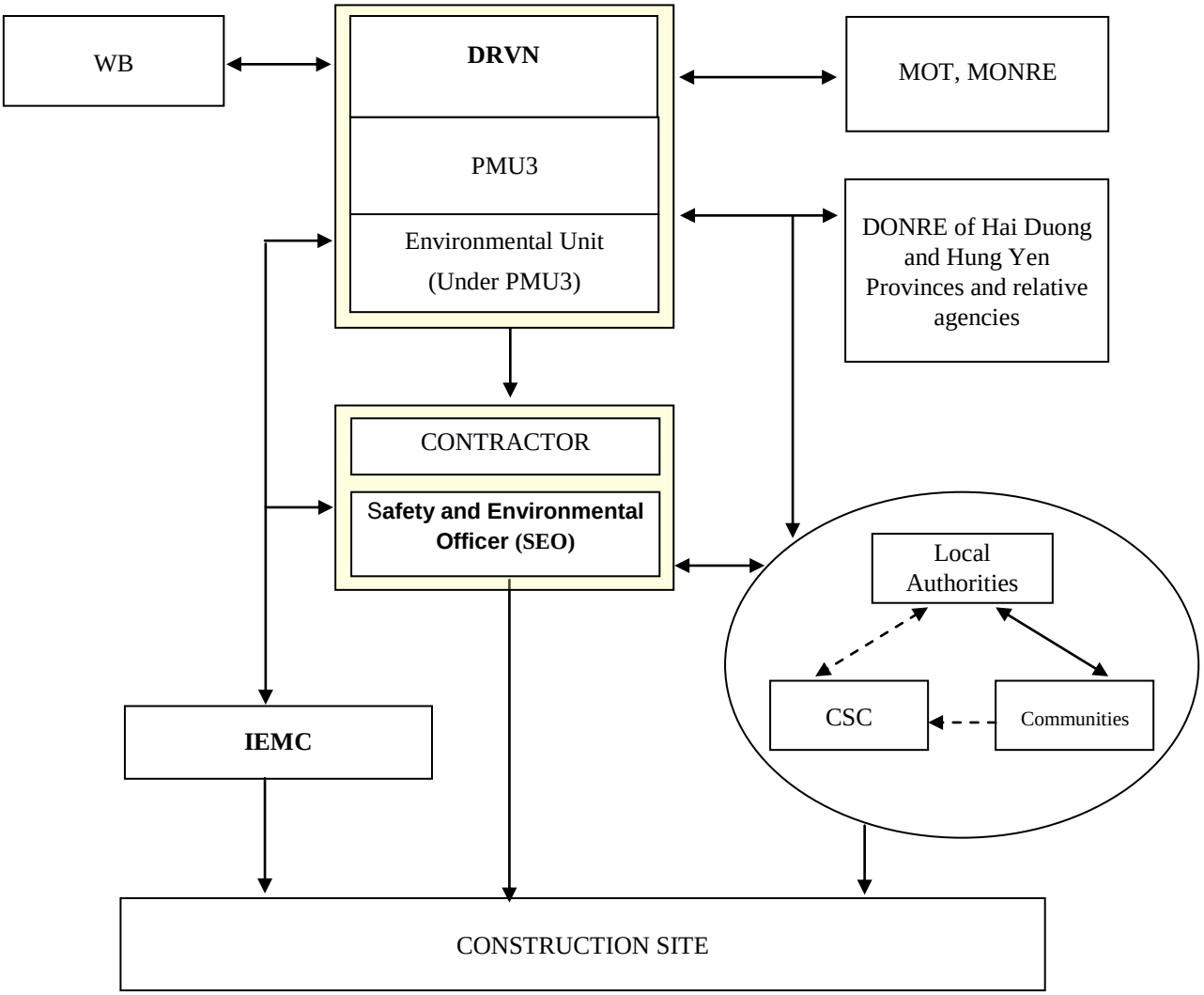
5.1.3.1. In Pre-construction and Construction Stages

Proper environmental management during construction requires the involvement of several stakeholders and agencies, each with different roles and responsibilities including:

- Project owner: DRVN, PMU3;
- The agency approved Environmental impact assessment report: MONRE;
- DONRE of Hai Duong province and DONRE of Hung Yen province and relative agencies;
- Independent Environmental Monitoring Consultant (IEMC);
- Contractor;
- Local communities;

World Bank (WB).

Figure 5.2. Organization Chart of Environmental Management of the Project



Specific responsibilities of the stakeholders are presented in Table 5.2 below:

Table 5.2. Roles and responsibilities of stakeholders

No.	Company/ Unit	Responsibilities
1	DRVN/ PMU3	DRVN, the Project implementing agency, will be responsible for overseeing the project implementation. PMU3, representative of the DRVN, will be responsible for monitoring the overall project implementation, including environmental compliance of the project. PMU3 will have the final responsibility for environmental performance of the project during both the construction and operational phases. Specifically PMU3 will: i) closely coordinate with local authorities in the participation of the community during project preparation and

No.	Company/ Unit	Responsibilities
		implementation; ii) monitor and supervise EMP implementation including incorporation of EMP into the detailed technical designs and bidding and contractual documents; iii) ensure that an environmental management system, as indicated in Figure 2, is set up and functions properly; iv) be in charge of reporting on EMP implementation to the DRVN and the World Bank. In order to get effectiveness in the implementation process, PMU3 will establish an environmental unit with at least two environmental staff to help with the environmental aspects of the project.
2	Environmental Unit (under PMU3)	The Environmental Unit is responsible for monitoring the implementation of WB's environmental safeguard policies in all stages and process of the project. Specifically, this unit will be responsible for: i) reviewing the subproject EIAs and EMPs prepared by consultants to ensure quality of the documents; ii) helping PMU3 incorporate EMPs into the detailed technical designs and civil works bidding and contractual documents; iii) helping PMU3 incorporate responsibilities for EMP monitoring and supervision into the TORs, bidding and contractual documents for CSC and IEMC; iv) providing relevant inputs to the consultant selection process; v) reviewing reports submitted by the CSC and IEMC; vi) conducting periodic site checks; vii) advising PMU3's leaders on solutions to environmental issues of the project; and viii) preparing environmental performance section on the progress and review reports to be submitted to the DRVN and the Bank.
3	CSC	The Construction Supervision consultant (CSC) will be responsible for supervising and monitoring all construction activities and for ensuring that Contractors comply with the requirements of the contracts and the EMP. The CSC shall engage sufficient number of qualified staff (e.g. Environmental Engineers) with adequate knowledge on environmental protection and construction project management to perform the required duties and to supervise the Contractor's performance. The Environmental Engineers shall be lead by a *Workplace Safety and Environment Supervisor (SES)* who shall have extensive experience (at least 5 years experience is required) in environmental management, supervision and monitoring on construction projects and be familiar with Viet Nam environmental legislatives requirements. The terms of reference for the CSC shall be clearly stipulated in the contract signed between CSC and PMU3.
4	Contractor	Based on the approved EMP, the Contractor will be responsible for establishing a site-specific EMP for each construction site area, submit the plan to PMU3 and CSC for review and approval before commencement of construction.. In addition, it is required that the Contractor get all permissions for construction (traffic control and diversion, excavation, labor safety, etc) following current regulations.

No.	Company/ Unit	Responsibilities
		The contractor shall be required to appoint a competent individual as the contractor's on-site *Safety and Environment Officer (SEO)* who will be responsible for monitoring the contractor's compliance with the EMP requirements and the environmental specifications.
5	Independent Environmental Monitoring Consultant (IEMC)	IEMC will, under the contract scope, provide support to PMU3 to establish and operate environmental management systems, offers suggestions for adjusting and building capacity for relevant agencies during the implementation period and monitor the Contractor's EMP implementation in both construction and operation stages. IEMC will also be responsible to support PMU3 to prepare monitoring reports on EMP implementation and submit these reports to DRVN for approval. The IEMC shall have extensive knowledge and experience in environmental monitoring and auditing to provide independent, objective and professional advice on the environmental performance of the project.
6	Ministry of Natural Resource and Environment (MONRE)	Implement or may assign its professional environmental protection agency to carry out: i) Inspecting and certifying the application of environmental protection works and measures for project operation; ii) Inspecting the application of environmental protection measures in the investment preparation and project construction phases when necessary. Shall detail the inspection and certification of application of environmental protection works and measures for project operation; and formulate and promulgate specialized technical guidelines for such inspection and certification.
7	Department of Natural Resources and Environment (DONRE)	With the role of state management in the environmental field, DONRE will be responsible for: i) supervising the implementation of EMP; ii) enforcing applicable laws, regulations and standards; iii) coordinate the environmental protection effort among departments concerned; and iv) checking and supervising construction, completion and operation of environment facilities.

5.1.3.2. In Operation Stage

After Project is completed and handed over to the functional management units of the Directorate for Roads of Vietnam (DRVN). These units will be responsible for the management, operation and maintenance of the work to comply with the existing regulations, The arising issues related to any agency who shall be responsible for implementation and report to DRVN.

5.1.4. Essential Base for the EMS operation

- To establish a adequate legal base
  - Update and comply with the requirements in accordance with the legal

regulation on environmental protection and safety of people's health.

- Develop and disseminate widely the contents of EMP and environmental mitigation measures on site.
- Prepare all the necessary licenses (licenses of construction, traffic diversion, waste soil discharge etc.).

- Raising environmental awareness for stakeholders
  - Raise environmental awareness for the workers on the construction site environment (learning about labor safety and sanitation).
  - Regular training field staff on mitigation measures on site.
  - Propagate, raise people awareness to understand the consequences of environmental degradation.
  - Maintain traffic sign system, safety regulations on the construction area.
- Maintain a system of information exchange and coordination channels to deal with the incident
  - Maintain regularly exchange meetings between stakeholders (PMU3, contractor, construction supervisors, local representatives).
  - Maintain report system with records including: hygiene and safety issue on the site, mitigation measures are implemented, the existing problems need to overcome, etc through its form as: diary, monthly / quarterly report of CSC, The suggestions of local authority and community representatives.
  - Provide the name and phone number of the responsible officials relating to environmental management, sanitation and safety of the Contractor, CSC and PMU3 and widely disseminated to the people around the area of the construction site.
  - Provide telephone number of hotline (hotline) of the functional agencies such as traffic inspection, environmental inspection, etc. sea on the project on and around the construction area.
  - Participate to solve the arising incidents, the risks and record in writing in accordance with current regulations.

5.2. Environmental Monitoring Program

5.2.1. Objectives

It is essential to design the monitoring program and monitoring frequency appropriately to be able to demonstrate both the overall performance of the project

works as well as the short- term impact due to peak construction activities. More specifically, as the integral and critical part of the EMP, the environment monitoring program should have the following objectives:

- Determine the actual extent of the impacts;
- Control impacts which are generated from construction process and mentioned in EIA report;
- Check environmental pollution standards applied to the project during construction;
- Check and supervise implementation of environmental protection solutions during construction based on EIA report.
- Suggest mitigation measures in case of unexpected impacts;
- Suggest to the Client to coordinate with central and local environmental organizations to solve pending issues relating to environmental protection under the scope of the Project;
- Assess the effect of mitigation measures in pre-construction, construction and operation stages;
- Confirm the impacts forecasted in the EIA.

5.2.2. Basis of Environmental Quality Monitoring

Environmental quality monitoring of the Project area shall comply with the provisions of law and the following technical conditions

- Environmental Protection Law 2005 and the legal documents related to the environmental impact assessment of the project;
- QCVN 2009, 2010 and Canadian sediment standards;
- Circular 28/2011/TT-BTNTM defined technical process of monitoring ambient air and noise environment;
- Circular No. 29/2011/TT-BTNMT on 01/8/2011 of the Ministry of Natural Resources and Environment stipulating the technical standards of monitoring inland surface water environment;
- Circular No. 30/2011/TT-BTNMT on 01/8/2011 of the Ministry of Natural Resources and Environment stipulating the technical standards of monitoring inland underground water environment;
- Circular No. 33/2011/TT-BTNMT on 01/8/2011 of the Ministry of Natural Resources and Environment stipulating the technical standards of monitoring the

soil environment;

- Environmental pollution forecast by the EIA;
- Current status of environmental quality in the project area.

5.2.3. Contents of Environmental Monitoring Program

The environmental monitoring program will be implemented during construction and operation process at 4 levels:

(i) Monitoring project completion Indicator

(ii) Monitoring the level of compliance with mitigation measures

(iii) Community-based Monitoring

(iv) Monitoring environmental parameters;

Details of the monitoring program proposed are presented below.

5.2.4. Monitoring Indicators

5.2.4.1. Monitoring Project Completion Indicator

A system of monitoring indicators are proposed to assess implementation of some project stages. These monitoring indicators which represent characteristics of sub-project activities can be collected easily based on experiences obtained from similar WB funded infrastructure investment projects in Viet Nam. Based on initial objectives, the following activitites will be established, including socio-economic effect, environment, and sustainable development.

These indicators will be stated in the manuals which provides guidance on project implementation. The main environmental indicators related to project investment effect includes but not be limited by the following matters:

(i) Decrease in the level of pollution load on NH38 and related axis roads.

(ii) Decrease in the level of accidents on NH38 and related axis roads.

This monitoring will be implemented after road completion. PMU3 will be resposible for collecting the information necessary to prepare periodical reports on project completion indicators with the help of a technical consultant.

5.2.4.2. Monitoring Compliance with Mitigation Measures

The monitoring assignments for the Contractor, CST and IEMC shall be clearly indicated in their terms of reference and contract documents shall be approved by the World Bank. CST will be responsible for submitting monthly reports which state environmental problems, actions and updated monitoring results. Based on monthly

reports and field monitoring trips, IEMC will be responsible for preparing and submitting every three months reports to PMU3, which shall include conclusions on environmental problems and the key implemented mitigation measures. Quarterly reports, prepared by PMU3, shall comprise the following aspects:

- A priority list of issues as determined in monitoring reports of the previous months.
- Methods taken by the Contractor to solve relevant.
- Pending matters, proposed solutions and explanation of special circumstances for non-compliance.

5.2.4.3. Community-based Monitoring

The communities will monitor the project along its construction process in order to ensure that the contractors will comply with all environmental and social regulations as well as to reduce the risks on their properties and economic activities, human health and the environment. According to the information phase, the community help to assess the mitigation measures as well as interested in the aspirations of the people, to contribute to a better environment management mechanism.

Community-based monitoring will form the spirit of voluntary report and mention the urgent issues. When there is damage to the environment, the community and local authorities will report to stakeholders.

5.2.4.4. Environmental Quality Monitoring Indicators

The environmental monitoring program will be implemented during 3 stages of the project including the pre-construction stage (environmental baseline); construction stage and operation stage (the two year of project execution).

Positions of environmental quality monitoring were selected based on the positions which had been measured and surveyed of environmental quality in the time of project planning as well as in the vulnerable positions which were defined as the objects impacted by the project in all of three phases: preparation, construction and operation.

The environmental quality monitoring positions of the project are shown in Table 5.3 and Figure 5.3 enough for covering waste resources (areas of construction and operation) and the affected objects (residential areas and vulnerable objects in the Project area).

Table 5.3. Positions of Environmental Quality Monitoring

No	Locations	Code	Pre-construction stage	Construction stage	Operation stage	Coordinates
I	**Environment of air, noise**		**5 locations**	**9 locations**	**5 locations**	
1	Starting point of Project	KK1; O1	x	x	x	20°55'15,09"N; 106° 9'11,75"E
2	Political training center & Prosecution of human (Km2+450)	KK2; O2		x		20°54'9,21"N; 106° 9'31,13"E
3	Ending point of Binh Giang Town bypass	KK3; O3	x	x	x	20°53'51,46"N; 106° 8'29,65"E
4	Residential area (Km4+200 ÷ Km4+350)	KK4; O4		x		20°53'31,33"N; 106° 8'39,95"E
5	Residential area (Km38+600 ÷ Km39+800)	KK6; O6		x		20°52'27,22"N; 106° 7'45,21"E
6	PR204	KK5; O5	x	x	x	20°50'59,94"N; 106° 6'36,27"E
7	Residential area (Km43+600 ÷ Km44+000)	KK7; O7		x		20°50'31,15"N; 106° 6'16,50"E
8	Residential area of Quang Vinh Commune (Km46+200)	KK8; O8	x	x	x	20°49'16,89"N; 106° 5'38,21"E
9	The ending point of Project – interchange with NH39 (Km52+716)	KK9; O9	x	x	x	20°47'46,44"N; 106°2'30,14"E
II	**Environment of surface water**		**5 locations**	**5 locations**		
1	Sat Bridge (Bridge's centerline)	Nm1	x	x		20°55'6,93"N; 106°9'29,22"E
2	Tranh 1 Bridge (Bridge's centerline)	Nm2	x	x		20°53'29,84"N; 106°8'39,22"E
3	Bun Bridge (Bridge's centerline)	Nm3	x	x		20°49'22,05"N; 106°5'23,52"E
4	Dia Bridge (Bridge's	Nm4	x	x		20°48'9,36"N;

No	Locations	Code	Pre-construction stage	Construction stage	Operation stage	Coordinates
	centerline)					106°4'13,60"E
5	Tinh Bridge (Bridge's centerline)	Nm5	x	x		20°47'46,50"N; 106°2'50,73"E
III	**Environment of groundwater**		**5 locations**	**5 locations**		
1	Minh Duc Commune	Nn1	x	x		20°55'16,57"N; 106°8'54,92"E
2	Thuc Khang Commune	Nn2	x	x		20°53'46,84"N; 106°8'24,17"E
3	Tan Phuc Commune	Nn3	x	x		20°50'59,94"N; 106° 6'36,28"E
4	Quang Vinh Commune	Nn4	x	x		20°49'44,56"N; 106°5'49,57"E
5	Toan Thang Commune	Nn5	x	x		20°47'46,44"N; 106°2'30,14"E

The overview of the environmental monitoring program shall be presented in the following table.

Table 5.4: Environmental Monitoring Requirements

No.	Monitoring items	Pre-construction stage	Construction stage	Operation stage
I	**Monitoring noise**			
1	Monitoring parameter	Leq	Leq	Leq
2	Monitoring frequency	01 time prior to construction. 01 location/day, Measure sixteen times /day, 3 samples/once	Measure once every 03 months. 01 location/day, Measure sixteen times /day, 3 samples/once	Measure once every 06 months. 01 location/day, Measure sixteen times /day, 3 samples/once
3	Frequency of taking samples	5 locations x 16 x 3	9 location x 16 x 4 x 3 x 2 years of construction (as expected)	5 locations x 16 x 2 x 3 x 2 years
4	Standard for comparison	QCVN 26 & 27:2010/ BTNMT		
II	**Monitoring air quality**			
1	Monitoring parameter	TSP, PM10, CO, SO_2, NO_2	TSP, PM10, CO, SO_2, NO_2	TSP, PM10, CO, SO_2, NO_2
2	Monitoring frequency	01 time prior to construction.	Measure once every 03 months.	Measure once every 06 months.

No.	Monitoring items	Pre-construction stage	Construction stage	Operation stage
		01 location/day, Measure eight times /day	01 location/day, Measure eight times /day	01 location/day, Measure eight times /day
3	Frequency of taking samples	5 location x 8	9 locations x 8 x 4 x 2 years of construction (as expected)	5 locations x 8 x 2 x 2 years
4	Standard for comparison	QCVN 05:2009/ BTNMT		
III	**Monitoring surface water quality**			
1	Monitoring parameter	Temperature, pH, Turbidity, DO, BOD, TSS, Fe, Oil, E.Coli and Coliform	Temperature, pH, Turbidity, DO, BOD, TSS, Fe, Oil, E.Coli and Coliform	
2	Monitoring frequency	01 time prior to construction.	Measure once every 03 months. 01 location/day	
3	Frequency of taking samples	5 locations x 1	5 locations x 4 x 2 years of construction (as expected)	
4	Standard for comparison	QCVN 08:2009/ BTNMT		
IV	**Monitoring groundwater quality**			
1	Monitoring parameter	Temperature, pH, turbidity, TS, Fe, Coliform, E.Coli	Temperature, pH, turbidity, TS, Fe, Coliform, E.Coli	
2	Monitoring frequency	01 time prior to construction.	Measure once every 03 months. 01 location/day	
3	Frequency of taking samples	5 locations x 1	5 locations x 4 x 2 years of construction (as expected)	
4	Standard for comparison	QCVN 09:2008/ BTNMT		

The projects of large infrastructure construction is usually done by successive construction method according to every specific section. So, in order to ensure objectiveness, science, practical reflecting the impacts of the process of project implementation (both of positive and negative), the monitoring program will have to be adjusted from time to time consistent with the actual construction site and project progress. Monitoring locations will be established on the basis of the map reference of monitoring locations which are established during the EIA preparation. In case the project was started within 1 year (from the time of approval of the EIA report) the

monitoring data can be used directly as the initial data.

5.2.5. Monitoring Report System

In order to exchange information effectively, establish a database for monitoring the implementation of mitigation measures, and create an effective implementation of EMP, it is essential to adopt a system of standard report at all levels of management as shown in the table below.

Table 5.5. System of Environmental Monitoring Report

No.	Issues to be reported	Monitoring at 1st level	Monitoring at 2nd level	Monitoring at 3rd level (One duplicate must be sent to MONRE and DONRE)
	Construction stage			
1	Implement mitigation measures on site in accordance with the EMP and contract clauses	**Implemented by:** Contractor **Frequency of report submission:** Monthly **Report sent to:** PMU3	**Implemented by:** PMU3 **Frequency of report submission:** once every three months **Report sent to:** DRVN	**Implemented by:** DRVN **Frequency of report submission:** once every three months **Report sent to:** MOT
2	Monitoring and supervision of the EMP compliance in accordance with the contract clauses	**Implementation Unit:** Construction Supervision Team (CSC) **Frequency of report submission:** Monthly – Quarterly **Report sent to:** PMU3	**Implemented by:** PMU3 **Frequency of report submission:** once every three months **Report sent to:** DRVN	**Implemented by:** DRVN **Frequency of report submission:** once every three months **Report sent to:** MOT
			Implemented by: IEMC **Frequency of report submission:** once every three months **Report sent to:** PMU3	
3	Community monitoring of EMP	**Implemented by:** Community	**Implemented by:** Local	

No.	Issues to be reported	Monitoring at 1st level	Monitoring at 2nd level	Monitoring at 3rd level (One duplicate must be sent to MONRE and DONRE)
	implementation	Monitoring by community Group **Frequency of report submission:** Monthly **Send report to:** Local authority	authority **Frequency of report submission:** In cases of reflection/complaints. **Report sent to:** PMU3	
Operation stage				
1	Environment and Traffic Monitoring		**Implemented by:** Functional company of DRVN **Frequency of report submission:** once every six months **Report sent to:** DRVN	**Implemented by:** DRVN **Frequency of report submission:** once every six months **Report sent to:** MOT
2	Traffic safety monitoring			**Implemented by:** Functional company of DRVN **Frequency of report submission:** once every six months **Report sent to:** MOT

5.3. Capacity Building and Training

5.3.1. Analysis and determination of training demands

Actual implementation of projects shows that coordination in environmental management is not always effective because of the following reasons:

- Lack of a unified coordination regime which should be established in the beginning of project among PMU3, relevant agencies, local authorities at project wards/communes especially;
- Local staff do not master loans borrowing process of project but carry out practices involving and following those of domestic projects with limited participation;
- The community does not have obvious awareness on their rights and obligations on environmental protection or in spite of understanding, there is a lack of regime to provide feedback;

- Relevant agencies were not always ready in coordinating works during project implementation. Some agencies assigned their functional staff to coordinate with the project but this assignment is only temporary and appointed staff do not master the coordination method as well as necessary procedures for discussion and contact with PMU3.

In order to overcome these matters, it is necessary to analyze and assess the capability and demands of relevant departments/divisions in environmental management and analyze actual demands for project implementation. Accordingly, a capacity building and training program will be established to increase the effective operation of environmental management systems in the future. Some assessments on training demands in environmental management as well as proposals for a training program are presented in the following table.

Table 5.6. Analysis and determination of training demands

No.	Subject	Preliminary assessment on capability/awareness	Capacity building/training on environmental management
1	Environment team - PMU3	- Have most staff with University/post university education, thus it is easy to them to comprehend new contents - Have working experiences in previous projects but have not gone into details of the environmental field. - Have basic knowledge in information technology, thus, it will be convenient for data management and information process as well as cooperation with other agencies.	- Should be further trained on environmental management process in project and implementation methods (from preparation stage of bidding documents, bid evaluation, contract signing, monitoring implementation and acceptance works, etc.). - Should increase awareness on critical roles of EMS - Should provide with more knowledge/legal regulations related to penalty for violations on the environment. - Should be provided with treatment solutions for arising problems on site.
3	Local leaders	- The communes have not been made sufficiently clear and understood about the project process. - Computer skills are still limited.	- Should be provided with preliminary knowledge on environmental laws and contents related to coordination in monitoring among ward/commune authorities in projects which are executed in the areas.

No.	Subject	Preliminary assessment on capability/awareness	Capacity building/training on environmental management
		- Awareness on community organization and monitoring is not clear. Community organization and monitoring have only been implemented for small projects which are invested by residents. - Have no experiences in community monitoring on a large scale.	- Should be trained on community monitoring. - Should have updated information on project progress and monitoring and information exchange regime. - Especially, environmental management process should be made clear and comprehended before, during and after construction.
4	Community representatives	- Not been established in the local area, Thus participants have not been determined - Most project areas are rural ones with cultivation works. Education is limited and working style is primarily spontaneous. - Income of residents is not high; infrastructure system is not sufficient; awareness on rights and responsibilities of individuals and community on environmental issues are limited.	- Should be provided with rights and responsibilities in environmental management (as well as legal regulations.) - Should be provided with clear simple methods which will be applied during project implementation process. - Increase the awareness of community on environmental management generally and potential impact of the project in particular. - Continuously utilize project information and important points in EMS as well as operation regime.
5	Contractor	- Contractor's leaders are qualified and experienced staffs who are competent in legal regulations. - Periodically organize training courses on environmental sanitation and labor safety. - Most Contractors consider environmental issues as arising ones with a separate cost and do not want to implement them or rectify the issues. - Awareness of Contractors on	- Should learn about environmental law and focus on contents related to roles of local authority and community supervisors. - Should comprehend environmental management process following requirements of WB's safeguard policies (for example, participation of IEMC, implementation of HSET process.) - However, for contractors these requirements will be followed through project documents and concrete criteria in bidding

No.	Subject	Preliminary assessment on capability/awareness	Capacity building/training on environmental management
		environmental issues during construction is limited.	documents as well as construction contract.

5.3.2. Proposed Programs on Capacity Building on Environmental Management

Based on an analysis of current capabilities, experiences and actual demands in project implementation, a capacity building and training program for relevant agencies is established as shown in the table below:

Table 5.7. Proposed programs on capacity building on environmental management

Training content	Subject to be trained	Number of trainees	Training time	Organization unit	Budget
Leaning on Labor safety and environmental sanitation	Contractor's workers and technical staff	All workers and staff on site	Prior to construction and following legal regulations	Contractor in coordination with Institute of Labor, War invalids and Social Affairs	Paid by Contractor
Learning on general environmental management process	Staff of PMU3 and public utility companies	5 persons	Prior to construction	PMU3 in coordination with IEMC	Paid by PMU3 or to be included in a package on training
Learning on Process of CEMP	Environmental staff under ward PC in the project area	14 persons (4 district staff + 14 town/ commune staff)	Prior to construction	Training consultant under Contract on capacity building and training for relevant agencies.	Included in Contract on training consulting
Learning on Process of SEMP	CSC's staff in charge of environmental sanitation under CSC	10 trainees	Prior to construction	PMU3 in coordination with CSC	In the Contract of CSC

5.4. Estimated Budget for EMP Implementation

5.4.1. Cost for Implementation of Mitigation Measures by Contractor

The cost for organization, training, dissemination, procurement, operation of equipment, and manpower for implementation of mitigation measures in and out of the

site in accordance with HSET requirements are integrated in the construction package. Contractors will be responsible to study, prepare alternatives and offer cost estimation for these activities. It is considered as one of the criteria for assessing the capability of the Contractor in the future and compliance level of the Contractor.

In case of violations, the Client can impose penalties or hire another unit to participate in solving arising problems.

5.4.2. Estimated Budget for Monitoring and Supervision

5.4.2.1. Supervision of EMP Implementation by CSC

The cost for the CSC to supervise EMP implementation in accordance with the EMP and the subproject bidding and contractual documents is integrated in the contract package with the CSC. Potential bidder for this package will be responsible to study environmental management requirements of the EIA and EMP to prepare and offer cost estimation for EMP supervision during the construction. It is considered as one of the criteria for assessing the capability of the potential CSC in supervising EMP implementation.

5.4.2.2. Monitoring Cost of Independent Monitoring Consultant (IEMC)

PMU3 shall sign a contract with IEMC for the duration of the construction process of the project. IEMC shall implement assignments of all project components according to the TOR.

The estimation cost for the IEMC (excluding monitoring and training costs) are following:

Table 5.8. Cost Estimate for Environmental Management Work

Unit: VND

No	Item	Unit	Quantity	Unit price	Amount
I	**Pre-construction**				**22,050,000**
1	Environmental management staff (1 person)	month	1	21,000,000	21,000,000
2	Other costs	%	5	21,000,000	1,050,000
II	**Construction phase**				**176,400,000**
1	Environmental management staff (1 person, in 24 months, every 3 months, 01 month/once)	month	8	21,000,000	168,000,000
2	Other costs	%	5	168,000,000	8,400,000
III	**Operation phase**				**88,200,000**
1	Environmental management staff	month	4	21,000,000	84,000,000

No	Item	Unit	Quantity	Unit price	Amount
	(1 person, in 24 months, every 6 months, 01 month/once)				
2	Other costs	%	5	84,000,000	4,200,000
	Total				**286,650,000**

5.4.2.3. Implementation Cost of the Monitoring Program

Based on the above-mentioned monitoring program the estimated costs for implementing this program are presented in the following table.

Table 5.9. Costs estimation for the monitoring program

Unit: VND

No	Items	Pre-construction stage		Construction stage (within 2 years as expected)		Operation stage		Total amount
		Location	Cost	Location	Cost	Location	Cost	
1	Monitoring air quality	5	19,400,000	5	155,200,000	5	77,600,000	252,200,000
2	Monitoring noise	5	12,480,000	5	99,840,000	5	49,920,000	162,240,000
3	Monitoring quality	5	4,265,000	5	34,120,000			38,385,000
4	Monitoring groundwater	5	2,100,000	5	16,800,000			18,900,000
5	Other cost		67,272,965		538,183,720		191,599,360	797,056,045
	Total		**105,517,965**		**844,143,720**		**319,119,360**	**1,268,781,045**

Notes: The above cost estimate excludes VAT tax. Other costs include costs for manpower, traveling, preparation of survey reports, etc.

Total estimated cost for implementation of a monitoring program is 1,268,781,045 VND. For the purpose of effective implementation, the monitoring program implementation can be combined with the contract established with IEMC.

5.4.3. Cost for implementation of capacity building and training

The cost estimation for implementation of capacity building and training is presented in the following table:

Table 5.10. Cost estimation for implementation of capacity building and training

Training contents	Subject to be trained	Number of trainees	Cost rate	Source of cost
Learning on labor safety and environment sanitation	Workers and technicians of Contractors	All workers and construction staff on site (150 turns of persons as expected)	150 x 200,000 = 30,000,000	Paid by contractor, this cost is included in the contract of construction
Learning of general environmental management process	PMU3's staff in charge of construction packages	5 persons	5 x 3,000,000 = 15,000,000	This cost should be included in the contract signed with IEMC
Learning on CEMP	Environmental staff under district/commune PC in the project area	18 persons (4 district staffs + 14 commune staffs)	18 per, x 1000,000/per, = 18,000,000	Included in the Contract signed with training consultant or IEMC
Learning on SEMP	Staff in charge of labor safety and environmental sanitation under CSC	10 trainees	10 per, x 1000,000/per, = 10,000,000	In the Contract of CSC
Total cost			**73,000,000**	

5.4.4. Cost estimation for the environmental treatment facilities

Cost estimation for the environmental treatment facilities training is presented in the following table.

Table 5.11. Cost estimation for the environmental treatment facilities

Unit: VND

TT	Environmental treatment facilities	Unit	Quantity	Unit price	Amount
1	Standard water jet	Each	6	500,000	3,000,000

TT	Environmental treatment facilities	Unit	Quantity	Unit price	Amount
2	Residual mud barrier	m^2	2,000	25,000	50,000,000
3	Portable toilet	Each	6	54,000,000	324,000,000
4	Mobile waste basket	Each	12	1,150,000	13,800,000
5	Hazardous waste container	Each	6	1,600,000	9,600,000
6	Temporary sedimentation basin	Each			
-	At the material washing areas, concrete mixing and washing concrete mixers	Each	6	8,000,000	48,000,000
-	At the canteen	Each	6	2,300,000	13,800,000
-	At the refectory area	Each	6	8,000,000	48,000,000
7	Water collector ditches	m	1,600	100,000	160,000,000
	Total				**670,200,000**

5.4.5. Total Cost Estimation

Apart from costs, which have been calculated in relevant packages/contracts, one more cost element will be required for EMP as follows:

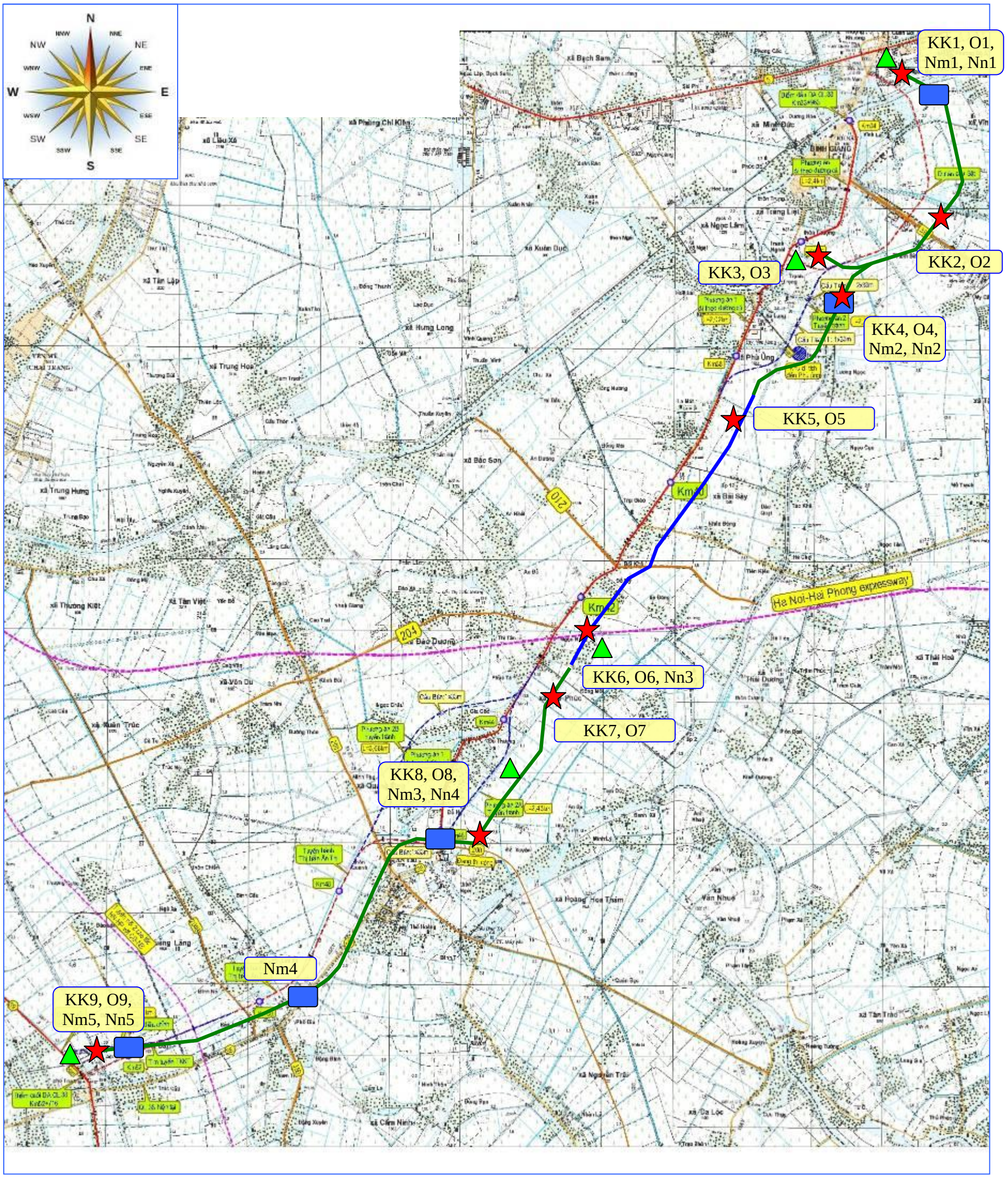
Table 5.12. Total Cost for the Environmental management Plan

Unit: VND

No	Contents	Cost
1	Cost for Independent Monitoring Consultant	286,650,000
2	Cost for monitoring program implementation	1,268,781,045
3	Cost for capability building and training	73,000,000
4	Cost for the environmental treatment facilities	670,200,000
	Sum	**2,298,631,045**
5	Contingency (10%)	229,863,105
	Total	**2,528,494,150**

The above cost rate is estimated based on current unit price and Consultant's experiences. Because the project will be implemented over many years, price fluctuation will be unavoidable. A contingency amount should be prepared for any unavoidable price or cost increase during project implementation

Firgue 5.3. Diagram of Environmental Quality Monitoring Locations



NOTE

- Section of new construction
- Section of improvement.
- Air (KK), Noise (O)
- Surface water (Nm)
- Groundwater (NN)

CHAPTER VI. PUBLIC CONSULTATION

Project owner – PMU2 has organized two (2) public consultation meeting: one time under Vietnamese regulation and another time under the World Bank guidelines.

I. Results of public consultation at the Request of Vietnam

Implementation of the Law on Environmental Protection, The project owner has sent a dispatch on public consultation to localities, and coordinated with consultant to directly discus with head of CPC and representatives of communities (Fatherland Front Committee) of fourteen (14) communes in the project area to inform about basic content of the project, the negative impacts of the project on the environment, mitigation measures and suggested the localities contribute opinions by official letter, in addition to know the aspiration as well as their environmental proposals for the project. The project owner has received the feedbacks from the localities – the minutes are copied and attached at Appendix 5 – Public consultation.

I.6.1. Public Consultation Opinions of Commune People Committe (CPC)

The CPCs have receipt dispatch from Project owner informed about basic content, the negative environmental impacts and mitigation measures of the project. Base on studies of the dispatch, relative contents and summaries of discussion between project owner and head of localities; The CPCs already had comments by official letter sent to project owner, summaries of locality comments are present in table 6.1:

Table 6.1. Public consultation opinions of Communal People's Committees

No.	Commune/ ward/town	Public consultation opinions		
		About the negative impacts of the project on the natural and social environment	**About the measures to minimize the negative environmental impacts**	**Recommendations for the Project owner**
1	Minh Duc commune	Agree with the impacts on socio-economic and natural environmental mentioned in the summary document	Agree with the summary document	– Ensure environmental sanitation during the construction stage. – Speed up the construction, assuring technical. – It needs to coordinate with localities to have the timely corrective measures.
2	Hung Thinh commune	Ensure implement the impacts at the regulation on environmental protection.	– Ensure the traffic and flow smoothly of the irrigation canals – The noise, vibration, wastes generated during the construction stage must be within the permitted limits, and do not affect to people life. – Do not affect to daily life of resident communities. – Strength the worker management works of contractor.	– It is representative with local authorities to implement the environmental protected measures – If there are impacts should have representative with communities and local people.
3	Vinh Tuy commune	Agree with the contents that are present in the summary document	Agree	– When construction must ensure the environmental, social security in the localities. – Clearance works must ensure compliance with the State policies
4	Vinh Hong commune	Agree with the contents that are present in the summary document	Agree with the assessments on the environmental ensured measures during the construction stage.	– When construction must ensure the environmental, social security in the localities. – Speed up the construction, assuring safety.

No.	Commune/ ward/town	Public consultation opinions		
		About the negative impacts of the project on the natural and social environment	**About the measures to minimize the negative environmental impacts**	**Recommendations for the Project owner**
5	Trang Liet commune	Agree	Agree	– Should design fully of canal system to ensure the drainage capacity and serving the agricultural, do not cause the inundation when construction. – Recommend project owner must have traffic system ensure safety.
6	Thuc Khang commune	Agree with the contents that are present in the EIA report.	Agree with the mitigation measures that are present in the report.	– Recommend project owner and construction contractors must implement the sanitation works, ensure the safety for people. – Compensate quickly for affected households, avoid the status of "only inform" caused impacts on life and production works of people.
7	Phu Ung commune	Agree with the contents that are present in the EIA report.	Agree with the mitigation measures that are present in the report.	Recommend project owner correctly implement the commitments that are present in the report.
8	Bai Say commune	Agree with the impacts that are present in the report.	Agree with the mitigation measures that are present in the report.	– Recommend that Speed up the construction, assuring safety. – Limit and recovery the dust pollution, noise pollution during the construction stage. – Compensate compliance with policies and laws. – Should arrange the drainage groove systems in the residential area.
9	Tan Phuc commune	Agree	Agree	– During the construction stage, recommend project owner ensure the sanitation because of there are

No.	Commune/ ward/town	Public consultation opinions		
		About the negative impacts of the project on the natural and social environment	**About the measures to minimize the negative environmental impacts**	**Recommendations for the Project owner**
				many people living along the roadsides. – Limit use machineries that cause the big noise level. – Before construction should have specific policies for relocated people.
10	Quang Vinh commune	Agree with the contents that are present in the EIA report of the project.	Agree with the measures to minimize negative impacts that are present in the EIA report of the project.	– Recommend the project owner should well implement the sanitation works, limit the dust generation cause environmental pollution. – Avoid construction in peak hours. – Speed up the construction, assuring quality.
11	An Thi town	Agree with the impacts that are present in the report.	Agree with the mitigation measures that mentioned by project.	– Ensure environmental sanitation during the construction stage. – Ensure the production and life of people in the project area.
12	Quang Lang commune	Agree	Agree	– Recommend project owner correctly implement the commitments that are present in the EIA report. – Should often update and inform to localities all of project changes during implementation stage.
13	Nghia Dan commune	Agree	Agree	– Recommend project owner correctly implement the commitments that are present in the EIA report.
14	Toan Thang commune	Agree	Agree	– Recommend early deploy and complete the project. – Recommend project owner correctly implement the commitments that are present in the report.

In addiction, PMU2 and consultant have directly discus with head of localities in the project area. They had mentioned the opinions and comments on environmental issues of the project focus in main contents as follow:

– In the pre-construction phase:

- Land clearance issue and resettlement issue: Local authorities recommend the project have got policies for compensate the lands and assets of people compliance with the Vietnamese policies and WB policies.
- Design an appropriate drainage system, stroked lines connecting the local population, not to affect the movement of people, of families living on either roadsides as well as the local irrigation system.

– In the construction phase:

- Sanitation: localities all recommended that local sanitation must be ensured during the construction process. They require project to set up plans for collecting and treating waste in construction, avoiding spillage that may pollute unhygienic environment; measures must be taken to minimize dust and not to affect the population;
- Public Health: local authorities concern that people's health could be affected by dust. They requested the project to seriously implement measures to minimize the impact of dust; reduce noise as committed in the consultation document of the project;
- Traffic Safety and Health and Safety: the localities request a plan for traffic diversion, specific signs, signboards, reasonable construction plan to avoid congestion and traffic accidents. Ensure traffic safety for people around the project area as well as ensuring Health and Safety for workers.
- Social security issue: Local authorities expressed concern that worker focusing from other local will impacts on local social security. In addiction, they require the project have to registry the temporary residence for the workers.
- Localities recommend that the project have to origin recovery the public facilities (Ex: local roads) after construction.
- Project implementation issue: Localities expressed concern that the project can not be implemented, therefore they recommend project owner early implement the project and speed up construction, on schedule and avoid prolonged status.

– In the operation stage:

- Almost all localities concerned to division issues of community and fields.

I.6.2. Opinions of people communities – Commune Fatherland Front Committee

CFFCs (Commune Fatherland Front Committee) of localities have receipt dispatch from Project owner informed about basic content, the negative environmental impacts and mitigation measures of the project. Base on studies of the dispatch, relative contents and summaries of discussion between project owner and head of CFFCs; CFFCs already had comments by official letter sent to project owner, summaries of CFFCs comments are present in table 6.2

Table 6.2. Public consultation opinions of CFFCs

No.	Commune/ ward/ town	Public consultation opinions		
		About the negative impacts of the project on the natural and social environment	**About the negative impacts of the project on the natural and social environment**	**About the negative impacts of the project on the natural and social environment**
1	Minh Duc commune	Agree with the impacts on socio-economic and natural environmental mentioned in the summary document	Agree with the summary document	– Ensure environmental sanitation during the construction stage. – Speed up the construction, assuring technical. – It needs to coordinate with localities to have the timely corrective measures.
2	Hung Thinh commune	Agree with the impacts that are present in the report. Should note the generated impacts during the construction stage and impacts on transportation, production activities.	– Cover during transport stage. – Do not cause noise in noon hours. – Water spray.	– It is representative with local authorities to ensure social security during project implementation process. – Correctly implement the mitigation measures that are present in the EIA report.
3	Vinh Tuy commune	Agree	Implement the project should ensure sanitation, accordance with socio-economic development condition of localities.	– Ensure the people life in land clearance area.; – When construction must ensure the environmental, social security in the localities. – Clearance works must ensure compliance with the State policies
4	Vinh Hong commune	Agree	Agree	– Speed up the construction, assuring social security in the localities. – Ensure the environmental sanitation during construction stage. – Compensate accordance with regulations and have the

No.	Commune/ ward/ town	Public consultation opinions		
		About the negative impacts of the project on the natural and social environment	**About the negative impacts of the project on the natural and social environment**	**About the negative impacts of the project on the natural and social environment**
				support policies for people who are loss production land, support to people in life stability stage.
5	Trang Liet commune	Agree	Agree	– Agree with project implementation. – In project implementation progress from construction stage to operation stage, should ensure drainage sysstem.
6	Thuc Khang commune	Agree	Agree	– Project owner have to implement and construct the project items on timely, limit the environmental pollution – Speed up the construction, assuring quality.
7	Phu Ung commune	Agree with the impacts that are present in the report.	Agree with the mitigation measures that are present in the report.	Recommend project owner correctly implement the commitments that are present in the report.
8	Bai Say commune	Agree with the impacts that are present in the report.	Agree with the mitigation measures that are proposed by project.	– Correctly implement the mitigation impacts that are present in the report.. – It needs to have the apropriate policies when acquire land and houses, ensure life for people.
9	Tan Phuc commune	Agree	Agree with the mitigation measures that are present in the report.	– Localities will support to project. – Correctly implement the requirement and policies of State.. – Recommend project owner ensure ans fully support for people to ensure life quality.
10	Quang Vinh commune	Agree with the contents that are present in the EIA report.	Agree with the mitigation measures that are present in the EIA report.	– Recommend The project implement sanitation work, bound to cause dust pollution.

No.	Commune/ ward/ town	Public consultation opinions		
		About the negative impacts of the project on the natural and social environment	**About the negative impacts of the project on the natural and social environment**	**About the negative impacts of the project on the natural and social environment**
				– Avoid during peak hours construction. – Construction ensure schedule, assuring quality
11	An Thi town	The vehicles participated in construction, transportation of materials usually have large load pollute the environment, destroy existing road surface, affect people's lives	– Usualy water spray. – Must have canvas covering the trucks transport of rock disposal and materials. – Must recovery the road after construction.	– Recommend The project must provide sufficient information to local projects. – Project must have management measures of workers, avoid conflict, ensure security and order in the locality. – Ensure environmental sanitation, labor safety in construction.
12	Quang Lang commune	– Impact on the environmental: dust, noise, waste, generated noise affects people; – Concentrate the workers from other areas affecting the security situation of the local area.	– Agree with the mitigation measures that are present in the EIA report. – Maintening the water spray and covering the trucks transport of rock disposal and materials during construction stage.	– Recommend limited low of impact on the environmental, assets and crops of the people. – To ensure security and order at the local site.
13	Nghia Dan commune	Agree	Agree	– Recommend project owner correctly implement the commitments that are present in the report.
14	Toan Thang commune	Agree	Agree	– Construction to ensure the safety of people and vehicles in traffic. – There should be close coordination with local authorities in managing workers, to avoid conflict with people, affecting the security situation of the local order.

I.6.3. Feedback and Commitment of Project Owner for Suggestions, Proposals and Requirements of Consulted Agencies and Organizations

The responses of public consultation as well as exchanging opinions of People's Committee and residential representatives (through Fatherland Front) at the public consultation at the request of the Viet Nam in January and March, 2013 were acquired by the Project Owner and integrated to solve for each object affected to ensure feasible mitigation measures, in particular:

– In the pre-construction phase:

o On the issue of land acquisition and resettlement: According to Document 1665/TTg-CN dated 17/10/2006 of the Prime Minister on the implementation of managing site clearance of traffic construction projects, Provincial People's Committee will set up independent sub-projects from projects which are approved by the district People's Committee through the Council of compensation for land acquisition & resettlement. Project owner is responsible for ensuring implementation of the compensation funds for land acquisition & resettlement. In terms of the project, currently plan for land acquisition & resettlement is made for submission to the Government of Vietnam and the World Bank. In this plan, the policies of the World Bank and the law of Vietnam are both incorporated, simultaneously satisfying the principle: those affected by the project will be compensated at least as much as or greater than what they are damaged.

o Drainage matter: the Project owner has acquired and made specific solutions to designing drainage systems such as: the entire route will build four new bridges; 18 culverts and 19 culverts to strengthen the aperture as well as ensure drainage water for irrigation in the region.

o The claws hooked on public roads: Project owner has directed consulting to set up a project to seriously implement the design of these root kit connection points.

– In the construction phase

o Problem sanitation, public health: The Project is committed to comply with the mitigation measures set out in the environmental impact assessment report. At the same time the project will coordinate with local public to disclose the activities, impacts and mitigation measures of the project for people to know.

o Traffic Safety Issues and the Health and Safety: Project Owner will include in the terms of the contract the construction contractor labor safety. In the process of construction traffic diversion will be strictly implemented, avoiding traffic congestion caused by construction.

- The social security issue: Project owner will acquire and put into term of the contract require the contractor must cary out work to check the health of workers before come to the localities and cary out the residence registration with local authorities; coordinate with the local authorities to solve the problems that arise. Specific measures are presented in Chapter 4.
- Issue of recovery the local roads: Project owner committed recocovery local road and public facilities after construction.

– In the operaton stage

- The community division issue: The project to acquire and put into the design of the intersection, the road connected to existing NH38.
- The issue of split the production land of a household: This is a common problem when forming new alignment. The project can only propose the local to consider appropriately arranged so that each owner just farming his land on one side of the road.

II. Results of Public Consultation at the Request of the World Bank

II.6.1. Organize the Public consultation

At the guidelines of the World Bank (WB) - Project of group B, so it need to organize 01 public consultation round. The participants include: households in the project area and the guests are local government representatives, professional staffs on environmental, transportation, cadastral etc; and organizations (Women's Association, Farmers' Association, Youth Union, Veterans, etc.). The project owner includes: representatives of the project owner and environmental consultantcy. The main content of the meeting as follows:

– Provide basic information about the project to the community;

– Provide information about the major impact expected of the project on the environment;

– Collect feedback on the project of participants.

Currenty, PMU No.2 has organized total of 13 public consultation meetings in communes and town of Hai Duong and Hung Yen province. The time of public consultation meetings as follow:

– January 26, 2013: Public consultation meeting in Bai Say and Tan Phuc commune;

– March 10, 2013: Public consultation meeting in Nghia Dan commune;

– March 15, 2013: Public consultation meeting in Quang Lang commune;

- March 16, 2013: Public consultation meeting in Vinh Tuy and Phu Ung commune;
- March 19, 2013: Public consultation meeting in Hung Thinh and Thuc Khang commune and An Thi town;
- March 20, 2013: Public consultation meeting in Vinh Hong and Trang Liet commune;
- March 21, 2013: Public consultation meeting in Toan Thang and Quang Vinh commune;

Table 6.3 Pictures of the Public Consultation Meetings

No.	Pictures	Notes
1		Project Staffs welcome and guide to participants
2		Participants observe documents, project aligment map.

No.	Pictures	Notes
3		Participants observe documents, project aligment map.
4		**Introduce the project:** Representative of consultantcy introduce the project and environmental impacts.
5		People expressed their opinions

No.	Pictures	Notes
6		People expressed their opinions

II.6.2. Public Consultation Result

After listening to representative of the Project introducing the Project's scale, route alignment, intersections and NH38 improvement plan, and bridges on the route, as well as impacts of the Project on the environment and recommendations on mitigation measures, participants have raised questions and give comments to the Project, mainly about following issue:

- Project implementation time: The are worried that this will be a "long-term pending" project, therefore, local authority and people wish that the Project will have specific and rapid implementation scheme.
- Land occupation and resettlement issue: Although all local residents agree land recovery for the Project, but they are concerned about compensation, support and resettlement. Local people have queries about compensation for legally licensed land and unlicensed land, garden land, farming land, virgin soil reclaimed, etc. For the issue of losing main income due to loss of farming land, many households wish the Project support them to change their profession.
- Community division issue: Local people and authorities are concerned of community segmentation. They put questions around the issue that when the road is constructed, it will hinder farming activities, dividing villages, segmenting agricultural land, etc.

- Impacts on waterworks: Local people are concerned that when the expressway is set up, it will cause flood in upstream and dry condition downstream, causing difficulty for agriculture production. Or if culvert size or culvert installation is unsuitable, it will also cause flood that affect agricultural production.

Consultation Minutes is copied and annexed to Appendix 5 – Public Consultation. Besides, there are also recommendations of local people as summarized in table 6.4.

Table 6.4. Summary of Public Consultation result and Answers of the Project Owner

No	Full Name	The issues considered by people	Reponses of the representative of the project
1	***Hung Thinh Commune***		
	Mr.Le Dinh Soai	• It is required to calculate the appropriate drainage system, ensure technical standards in the Design	• The project recorded the opinions and instructed design consultant to study designing adequate drainage system, not to allow flooding occur during the construction.
	Mr.Pham Dinh Trieu	• A large number of workers from other places are mobilized to the project which may disturb the law and order situation of the locality. It is requested to have rules and regulations to manage this work force of the project. • Agricultural land is occupied for the project resulting in loss of jobs and income sources. It is required to have a reasonable compensation and support regime	• The project recorded the opinions and they will be supplemented in the contract with the construction contractor.
	Ms. Le Thi Tuoi	• Currently, many households' lands are acquired but they have no ownership certificates. Pleased, support us about this.	• According to the regulations, in some cases, the residents have no ownership certificate, if the land ownership is legal and it has no argument, its owner will be compensated.
2	***Vinh Tuy Commune***		
	Ms. Pham Thi Don	• The project is required to be executed as the schedule. • Make satisfactory Compensation and	• The project owner commit to implement following the schedule, ensure the construction progress.

		adequate support for people.	
	Mr.Vu Van Dung	• In construction of the project, it is required not to have stagnant water on the remaining land of the people.	• This issue has been taken into account and drainage culverts have been at appropriate arranged positions. Culvert density and aperture has been calculated to ensure good drainage, not causing stagnation of water and erosion at the downstream.
3	***Vinh Hong Commune***		
	Mr.Pham Xuan Qua	• Project impacts on the natural environment, daily life of the people. The project owner is proposed to apply mitigation measures. • How about the compensation price for clearance of the uncropped perennial trees	• Environmental and socio-economic impact mitigation measures are detailed in Chapter 4 - Assessment of environmental impacts of the project and project owner committed to comply with the proposed measures. • Asset value crop is priced before that time on land acquisition announced. After this time any contingent will not be taken into account. When information campaign is operated, project staff will come to each household to deliver papers for inventory of assets, trees on the land, and the Compensation and resettlement committee will check to disclose the land acquisition plan. The amount of compensation shall be equal to the existing value of trees. Valuation's existing plants must be actively engaged by local residents and the future of that value of the plant must be shown.
	Mr.Pham Van Lam	• Site leveling activities create generate dust and noise affecting agricultural production, business activities of the people. Remedies are required.	• Project owner committed to implement fully the impact mitigation measures are detailed in Chapter 4 – EIA Report
4	***Trang Liet commune***		
	Mr.Pham Xuan Thi	• In implementation of the project, there will be incidents such as collapse, industrial accidents and traffic accidents, etc. The Project owner is	• Measures for Prevention, Mitigation of Adverse Impacts of the Project on the Environment (if any) are mentioned in Chapter 4 – EIA

		required to have preventive measures and overcoming the problems (if any).	Report.
	Mr.Dao Trong Dan	• Training some vocational jobs suitable for elderly people of land acquisition, loss of jobs, such as: bamboo and rattan knitting, etc. • Support concessional fund for some households to switch their production.	• Project owner and the Donor will coordinate with local people to support stabilize the life, and job training for people.
5	***Thuc Khang Commune***		
	Mr.Le Van But	• The Project route cut my field in two parts, cultivation shall be difficult; so, who will compensate us.	• The project can only suggest to local governments consider reasonably arranged so that each scene work all their land to the side of the road.
	Mr.Vu Duc Thau	• The price of compensation for arable farmland acquisition is not satisfactory at present. The project is required to have appropriate policies to maximum limit damages to the people losing agricultural land.	• Land acquisition compensation cost will be applied according to the locality's latest match actual prices.
6	***Phu Ung Commune***		
	Mr.Nguyen Thai Duong	• The Project is required to implement following the progress securing the construction schedule. • The project owners are proposed to carry out appropriate and reasonable compensation for land acquisition.	• The project owner commits to follow the issued schedule. • The Project Owner commits to carry out appropriate compensation for land acquisition and there will be internal supervisors for implementation of this work.
	Mr.Tan – land officer of the commune	• Design appropriate canal systems, ensuring adequate drainage, avoid causing flooding affect agricultural production. • The project cutting Phu Ung Industrial Cluster that was approved. It is required to review and adjust the route to be compatible with the plan of the commune.	• To ensure water provision and drainage project, 74 culverts have arranged along the route. • Phu Ung Industrial Cluster planning has been adjusted by the People Committee. Design of the project will suit this planning. Thus, the project will not affect the Local Plan.
	Mr.Dang Dinh Tien	• In the process of implementation of the project will generate conflicts between the people and the construction units and there will be problems of the irrigation, travel, daily ... Suggest the construction units to	• The project owner committed to comply with the mitigation measures set out in the EIA report including the construction schedule.

		abide by rules and units of local. • It is required to carry out quick construction with quality assurance limited impact on the economy of the household.	
	Mr.Tran Cong Trang – Chairman of the commune	• The Project will contribute to economic development - local society, we agree with the policy of the State. • It is suggested that farmers whose land are acquired will lose jobs and should be supported by development of bamboo and rattan sectors or industries locally.	The compensation policy has been studied in accordance with the policies of the Government of Vietnam and the Donor (World Bank).
7	***Bai Say Commune***		
-	Mr.Hoang Cong Hy	• It is required to apply the measures for mitigation of environmental impacts. • Dust pollution is a problem a lot of people interested, the project is suggested to be very interested in this matter. • Please arrange adequate drainage culverts to ensure no flooding.	• Project Owner committed to minimize the impacts on the environment as stated in Chapter 4 – EIA Report. • Sewer line both sides will be calculated and guaranteed not to cause flooding.
-	Ms. Nguyen Thi Tien	• People are very supportive of the project due to the economic benefits the project brings. • Avoid soil spilling down to farms of local residents, if any, there should be adequate compensation.	The contractor will arrange mud collectors with geotextile at the construction stage in the sections crossing the ponds, canal to stop mud flowing down.
-	Mr.Nguyen Van Nghia	The soil transportation vehicles often cause more dust when moving, there should have specified the time for trucks operating on the roads.	In the process of soil transport, the vehicle with lids for shipping. In the case of a vehicle without a lid, will use the canvas to cover materials to minimize dust pollution during transportation
-	Mr.Phan Van Nhuan	• Agree with the mitigation measures that were proposed for the project. • Construction should be avoided at night time to minimize noise and ensure the health of local people.	• In residential areas and other special areas, the construction activities will be carried out on priority in day time to ensure the health of people
-	Mr.Nguye	It is required to publicize information on environmental mitigation measures for the	The project will publicize environmental management plan at the request of LEP

	n Van Dat	local authorities and the people to know and supervise in the construction process.	Vietnam so that local people can know, check and supervise the process.
8	***Tan Phuc Commune***		
-	Mr.Nguyen Van Bao	• It is required to provide specific and enough information to project content people. • The impact of land acquisition should have specific measures. Please provide information about the case of the land without certificates of land use rights.	• According to the law regulations, in some cases, the residents have no ownership certificate, if the land ownership is legal and it has no argument, its owner will be compensated..
-	Mr.Dang Van Du	• Limit construction from 22h to 06h in night time to ensure the health of people.	• The project records the comments and put into the contract with the contractor.
-	Mr.Dang Quoc Tuan	• Land acquisition should be implemented clearly and transparently in accordance with regulations to ensure project progress.	• The project owner committed to transparently implement land acquisition work which will be monitoring internal and external monitoring when performing this work.
9	***Quang Vinh Commune***		
-	Mr.Nguyen Quang Tuan	• Local people agree with and support the project due to the social economic benefits; However, the project side should pay attention to the real problems of the people, to prevent material spillage and waste discharging to the roads. • The project owner should pay attention to the issue of social security and public order under the influence of the concentration of workers.	• The means of transport are ensured of emission standards in accordance with general and specialized materials and will use covers or lids to avoid spreading dust scattering on the road. • The project owner and contractors will have particular rules and regulations, and will work with local people to promote the understanding of the social evils, prostitution, disease, HIV in the region ... to limit generation of social evils.
-	Ms. Nguyen Hong Nhung	• When the project is under construction, there will be impacts on the system of infield canals and roads. So the project owner should pay more attention to the prevention and mitigation of impacts.	• The drainage on both sides will be calculated and guaranteed not to cause flooding.
10	***An Thi Town***		
-	Mr.Cap Van Tinh	• Request execution units when transporting solid waste and materials should avoid materials to be spilled out	• The contractor will install mud partitions with geotextile at the construction sections which cross the

		into the street and fields. • The Project is suggested to acquire all remaining land area of the people which are left of small piece shape, not conducive for cultivation. • It is required to study connecting roads to the local roads, interior roads with NH38 to facilitate the traffic participation of the local people.	pond, canal to prevent mud flowing down. • In the project, localities are encouraged to consider reasonable arrangement of fragmented land owners so that only a portion of his farm on the side of the project road • Smooth connection has been considered for connecting line between the project and the local roads
	Mr.Nguyen Phu Trong	• It is requested to study culverts crossing the roads, especially the irrigation culverts to ensure appropriate aperture and positions. • It is proposed to consider a number of solutions for an area located between fields and ditches at the expected NH38, avoiding the remaining land area is too narrow, causing difficult cultivation for local people after completion of the project.	• The drainage system on both sides will be calculated and guaranteed not to cause flooding.
11	***Quang Lang***		
	Mr. Luu Quan Van	• We suggest that the Project to follow strictly laws on price and support policy for affected people..	• The Project will listen to the comment and commit to implement LA in accordance with the Government's and the Donor's regulation.
	Mr. Bui Kim Trong	• The Project cause segmentation of agricultural land, e.g. land of a person may be divided into 2 separate parts, causing difficulty for production, in the commune there are many households affected by this situation. It is impossible for one person to buy land of the other arbitrarily, thus it is very difficult to manage. We wish that the Project to solve this issue so that we can stabilize the production..	• Farming land division into separate lots is common issue when the Project crossing farming land. The Project will cut the land into 2 parts, normally, the Project will propose local authorities to rearrange so that each land owner has an entire land plot on one road side. However, land plots in those cases are smalls. In our case, the land area is very large, thus more detailed consideration should be taken, we can either rearrange land if the plots are small, or design more underpasses and access roads if land

			on both sides is large. One can work with People's Committee to arrange this.
	Ms. Nguyen Thi Nga	• The project's construction will occupy temporary the canal system, disrupting irrigation, affecting agricultural production. It is suggested that The Project should have countermeasures for the above conditions.	• The Project commits to restore the canal after completion.
12	***Nghia Dan***		
	Mr. Tran Van Cuong	• He proposed to ensuring life standard for relocated households as before relocation.	• The principle of Vietnam Government and the donor (World Bank) is that resettlement should ensure at least equal life standard for relocated people.
	Mr. Nguyen Quang Lem	• The Project's benefit is to bring in benefits to local people, contributing to socio-economic development of the communes. However, it is suggested that the Project Owner should keep the environment and hygiene condition clean, ensuring security and safety, restricting social evils.	
13	***Toan Thang Commune***		
	Mr. Nguyen Ngoc Hoang	• During construction there will be a large quantity of rubbish and wastes generated. How will they be collected and treated?	• Solid wastes: For waste soil and life wastes: To collect, treat and transport to dump site within a day. For chemical-origin wastes: To collect, store in specialized bin and treat appropriately according to Circular no. 12/2011/TT-BTNMT dated 14/4/2011 on hazardous waste management. • Waste water For waste water from construction activities and life waste water: Waste water should be led through ditches with rubbish grill, and collected to trash bins for deposition to discard mud. After

			preliminary treatment, the waste water can be drained to the City's sewage system. • For waste oil and oily water from machine maintenance activity: To collect and use trash bins and specialized steel drums for treatment according to Circular no. 12/2011/TT-BTNMT dated 14/04/2011 on hazardous waste management.
	Mr. Nguyen Van Su	• It is proposed that the Project should have mitigation measures against impacts caused by noises, vibration during construction, especially night time..	Mitigation measures against impacts caused by noises, vibration will be presented in chapter 4, Environmental Impact Assessment (EIA) of the Project
	Ms. Nguyen Thi Mui	• When executing the Project, there will be a large number of workers from outside. So how to deal with security, safety, etc. matter?	• The Project Owner will register temporary residence for workers from outside with local authorities. And It will coordinate with local authorities in education for and management of the workers. • To use local laborers.
	Ms. Tran Thi Dung	• The Project implementation should be rapid, ensuring technical specification to avoid early repair even before operation.	• The Project commits to implement as scheduled.

II.6.3. Local people interview result

In the first consultation, the Project Owner distributed interview forms to 315 households participating the meeting. These all are directly affected households by the Project. Table 6.5 summarizes and analyzes questions in the questionnaire.

Table 6.5. Summary and Analysis of Questionnaires

No.	Items	Hung Thinh	Viunh Tuy	Vinh Hong	Trang Liet	Thuc Khang	Phu Ung	Bai Say	Tan Phuc	Quang Vinh	An Thi town	Quang Lang	Nghia Dan	Toan Thang	Total	%
I	**Project knowledge**															
1	Number of people	25	37	35	34	55	44	77	35	55	33	50	45	15	**540**	
2	People who have not known															
3	People who have known															
-	From People's Committee	20	25	35	14	35	44	34	15	35	13	25	30	15	**340**	63
-	From mass media		3		10			20		15	20	25	15		**108**	20
-	From other people	5	9		10	20		23	20	5					**92**	17
II	**Opinions about project's environmental impacts**															
2.1	**In construction phase**															
1	Dust pollution	20	37	35	31	40	34	68	35	40	33	35	45	8	**461**	85
2	Noi pollution during construction stage	25	37	29	25	45	36	60	35	40	33	35	45	9	**454**	84
3	Due to construction wastes	15	20	15	24	38	36	65	35	40	33	25	45	8	**399**	74
4	Due to land acquisition	15	18	30	34	45	36	75	15	24	18	22	25	10	**367**	68
5	Due to generation of conflic	20	27	35	34	46	27	55	10	19	15	30	34	10	**362**	67

No.	Items	Hung Thinh	Viunh Tuy	Vinh Hong	Trang Liet	Thuc Khang	Phu Ung	Bai Say	Tan Phuc	Quang Vinh	An Thi town	Quang Lang	Nghia Dan	Toan Thang	Total	%
6	On Traffic	10	29	27	28	37	25	55	12	21	22	30	20	11	**327**	61
2.2	**Trong giai đoạn khai thác**															
7	Due to dust	7	15	21	11	15	0	16	5	12	15	10	9	0	**136**	25
8	Noise pollution	0	2	6	0	8	12	16	0	0	15	0	1	0	**60**	11
III	**Opinions about other environmental impacts that may occur during Project implementation**															
IV	**Opinions about Project benefits**															
	Improve route quality	25	37	35	34	55	44	77	35	55	33	50	45	15	**540**	100
	Reduce traffic congestion	20	17	25	14	45	24	27	16	29	21	45	45	10	**338**	63
	Reduce traffic accidents	17	20	28	27	42	44	55	31	30	33	42	31	15	**415**	77
	Develop society, culture and education	25	37	35	34	55	44	77	35	55	33	50	45	11	**536**	99
	Develop economy due to improved good transportation in the region	15	20	25	10	21	20	35	13	11	22	25	19	15	**251**	46
IV	**Opinions about other benefits**															

- About the project: allmost of affected households known information of project through various forms such as 63% through local government, 20% through the newspapers and 17% through a variety of sources.
- On the positive effects brought by the project: 100% of the people were aware that benefits gained from improving the quality of roads are good; 63% expected to reduce traffic congestion; 77% assumed that upgrading roads would reduce traffic accidents; 99% assumed the complete project would contribute to the social, cultural, educational and economic development. 46% assumed that economy would develop thanks to the enhancement of the circulation of goods in the region.
- On the negative effects brought by the project during the construction phase: Apart from the positive impacts, the people interviewed also found that the project would generate negative impacts such as environment and public health impacts due to air pollution during the construction (85%); Impact on public health due to noise pollution during construction (84%); Impact on water quality construction waste (74%); Impact on daily life and business activities due to land acquisition, relocation and resettlement (68%); Impact on daily life due to arising conflicts with the workers (67%); Impact on traffic operations on the route in the construction sector (60%).
- On the negative effects brought by the project in the exploitation phase: Almost of people surveyed said that after the project is completed and put into operation, the impacts due to dust and noise pollution is small: dust pollution (25%), noise pollution (11%).

CONCLUSION, PROPOSALS AND COMMITMENTS

I. Conclusion

1. Impacts corresponding to each activity in the operation stage of the Project have been fully identified. The assessment of impacts on each object according to the factors from the operations has been maximally identified. Scale of main impacts caused by the project's activities on environment is in the following descending order:

   - Impacts due to land occupation, especially permanent occupation of residential land which is the strong impact, directly affecting households' lives;
   - Impacts on road transport for (i) occupation by construction machines (ii) deposition of eroded products during earthwork and scattering materials during transport process, causing muddy condition which hinder traffic flow and cause traffic unsafety;
   - Impacts on waterway traffic because of floating system constructing 01 pier of Sat bridge inside the flow occupying waterway traffic on Sat river.
   - Impacts on population due to air pollution, noise, vibration and on agricultural activities, ponds due to spill of materials when digging and filling road foundation, which badly affect human health and local community activities;
   - Impacts on water environment due to the construction of road, bridges project route and activities of the construction sites are main impacts on water environment, sediment, including quality of water, sediment; water ecosystem; and irrigation capacity of water sources, which are rivers (the Sat, the Cuu An, the Bun, the Quang Lang, the Dien Bien), irrigation canals, fish ponds in the project area

   These are medium to strong impacts, which have been analyzed in details to set out appropriate mitigation measures. However, some impacts have not been exactly determined their level, spatial/ time scale because the information is not clear enough, the assessment is only limited in analysis under the general framework, including (i) location of temporary material/ waste soil stockpile and storage time; (ii) arrangement of specific items during construction.

2. The mitigation measures proposed to the main impacts (impacts due to land occupation, impacts on water environment, population and traffic) and other impacts that are highly feasible and effective. However, in order to ensure residual impacts acceptable, environment at waste sources and affected objects (including air, noise,

vibration, quality of surface water, groundwater, soil, and sediment) shall be monitored to take appropriate adjustments. In particular:

- In terms of impacts due to land occupation: Establishing an overall plan on compensation, support and resettlement in accordance with Circular No. 14/2009/TT-BTNMT dated 1 October 2009 of the Ministry of Natural Resources and Environment. The compensation must be carried out to each household publicly, fairly at reasonable price based on the price framework of the Government and People's Committees of provinces/cities taking into consideration the local actual situation and compensation price of the projects that have been implemented in the same area to determine the compensation price.
- Soil environment: Sedimentation and spillage in the agricultural areas along the route and the residential/ traffic land shall be monitored in the construction stage to assess the accuracy of the forecasts and set out appropriate additional measures, minimize damages;
- Water environment, sediment in the rivers within the construction area should be monitored in the project's stages to confirm that the project's activities do not significantly affect the quality of river water and sediment quality;
- Air environment , noise, vibration along the route are required to be monitored in 3 phases: preparation, construction and operation;
- Environmental incidents: technical incidents, fire/ explosion and ship accidents are potential, so it is necessary to establish a safety plan on traffic organization and implement this plan under supervision to ensure residual impacts acceptable.
- Environment management and monitoring shall be implemented in all three stages: preparation, construction and operation. The project's owner is responsible for environment management and monitoring; provide funds for these activities fully and timely. The costs for environmental protection is included in total investment of the Project.

3. Community consultation was conducted in accordance with the Law on Environmental Protection. Participants are representatives of People's Committee and local communities (Fatherland Front) of communes within the project area.
4. After the project's EIA report has been approved by the Ministry of Transport, the project's owner shall establish an environmental management plan, environmental specifications in the detailed design stage as the basis for implementing the

environmental management plan of the construction contractors.

II. Proposals

The project requires cooperation and support of Hai Duong Provincial Department of Natural Resources and Environment as well as People's Committee and Fatherland Front of communes within the project area together with local authorities to implement the environmental protection plan during the project implementation

III. Commitments

1. Implementing the environmental management/ supervision program as proposed in Chapter IV, including measures for mitigation of negative impacts, prevention and response to environmental incidents; construction of environmental treatment works and implementation of environmental monitoring after the project's EIA report has been approved by the Ministry of Transport. The project's owner commits to provide full funding for these activities.

   In the course of construction, the following standards and Vietnamese/ international standards on environment must be complied; ensuring quality of air, surface water, groundwater and sediment consistent with Vietnamese/ international standards on environment, including:

   a. Law on Environmental Protection dated 29 November 2005 of the Socialist Republic of Vietnam;
   b. Decree No. 80/2006/ND-CP dated 9 August 2006 of the Government detailing and guiding a number of articles of the Law on Environmental Protection;
   c. Decree No. 21/2008/ND-CP dated 28 February 2008 of the Government amending and supplementing a number of articles of Decree No. 80/2006/ND-CP dated 9 August 2006 detailing and guiding a number of articles of the Law on Environmental Protection;
   d. Decree No. 29/2011/ND-CP dated 18 April 2011 on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment;
   e. The Government's Decree No. 59/2007/ND-CP dated 9 April 2007 on solid waste management;
   f. Circular No. 26/2011/TT-BTNMT detailing a number of articles of the Government's Decree No. 29/2011/ND-CP dated 18 April 2011 on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment;

g. Circular No. 12/2011/TT-BTNMT dated 14 April 2011 stipulating hazardous waste management;

h. Complying with environmental standards in 1998, 1999, 2001, 2002, etc.; Vietnamese standards on environment in 2008, 2009, 2010, including:

- QCVN05:2009/BTNMT - National technical regulation on ambient air quality;
- QCVN06:2009/BTNMT - National technical regulation on hazardous substances in ambient air;
- QCVN26:2010/BTNMT - National technical regulation on noise;
- TCVN7210:2002, Vibration and shock. Vibration emitted by roads traffic. Maximum limits in the environment of public and residential areas;
- QCVN27:2010/BTNMT - National technical regulation on vibration;
- QCVN03:2008/BTNMT - National technical regulation on the allowable limits of heavy metals in the soils;
- QCVN08:2008/BTNMT - National technical regulation on surface water quality;
- QCVN09:2008/BTNMT - National technical regulation on underground water quality;
- QCVN14:2008/BTNMT - National technical regulation on domestic wastewater;
- QCVN40:2011/BTNMT - National technical regulation on industrial wastewater.
- QCVN 43:2012/BTNMT, National technical regulation on sediment quality.

i. Complying with criteria on measurement and analysis methods (as mentioned in the Introduction);

j. Industry standards on road design.

2. Commitments on community:

a. Respecting the values of local community and continuously exchanging, consulting with local people in the tasks that affect environment in the project area;

b. Coordinating with Compensation Council and People's Committee of districts/ communes related to the project to settle issues on land occupation, relocation, resettlement, occupation and relocation of infrastructure works under Decision No. 69/2009/ND-CP and prevailing regulations of the Ministry of Construction in accordance with its rights and obligations;

c. Continuously improving pollution mitigation measures by supervision, monitoring, inspection and review. Strictly complying with regulations on informing, notifying the implementation of contents of the EIA report as approved and requirements of the approved decision under Decree No. 29/2011/ND-CP dated 18 April 2011 on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment and Circular No. 26/2011/TT-BTNMT detailing a number of articles of Decree No. 29/2011/ND-CP dated 18 April 2011 on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment;

d. To commit to manage waste well;

e. To commit to Coordinate with local authorities on employment, health protection, maintenance of order and security in the project area;

f. Ensure irrigation water not be interrupted;

g. Ensure not to cause power failure that disrupts socio-economic activities of the localities;

h. Strictly implementing regulations on environmental management and protection of Hai Duong and Hung Yen provinces;

i. To commit to work together with local authorities to obtain written consent on the disposal location prior to the construction;

3. Commitments on compliance with general regulations on environmental protection related to stages of the Project, including:

a. Commitments on environmental protection solutions/ measurements in the preparatory stage and construction, then official operation as presented in items 4.1 and 4.2 of Chapter 4;

b. Các cam kết về các giải pháp, biện pháp bảo vệ môi trường sẽ được thực hiện trong giai đoạn từ khi Dự án đi vào vận hành chính thức, được trình bày tại mục 4.3;

c. The project's owner commits to settle all claims of the community on environment of the Project in accordance with the laws on claims, denunciations and regulations defined in Chapter XIV "Inspection, settlement of violations, claims/ denunciations and compensation for environmental damage" of 2005 Law on Environmental Protection. Commitments on compensation in case of incidents, problems regarding site clearance.

d. Commitments on compensation, land recovery and return, roads and irrigation ditches temporarily occupied by the project.

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