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Appendix-1
Member List of Study Team

Appendix -1
Member List of the Survey Team

MEMBER LIST OF THE SURVEY TEAM

No.	Name	Position	Occupation	Period (arr. – dep.)
1	Mr. Ryoichi KAWABE	Leader	Assistant Director, Transportation and ICT Division 3, Economic Infrastructure Department, JICA JICA	Field Survey 3Sep- 10Sep
2	Mr. Masatoshi ETO	Chief Consultant Slope Countermeasures	Geosphere Engineering Office,Environmental Solution Division, Overseas Consulting Administration,Nippon Koei CO.,LTD	Field Survey 1SEP - 30SEP Discussion on DOD 1 Mar-7Mar
3	Mr. Akira. OHKAWARA	Design of Slope Countermeasures 1	General Manager,Geosphere Engineering Office,Environmental Solution Division, Overseas Consulting Administration,Nippon Koei CO.,LTD	Field Survey 3SEP - 30SEP
4	Mr.Hiroaki TAUCHI	Design of Slope Countermeasures 2	Manager,Geosphere Engineering Office,Environmental Solution Division, Overseas Consulting Administration,Nippon Koei CO.,LTD	Field Survey 1SEP - 30SEP Discussion on DOD 1 Mar-7Mar
5	Mr.Toshimasa KOBAYASHI	Investigation of Natural Features	Chief of Geophysical Division Geophysical Survey Department Disaster Management Division Earth System Science CO.,LTD	Field Survey 4SEP - 18SEP
6	Mr. Yuzo NAKANO	Design of Road	Highways and Bridges Department Infrastructure Development Division, Overseas Consulting Administration,Nippon Koei CO.,LTD	Field Survey 16SEP - 30SEP
7	Mr. Tomoyuki. NISHIKAWA	Construction Plan / Cost Estimate	Geosphere Engineering Office,Environmental Solution Division, Overseas Consulting Administration,Nippon Koei CO.,LTD	Field Survey 1SEP - 30SEP
8	Mr. Pucai YANG	Environmental/Social Consideration	Geosphere Engineering Office,Environmental Solution Division, Overseas Consulting Administration,Nippon Koei CO.,LTD	Field Survey 1SEP - 30SEP
9	Mr. Yasuo TAKEISHI	Asistance and Coordination/ Investigation of Natural Features	2nd Engineering Department Sapporo Branch, Domestic Consulting Administration,Nippon Koei CO.,LTD	Field Survey 3SEP - 30SEP

Appendix-2
Study Schedule

Field survey Schedule From 1st Sep 2011 to 30th Sep 2011

No.	Date	Day	Mr.R.KAWABE	Mr. M. ETO	Mr. P. YANG	Mr. A. OHKAWARA	Mr. H. TAUCHI	Mr. Y. TAKEISHI	Mr. T. NISHIKAWA	Mr. Y. NAKANO	Mr. T. KOBAYASHI	
			Team leader	Chief Consultant Slope Countermeasures	Environmental and Social Survey	Design of Slope Countermeasures 1	Design of Slope Countermeasures 2	Asistance and Coordination/ Investigation of Natural Features	Construction Plan / Cost Estimate	Design of Road	Investigation of Natural Features	
			JICA	Nippon Koei	Nippon Koei	Nippon Koei	Nippon Koei	Nippon Koei	Nippon Koei	Nippon Koei	Earth System Science	
1	1-Sep	Thu		HND-HNG-KTM	HND-HNG-KTM		HND-HNG-KTM		HND-HNG-KTM			
2	2-Sep	Fri		Meeting with JICA Tender-contract	Meeting with JICA Tender-contract		Meeting with JICA Tender-contract		Preparation for office			
3	3-Sep	Sat	Tokyo-BKK	Meeting	Meeting	NRT-BKK-KTM	Meeting	NRT-BKK-KTM	Meeting			
4	4-Sep	Sun	BKK-KTM								HND-BKK-KTM	
5	5-Sep	Mon	CC to EoJ, JICA, DOR and MOPPW		Data collection and analysis	Moving to site	Moving to site	Moving to site	Data collection and analysis		Moving to site	
6	6-Sep	Tue	Site Survey SecIII Stay at the Khalte Camp		Data collection and analysis	Site Review	Borrow site	Borrow site	ditto		Field survey and analysis	
7	7-Sep	Wed	Sitesurvey SecII 15:40 Janakpur1605 kathmandu Buddha Air U4 506		ditto	Site Review	Field survey	Field survey	ditto		ditto	
8	8-Sep	Thu	AM: M/D Discussion with MOPPW and DOR		ditto	Field survey	ditto	ditto	ditto		ditto	
9	9-Sep	Fri	AM: Signing om M/D with MOPPW PM: Report to JICA, EoJ		ditto	ditto	ditto	ditto	ditto		ditto	
10	10-Sep	Sat	To the other mission	Moving to site	Moving to site	ditto	ditto	ditto	Moving to site		ditto	
11	11-Sep	Sun		Field Survey	Field Survey	ditto	ditto	ditto	Field Survey		ditto	
12	12-Sep	Mon		ditto	ditto	ditto	ditto	ditto	ditto		ditto	
13	13-Sep	Tue		ditto	ditto	Otheir site	ditto	Design and Reporting	ditto		ditto	
14	14-Sep	Wed		ditto	ditto	Otheir site	ditto	ditto	Moving to KTM		Reporting	
15	15-Sep	Thu		ditto	ditto	ditto	ditto	ditto	Data collection andReporting		ditto	
16	16-Sep	Fri		Moving to KTM	Moving to KTM	Moving to KTM	Moving to KTM	Moving to KTM	ditto	HND-HNG-KTM	Moving KTM	
17	17-Sep	Sat		Reporting	Reporting	Design and Reporting	Design and Reporting	Laboratry test	ditto	Moving to site	KTM-BKK	
18	18-Sep	Sun		ditto	ditto	ditto	ditto	Laboratry test	ditto	Data collection and analysis	BKK-NRT	
19	19-Sep	Mon		ditto	ditto	ditto	ditto	Design and Reporting	ditto	ditto		
20	20-Sep	Tue		ditto	ditto	ditto	ditto	ditto	ditto	ditto		
21	21-Sep	Wed		ditto	ditto	ditto	ditto	ditto	ditto	Repoting		
22	22-Sep	Thu		ditto	ditto	ditto	Moving to site	Moving to site	Moving to site	Moving to KTM		
23	23-Sep	Fri		ditto	ditto	ditto	Moving to KTM	Moving to KTM	Moving to KTM	Repoting		
24	24-Sep	Sat		ditto	ditto	ditto	ditto	ditto	Repoting	ditto		
25	25-Sep	Sun		ditto	ditto	ditto	ditto	ditto	ditto	ditto		
26	26-Sep	Mon		ditto	Moving to KTM	ditto	ditto	ditto	ditto	ditto		
27	27-Sep	Tue	Meeting with JICA, Data analysis and Reporting									
28	28-Sep	Wed	Meeting with DOR									
29	29-Sep	Thu		KTM-BKK	KTM-HNG	KTM-BKK	KTM-HNG	KTM-BKK	KTM-HNG	KTM-HNG		
30	30-Sep	Fri		BKK-NRT	HNG-HND	BKK-NRT	HNG-HND	BKK-NRT	HNG-HND	HNG-HND		

HND :Haneda
 NRT :Narita
 HNG :Hong Kong
 KTM :Kathmandu
 BKK :Bangkok
 JICA: Japan International Cooperation Agency
 EOJ: Embassy of Japan
 MOPPW: Ministry of Physical Planning and Works
 DOR: Department of Roads

Survey Schedule (Field Survey From 1st Sep 2011 to 30th Sep 2011)

Appendix -2
Survey Schedule

Survey Schedule

(Explanation on Draft Final report From 1st Mar 2012 to 7th Mar 2012)

Date			JICA Member	Consultant Member	
			Team Leader	Chief Consultant / Slope Countermeasures	Design of Slope /Countermeasure 2
No	Date	Day	Mr. T. TAKE	Mr. M.ETO	Mr. H.TAUCHI
1	1 st Mar	Thu		Tokyo –Hong Kong– KTM	
2	2 nd Mar	Fri	AM:Meeting with JICA & DOR for DOD		
3	3 rd Mar	Sat		Meeting with concerned study team and collection of related information	
4	4 th Mar	Sun		Meeting with concerned study team and collection of related information	
5	5 th Mar	Mon	AM : Briefing of DOD and Signing on the MD,Report to EOJ & JICA		
6	6 th Mar	Tue		KTM- Hong Kong	
7	7 th Mar	Wed		Hong Kong-Tokyo	

Remarks:

JICA: Japan International Cooperation Agency

EOJ: Embassy of Japan

DOR: Department of Roads

Appendix-3
List of Parties Concerned
in the Recipient Country

List of Parties Concerned in the Recipient Country

List of Parties Concerned in the Recipient Country

Counterparts Organization		
1	Ministry of Physical Planning and Works: MOPPW	
	Mr. Kamal Raj Pandey	Joint Secretary
2	Department of Roads: DOR	
	Mr. Indu Sharma Dhakal	Director General
	Mr. Dinker Sharma	Director General (From Jan-6-2012)
	Mr. Hari B. Shrestha	Deputy Director General
	Mr. Yogendra Kumar Rai	Deputy Director General (From Dec-1-2011)
	Mr. Bindu Shamsher Rana	Project Manager, Sindhuli Road (Until Jan-4 2012)
	Mr. Shiva Raj Adhikari	S. D. Engineer of SRCP, S. D. Engineer of FCB
	Mr. Yam Narayan Yogi	Engineer
3	Ministry of Local Development, DDC, Sindhuli	
	Mr. Dhurba Bahadur Khadka	Local Development Officer Sindhuli
	Mr. Sagar Kumar Dhakal	Program Officer Sindhuli
4	Ministry of Forest, District Forest Office, Sindhuli	
	Mr. Chudamani Khatiwoda	District Forest Officer Sindhuli
5	Department of Water Induced Disaster Prevention (DWIDP)	
	Mr. Shanmukhesh C. Amatya	Chief Engineer
Japanese Concerned Organization		
6	Embassy of JAPAN, Nepal	
	Mr. Yasuhiro NOMURA (野村康裕)	Second Secretary
7	Japan International Cooperation Agency, Nepal office : JICA Nepal	
	Mr. Mitsuyoshi KAWASAKI (河崎充良)	Chief Representative
	Mr. Toru TAKE (武徹)	Senior Representative
	Mr. Kenichiro IIZUKA (飯塚健一郎)	Representative
	Mr. Hiroshi YASHIMA (矢島弘)	Specialist
Concerned Study Teams		
8	The Project for The Shindhuli Road Construction	
	Mr. Hideo KATAGIRI (片桐 英夫)	Resident Engineer
	Mr. Hiroshi FUJISAWA (藤沢 博)	Resident Engineer
	Mr. Kei KASAHARA (笠原 慶)	Resident Engineer
9	The Project for Operation and Maintenance of The Shindhuli Road	
	Mikihiro MORI (森 幹尋)	Road Disaster Prevention Plan
	Mr. Bindu Shamsher Rana	Road Administration Expert
	Mr. Isao INUDUKA (犬塚 功)	Support for Self-reliance Road Maintenance
	Mr. Hiroyuki KATSURO (勝呂 博之)	Road Disaster Expert
	Mr. Wako Noto (能登 和幸)	Coorditaion/ Road Maintenance Management Support

Local People

15	Primary School (Shree Prathamik Vidyalaya)	
	Mr. Narayan Karki	Principle
	Mr. Dhurba Kumar Basnet	Teacher
	Shusila Shrestha (F)	Teacher
	Babita Shresth (F)	Teacher
	Parbati Dahal (F)	Teacher
	Purnima Shrestha (F)	Teacher
16	Local People	
	Ruka Maya Thapa (F)	Landowners
	Mr. Jurga Magar	Landowners
	Reena Thapa (F)	Landowners

Appendix-4
Minutes of Discussions

Appendix -4

Minutes of Discussions

4-1 Field Survey 9th September 2011

4-2 Explanation on Draft Final report 5th March 2012

**Minutes of Discussions
on the Preparatory Survey
on the Project for Countermeasure Construction for the Landslides
on Sindhuli Road (Section II)
in Nepal**

Based on the results of the precedent Preparatory Survey conducted from May 2010 to March 2011, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Countermeasure Construction for the Landslides on Sindhuli Road (Section II) (hereinafter referred to as "the Project").

JICA sent to Nepal the Preparatory Survey Team (hereinafter referred to as "the Team") headed by Mr. Ryoichi KAWABE, Assistant Director, Transportation and ICT Division 3, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from 1st September to 29th September, 2011.

The Team held discussions with the officials concerned of the Government of Nepal and conducted a field survey at the study area.

In the course of discussions and field survey, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Outline Design Study Report.

Kathmandu, 29 September, 2011



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Indu Sharma

Ryoichi KAWABE
Leader
Preparatory Survey Team
Japan International Cooperation Agency
(JICA)

Indu Sharma DHAKAL
Director General
Department of Roads (DOR)
Ministry of Physical Planning and Works
(MOPPW)
The Government of Nepal

ATTACHMENT

1. Objective of the Project

The objective of the Project is to construct countermeasures for the landslides at sta.17+600 and sta.18+200 on the Sindhuli Road (Section II) and enhance the whole Sindhuli Road linking the northern remote areas of Sindhuli district with East-West Highway and Arniko Highway.

2. Project Site

The Project site is shown in Annex-1.

3. Responsible and Implementing Organizations

3.1 The responsible organization for executing the Project is the Ministry of Physical Planning & Works (MOPPW).

3.2 The implementing agency is the Department of Roads (DOR).

The organization charts of MOPPW and DOR are shown in Annex-2-1 and 2-2 respectively.

4. Items requested by the Government of Nepal

As a result of the discussions, both sides confirmed that the requested component was as below, and the construction of countermeasure at sta. 17+400 will be implemented by Nepalese side.

- Construction of countermeasures at sta.17+600 and sta.18+200 on the Sindhuli Road (Section II)

JICA will assess the appropriateness of the request and will report the findings to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

5.1 The Nepalese side understands the Japan's Grant Aid scheme explained by the Team as described in the Annex-3.

5.2 The Nepalese side will take the necessary measures as described in Annex-4 for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the study

6.1 JICA will prepare the draft report and dispatch a mission to Nepal in order to explain its contents in January 2012.

6.2 When the contents of the report are accepted in principle by the Government of Nepal, JICA will complete the final report and send it to the Government of Nepal in April 2012.

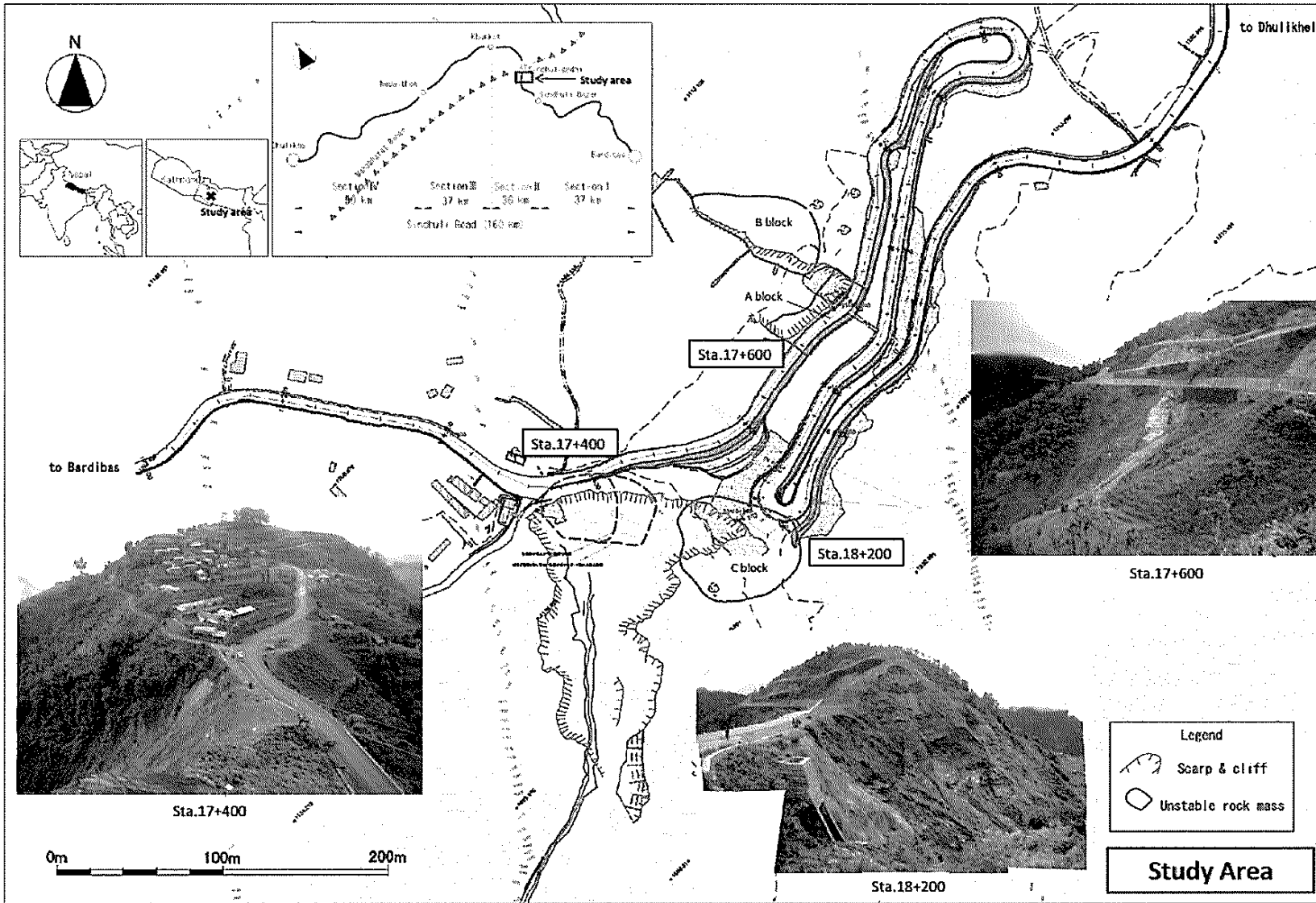


7. Other Relevant Issues

- (1) The procedures necessary for the approval of IEE (Initial Environmental Examination) shall be implemented by the Nepalese side by the end of February 2012, if tree cutting is necessary on the Project as written in the precedent Preparatory Survey.
- (2) If other necessary procedures regarding environmental and social consideration are confirmed on the Survey, these shall be also implemented by the Nepalese side by the end of February 2012.
- (3) The Nepalese side will submit answers to the Questionnaires from the Team by 25th September, 2011.
- (4) The Nepalese side will provide security-related information as well as measures to ensure the safety of the Team.
- (5) The Nepalese side will furnish the Team with all available and relevant data, information and document related to the Survey.
- (6) The Nepalese side will assign counterpart personnel.

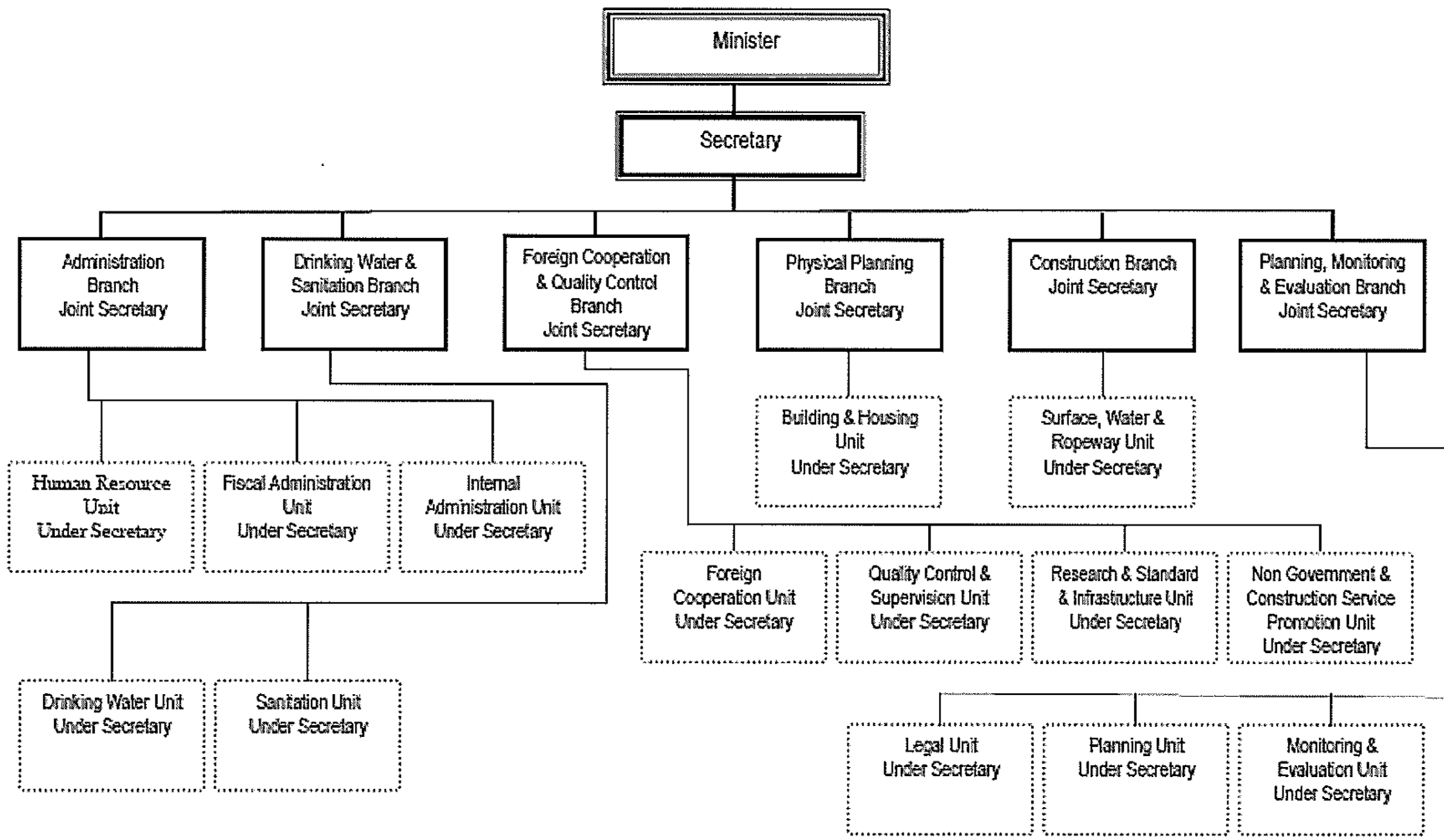
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**Ministry of Physical Planning & Works
Organization Chart**

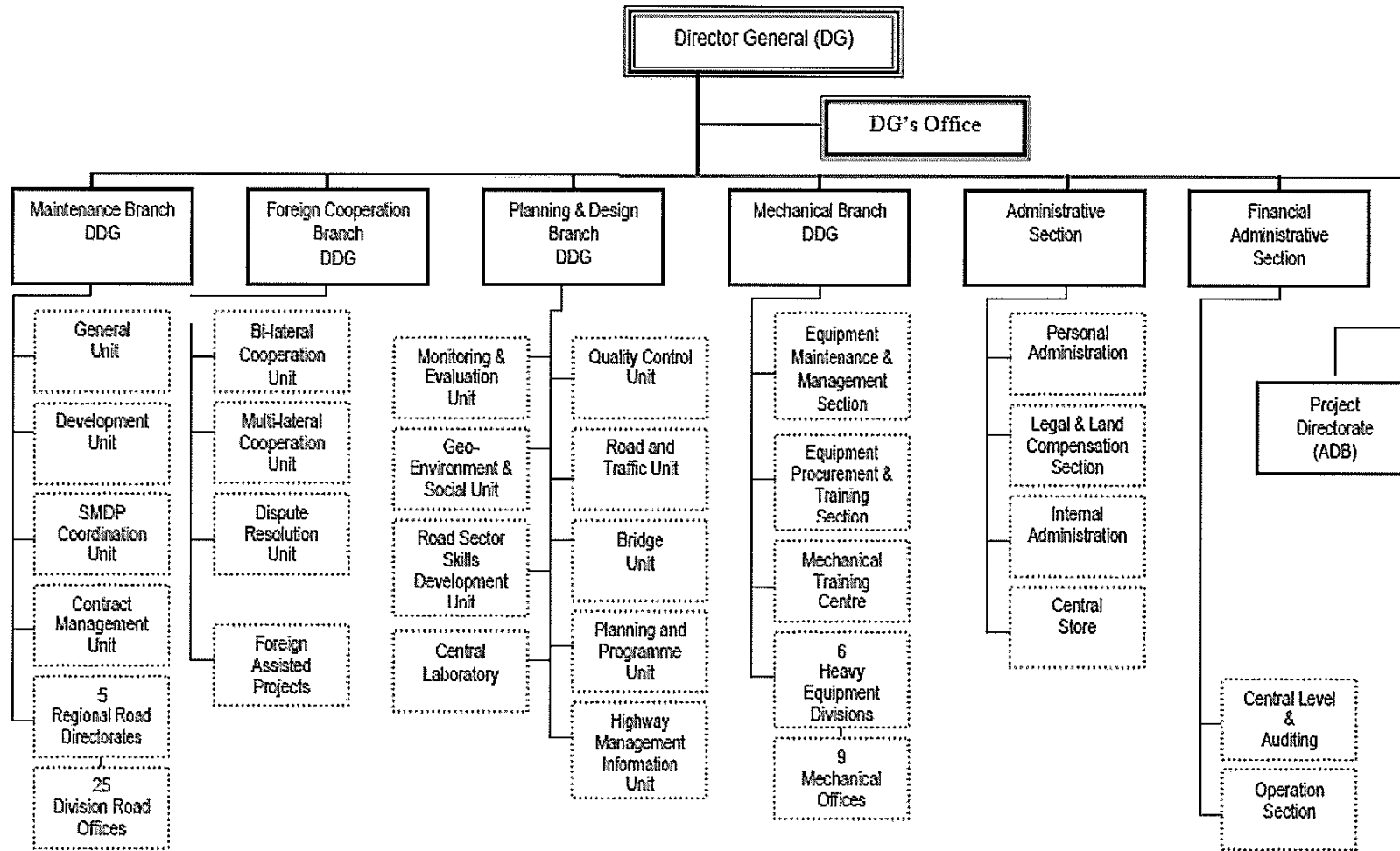


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**Department of Roads
Organization Chart Including all Offices**



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JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as “the GOJ”) is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

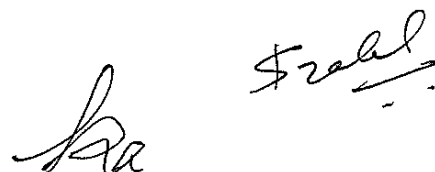
- Preparatory Survey
 - The Survey conducted by JICA
- Appraisal & Approval
 - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as “the G/A”)
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a



technical, financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

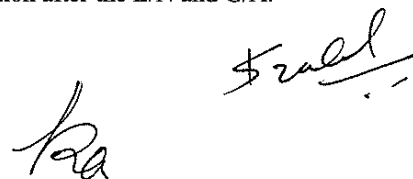
3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

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(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex 4.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment

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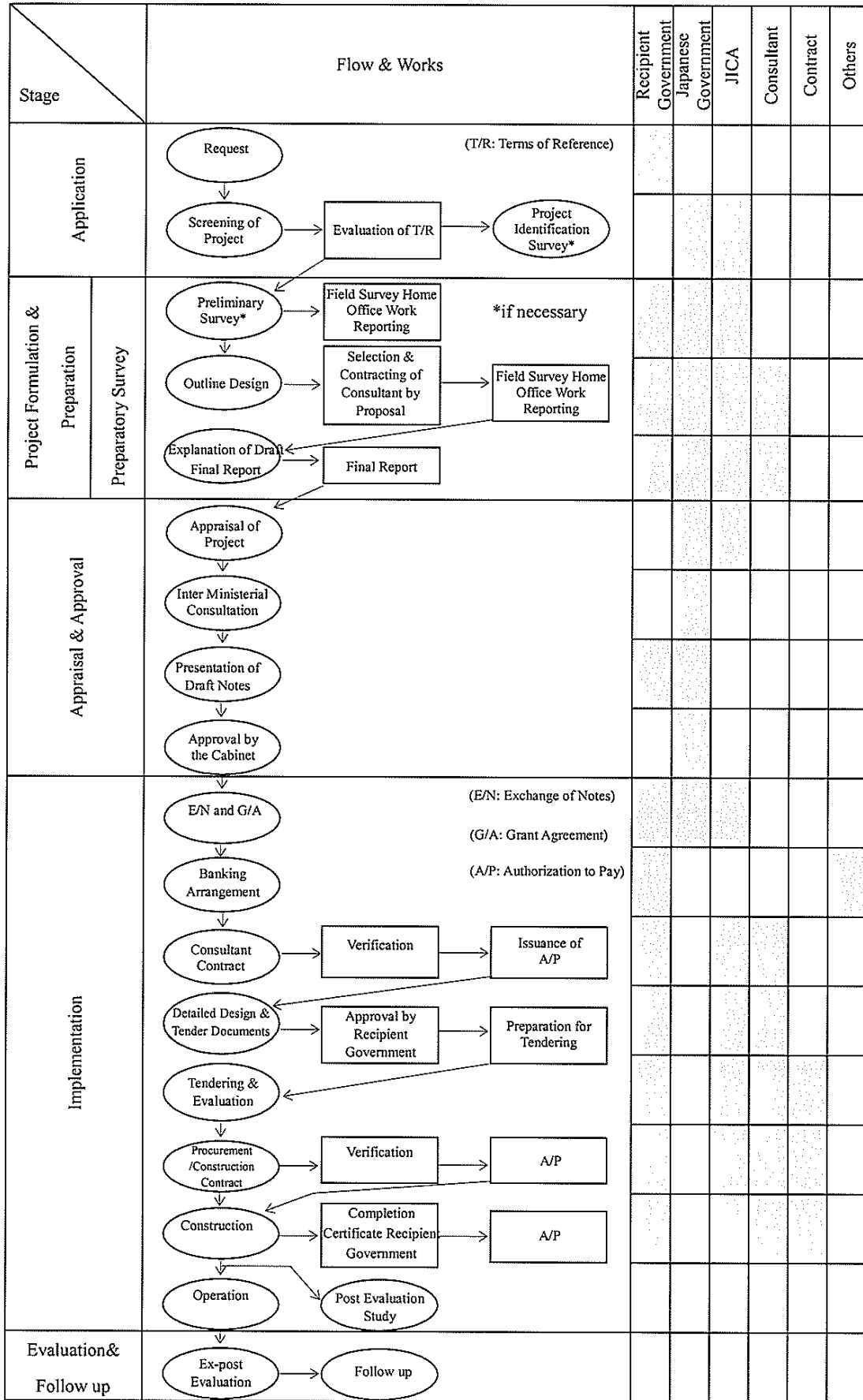
commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

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FLOW CHART OF JAPAN'S GRANT AID PROCEDURES

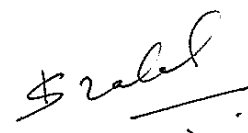


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Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure lots of land necessary for the implementation of the Project and to clear the sites;		•
2	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services [be exempted] / [be borne by the Authority without using the Grant]		•
4	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
5	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		•
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
8	To give due environmental and social consideration in the implementation of the Project.		•

(B/A : Banking Arrangement, A/P : Authorization to pay)




Minutes of Discussions
on the Preparatory Survey
on the Project for Countermeasure Construction for the Landslides
on Sindhuli Road (Section II)
in Nepal

In September 2011, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Teams on the Project for Countermeasure Construction for the Landslides on Sindhuli Road (Section II) (hereinafter referred to as "the Project") to Nepal, and through discussions, field surveys and technical examination of the results of the surveys in Japan, JICA prepared a Draft Final Report of the Outline Design.

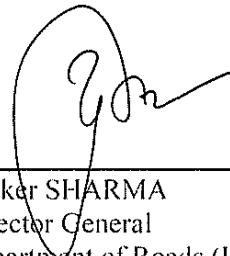
In order to explain and to consult with the concerned officials of the Government of Nepal on the component of the Draft Final Report, JICA sent Nepal the Preparatory Survey Team for Draft Final Report Explanation (hereinafter referred to as "the Team"), which is headed by Mr. Toru Take, Senior Representative of JICA Nepal Office, from March 1st to March 6th, 2012.

And as a result of discussion, both sides confirmed the main items described on the attached sheets.

Kathmandu, 5 March, 2012



Toru TAKE
Leader
Preparatory Survey Team
Japan International Cooperation Agency
(JICA)



Dinker SHARMA
Director General
Department of Roads (DOR)
Ministry of Physical Planning and Works
(MOPPW)
Government of Nepal

ATTACHMENT

1. Title of the Project

The project title at the implementation stage of the Project was agreed as “the Project for Countermeasure Construction for the Landslides on Sindhuli Road (Section II)”.

2. Project Components

After the explanation of the contents of Draft Final Report by the Team, the Nepalese side agreed in principle to the project components.

3. Japan’s Grant Aid Scheme

The Nepalese side understood the Japan's Grant Aid scheme and the necessary measures to be taken by the recipient country as explained by the Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both sides on September 9th, 2011.

4. Schedule of the Study

JICA will complete the final report and send it to the Government of Nepal by the end of March, 2012.

5. Project Cost

The Nepalese side was informed that the Project cost should not exceed the upper limit of amount agreed on in E/N and G/A and understood that the Project Cost Estimate attached as Annex-1 is not final and is subject to change by the result of examination through revision of the Outline Design.

6. Environment and Social Considerations

(1) Completion of IEE approval procedures

The Nepalese side explained the IEE study report will be submitted to Ministry of Physical Planning and Works (MOPPW) from Department of Roads by the end of May and the approval by MOPPW will be obtained within one month from the submission of the report.

(2) Environmental check list and monitoring form

Both sides agreed on the contents of environmental check list as shown in Annex-2. And both sides agreed to monitor the procedures in accordance with the monitoring form as shown in Annex-3.

7. Proper Maintenance of the Project Area

(1) Operation and Maintenance Cost

1) Project Sections

The Team explained the necessary cost for operation and maintenance of the project sections after the completion of the Project as shown in Article 3, Annex-1. The Nepalese side confirmed the cost and explained that it would be covered from annual road maintenance budget.

2) Entire Sindhuli Road

The Team also explained the necessary cost for operation and maintenance of the entire Sindhuli Road as shown in Chapter 5 of the Draft Final Report. The Nepalese side confirmed the cost and explained that it would be covered from annual road maintenance budget as well.

(2) Technical Cooperation Project for the Operation and Maintenance of Sindhuli Road

Both sides confirmed that the Nepalese side operates and maintains the whole Sindhuli road by making full use of the fruits of “the Technical Cooperation Project for the Operation and Maintenance of Sindhuli Road” which has been launched since December 2011.

8. Other issues

(1) Confidentiality of the Project

The Nepalese side agreed that all the information related to the Project such as detailed drawings, specifications, and the result of cost estimate shall not be released to a third party before conclusion of all the contract(s) for the Project, because they are confidential documents that contain information related to the tender.

(2) Countermeasure Construction for the landslide at sta. 17+400

Both sides confirmed that the Nepalese side shall complete the countermeasure construction for the landslide at sta. 17+400 by itself before the completion of the countermeasure construction at sta. 17+600 and sta. 18+200, which is expected in December 2014.

<List of Annex>

Annex-1	Project Cost Estimate (Confidential)
Annex-2	Environmental Check List
Annex-3	Monitoring Form

Project Cost Estimate

This Page is closed due to the confidentiality.

Annex 2

Environmental Check List(1) Permits and Public Explanation

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) IEE and Environmental Permits	<p>(a) Have IEE reports been already prepared in the official process?</p> <p>(b) Have IEE reports been approved by the authorities of the Nepalese government?</p> <p>(c) Have IEE reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?</p> <p>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host Nepalese government?</p>	<p>(a) N</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p>	<p>(a) IEE is being carried out by DoR which will be completed in April 2012</p> <p>(b) IEE reports will be submitted to MoPPW in April for approval.</p> <p>(c) It is expected that the report will be unconditionally approved.</p> <p>(d) Required environmental permits will be obtained in accordance to the laws, regulations of Nepal and IEE recommendation.</p>
(2) Explanation to the Local Stakeholders	<p>(a) Have contents of the project and the potential impacts been adequately explained to the local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the local stakeholders?</p> <p>(b) Have the comments from the stakeholders (such as local residents) been reflected in the project design?</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) Contents of the project will be explained to the local stakeholders in the process of IEE.</p> <p>(b) Comments and requirements from the stakeholders will be introduced to the project design and execution.</p>
(3) Examination of Alternatives	<p>(a) Have alternative plans of the project been examined with social and environmental considerations?</p>	<p>(a) Y</p>	<p>Alternative plan has been studied in the preparatory study implemented by JICA.</p>

Environmental Check List(2) Pollution Control

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Air Quality	<p>(a) Is there a possibility that air pollutants emitted from project-related sources such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken?</p> <p>(b) If air quality already exceeds the country's standards near the route, is there a possibility that the project will make air pollution worse?</p>	<p>(a) Y</p> <p>(b) N</p>	<p>(a) Dust and gas are anticipated during construction.</p> <p>(b) Existing air quality is clean and good. Periodical watering around the project area will be carried out to reduce blowing of dust.</p>
(2) Water Quality	<p>(a) Is there a possibility that soil runoff from bare lands resulting from earthmoving activities, such as cutting and filling, will cause water quality degradation in the</p>	<p>(a) Y</p> <p>(b) Y</p>	<p>(a) Petroleum and hydraulic fluid spills from heavy equipment might occur and cause water pollution during construction.</p> <p>(b) Petroleum and hydraulic fluid</p>

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	downstream water areas?		spills from heavy equipment will be minimized by careful construction management.
	(b) Is there a possibility that the project will contaminate water sources such as well water?		
(3) Noise and Vibration	(a) Do noise and vibrations from the vehicle comply with the country's standards?	(a) Y (b) Y	(a) Noise and vibration generated by heavy machines and equipment are expected to comply with the Nepalese Standards.
	(b) Do low frequency sound from the vehicle comply with the country's standards?		(b) Low frequency sound from machines/equipment is expected to comply with the Nepalese Standards.

Environmental Check List(3) Natural Environment

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	No issues on protected area.
(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats, e.g., coral reefs, mangroves, or tidal flats? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (c) Are adequate protection measures taken to prevent impacts such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (d) Is there a possibility that the installation of access roads will cause impacts such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	(a) N (b) N (c) N (d) N	(a) and (b) No issues on ecosystem in the project site. (c) Adequate protection measures will be taken in the construction stage to prevent impacts such as disruption of migration routes, habitat fragmentation, and traffic accidents of wildlife and livestock. (d) There is no possibility that installation of access roads will cause impacts such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems. Access road will be constructed in a farmland of millet which will be given reasonable compensation by DoR and restored after completion of the project.
(3) Hydrology	(a) Is there a possibility that the alteration of topographic features and installation of structures such as tunnels will adversely affect surface water and groundwater	(a) N	No issues on hydrology in the project area.

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	flows?		
(4) Topography and Geology	<p>(a) Are there unstable slopes that may cause landslides or slope failure? Are adequate measures considered to prevent landslide or slope failure where needed?</p> <p>(b) Is there a possibility that civil works such as cutting and filling will cause slope failures or landslides?</p> <p>(c) Is there a possibility that soil runoff will result from cut and fill area?</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) Y</p>	<p>(a) Many unstable slopes are developing in the project site which will be stabilized by the countermeasures implemented in the project.</p> <p>(b) Safe construction is planned, and cutting and filling works will be implemented safely by careful construction management.</p> <p>(c) Some amount of soil runoff during construction stage will be minimized by careful construction.</p>

Environmental Check List(4) Social Environment

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Resettlement	<p>(a) Is involuntary resettlement being caused by project implementation? If yes, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is there land use and use of local resources? Is there adequate explanation on land use to landowners and will reasonable compensation be given?</p>	<p>(a) N</p> <p>(b) Y</p>	<p>(a) No involuntary resettlement is caused by the project.</p> <p>(b) Private field will be used for temporary road which will be given reasonable compensation. After completion of the project, the used land will be restored.</p>
(2) Living and Livelihood	<p>(a) Is there a possibility that the project will affect the existing means of transportation and the associated workers?</p> <p>(b) Is there a possibility that the project will cause significant impacts such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(c) Is there any possibility that the project will adversely affect the living conditions of the inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(d) Is there any possibility that diseases, including infectious diseases such as HIV, will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(e) Is there any possibility that the project will adversely affect road traffic in the surrounding areas, e.g., increase of traffic congestion</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) Y</p> <p>(f) Y</p> <p>(g) N</p>	<p>(a) Traffic regulation during construction will disturb the traffic which will be minimized by careful construction management.</p> <p>(b) There is no significant impact on land use and local sources.</p> <p>(c) There is no possibility that the project will adversely affect the living conditions of the inhabitants</p> <p>(d) Advance safety and healthcare directive and management are carried out.</p> <p>(e) Traffic regulation during construction will disturb the traffic, which will be minimized by careful construction management.</p> <p>(f) Same as above.</p> <p>(g) There is no possibility that facilities generated by the project will cause sun shading and radio interference.</p>

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	and traffic accidents?		
	(f) Is there any possibility that the project will disturb the movement of inhabitants?		
	(g) Is there any possibility that the facilities generated by the project will cause sun shading and radio interference?		
(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no heritage in the project area.
(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Cut and fill slope will be treated by suitable vegetation and protection work.
(5) Ethnic Minorities and Indigenous People	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous people? (b) Are all of the rights of ethnic minorities and indigenous people, in relation to land and resources, respected?	(a) Y (b) Y	(a) and (b) No issues on ethnic minorities and indigenous people.
(6) Working Conditions	(a) Does the project observe Nepalese labor laws and regulations? (b) Are tangible safety considerations in place for individuals involved in the project such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project such as the establishment of a safety and health program, safety training (including traffic safety and public health) for workers, etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project will not violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) The project will be implemented observing Nepalese labor laws and regulations strictly. (b) The project will be implemented under advanced safety management. (c) Advanced safety management plan will be established which will be strictly applied during project implementation. (d) Security management plan will be established which involves local police.

Environmental Check List(5) Others

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction, e.g., noise,	(a) Y (b) Y (c) Y	(a), (b), (c), Adequate measures and

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	<p>vibrations, turbid water, dust, exhaust gases, and wastes?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce the impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce the impacts?</p>		<p>considerations will be taken for any kind of environmental impact such as pollution to natural and social environment.</p>
(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y (b) Y (c) Y (d) Y</p>	<p>(a) An Environmental Monitoring Unit (EMU) will be established by DoR which will be responsible for the execution of the monitoring program.</p> <p>(b) Major items of monitoring include "permit and public explanation", "pollution control", and "social environment"</p> <p>(c) DoR will establish an EMU.</p> <p>(d) The monitoring program by DoR will include the monitoring method and the regulations to be followed.</p>

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Annex 3

Monitoring Form

As environmental review indicates the need for monitoring the items shown below, the Ministry of Public Works should undertake monitoring for necessary items and report to JICA monthly.

1 Permit and Public Explanation

Table 1.1 Monitoring on Permit and Public Explanation

Monitoring Item	Date	Monitoring Result
Implementation of IEE		
Approval of IEE		
Explanation of project		

2 Pollution Control

2.1 Air Quality

Table 2.1 Monitoring on Air Quality

Monitoring Item	Date	Monitoring Result
Visual observation on air quality		

2.2 Water Quality

Table 2.2 Monitoring on Water Quality

Measurement Item	Unit	Measured Value	Nepalese Standard	Remarks
PH	mg/L			
BOD	mg/L			
SS	mg/L			
DO	mg/L			
Bacillus Coli	MPN/100 mL			

2.3 Noise/Vibration (measurement point: the nearest house from the site)

Table 2.3 Monitoring on Noise/Vibration

Measurement Item	Unit	Measured Value	Nepalese Standard	Remarks
Noise level	mg/L	dB		
Vibration level	mg/L	dB		

3. Natural Environment

- No issues on natural environment-

4. Social Environment

Table 1.1 Monitoring on Permit and Public Explanation

Monitoring Item	Date	Monitoring Result
Agreement on private lands		
Compliance on labor laws		

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Compliance on safety system
Compliance on health program
Situation of security guard

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Appendix-5 References

- 5.1 Preliminary Environmental and Social Consideration Study in The Preparatory Survey on The Project for Countermeasures for Landslides on Sindhuli Road (Section II)***
- 5.2 Environmental Photographs***
- 5.3 Construction photographs***
- 5.4 Results of Geophysical Exploration***
- 5.5 Soil Test Result***
- 5.6 Review of Monitoring Data***
- 5.7 Calculation Sheet (Stability Analysis & Structural Calculation)***
- 5.8 The Detailed Design Drawings (Plan & Profile, Typical Cross Section)***

Appendix-5.1
Preliminary Environmental and Social
Consideration Study in The Preparatory
Survey on The Project
for Countermeasures for Landslides
on Sindhuli Road (Section II)

**Preliminary Environmental and Social Consideration Study
in The Preparatory Survey on
The Project for Countermeasures for Landslides on
Sindhuli Road (Section II)**

1 TITLE OF THE PROJECT AND RELEVANT PROJECT REPORT

(1) Title of the Project

The Project for Countermeasure Construction for Landslides on Sindhuli Road (Section II)

(2) Responsible and Implementing Organization of the Project

The implementing agency for the project is the Department of Roads (DoR) and the responsible organization is the Ministry of Physical Planning and Works (MoPPW).

(3) Relevant Project Report

- The preparatory survey on The Project for Countermeasure Construction for Landslides on Sindhuli Road (Section II), Main Report, March 2011, JICA.
- Environmental Impact Assessment (EIA) for Section II, Sindhuli Bazar – Khurkot Road under the Banepa – Sindhuli – Bardibas Road Project, Final Report, October 1999, GEOCE Consultants (P) Ltd.

2 ENVIRONMENTAL CATEGORIZATION AND BASIS

The environmental category of the project was determined as Category B according to JICA Guidelines for Environmental and Social Considerations (April, 2010), based on the following reasons:

- The project aims to construct countermeasures for landslides within Sindhuli Bazar – Khurkot Road (Section II), and to rehabilitate the national highways. Accordingly, no significant negative impact would be expected from the construction activities of the project.
- The locations for the implementation of the countermeasure construction involve two sites, with a total road section length of about 250 m. In addition, the proposed countermeasures are planned to be completed within two years.
- The proposed countermeasures against landslides are permanent works with high stability, such as anchors and reinforced earth walls.

3 OUTLINE OF THE PROJECT

(1) Banepa – Sindhuli – Bardibas Road Project

The Banepa – Sindhuli – Bardibas Road, which is classified as a national highway, is one of the most important strategic roads linking Kathmandu Valley and eastern Terai. The road has been constructed by means of a section by section approach since November 1996 as shown in Table 1 through a grant assistance from the Government of Japan. The Banepa – Sindhuli – Bardibas Road is planned to be completely constructed and fully opened in 2014.

Table 1 Banepa – Sindhuli – Bardibas Road (total length of 158 m)

Section	Name of Road	Length (km)	Status	Remarks
I	Bardibas – Sindhuli Bazaar	37	Constructed	No EA ¹⁾
II	Sindhuli Bazaar – Khurkot	39	Constructed	EIA ²⁾
III	Khurkot – Nepalthok	32	Under construction	EIA ²⁾
IV	Nepalthok - Dhulikhel	50	Constructed	No EA ¹⁾

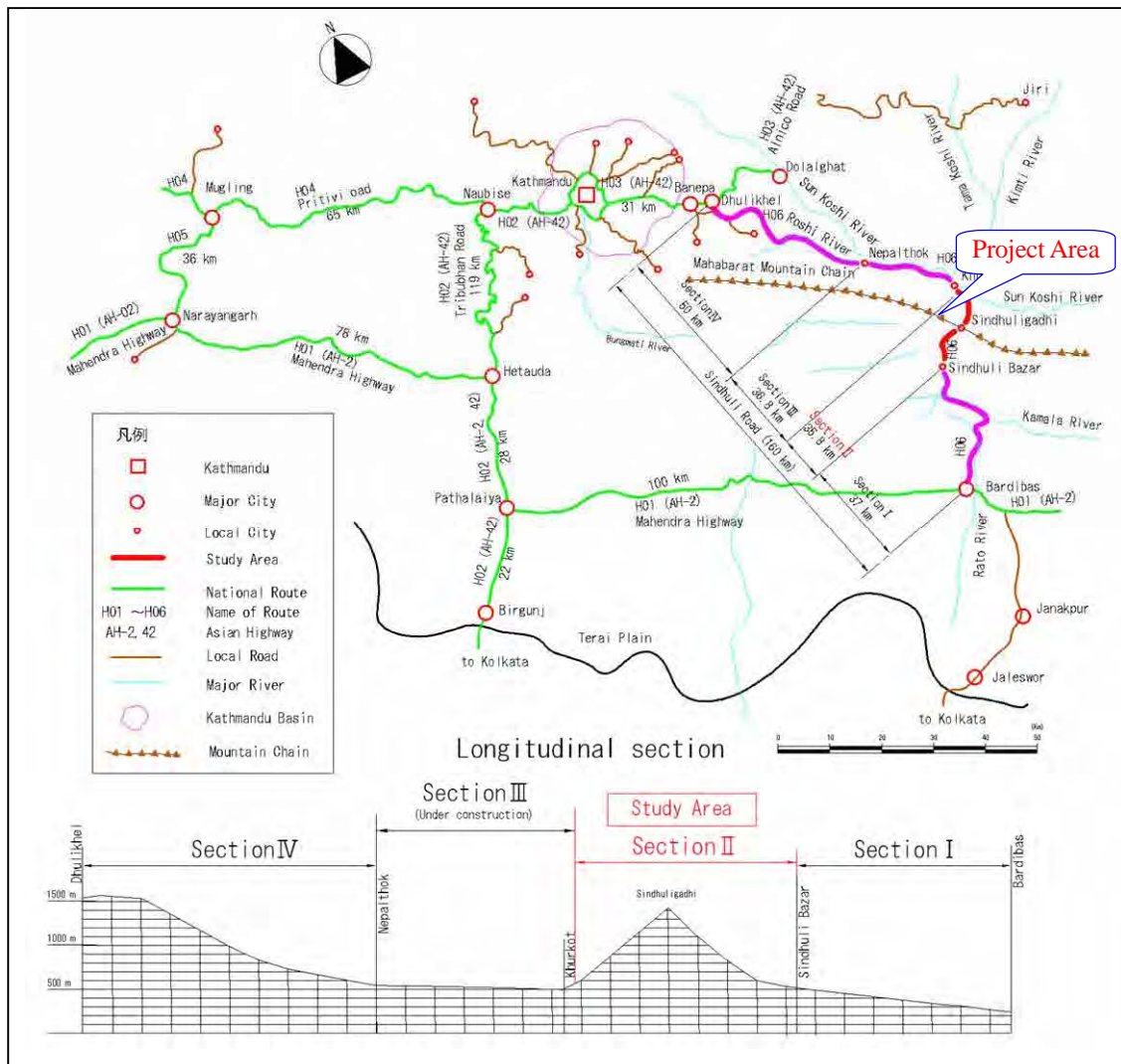
Notes: 1) No environmental assessment, such as EIA and IEE, was legally required at the period of the project implementation

2) EIA - Environmental Impact Assessment for the road project was completed and approved.

Source: JICA Study Team

(2) Location of the Project

The project involves construction of countermeasures against landslides at Sta. 17+600 and Sta. 18+200 within the Sindhuli Bazaar – Khurkot Section, Section II of the Banepa – Sindhuli – Bardibas Road as shown in Figure 1. The project's location is summarized in Table 2.



Source: JICA Study Team

Figure 1 Location of the Project Site

Table 2 Outline of the Project Location

Section	Site	Section Length (m)	Damaged Area (m ²)
II	Sta. 17+600	80	80 × 100 = 8,000
	Sta. 18+200	170	50 × 50 = 2,500
Total		250	10,500

Source: JICA Study Team

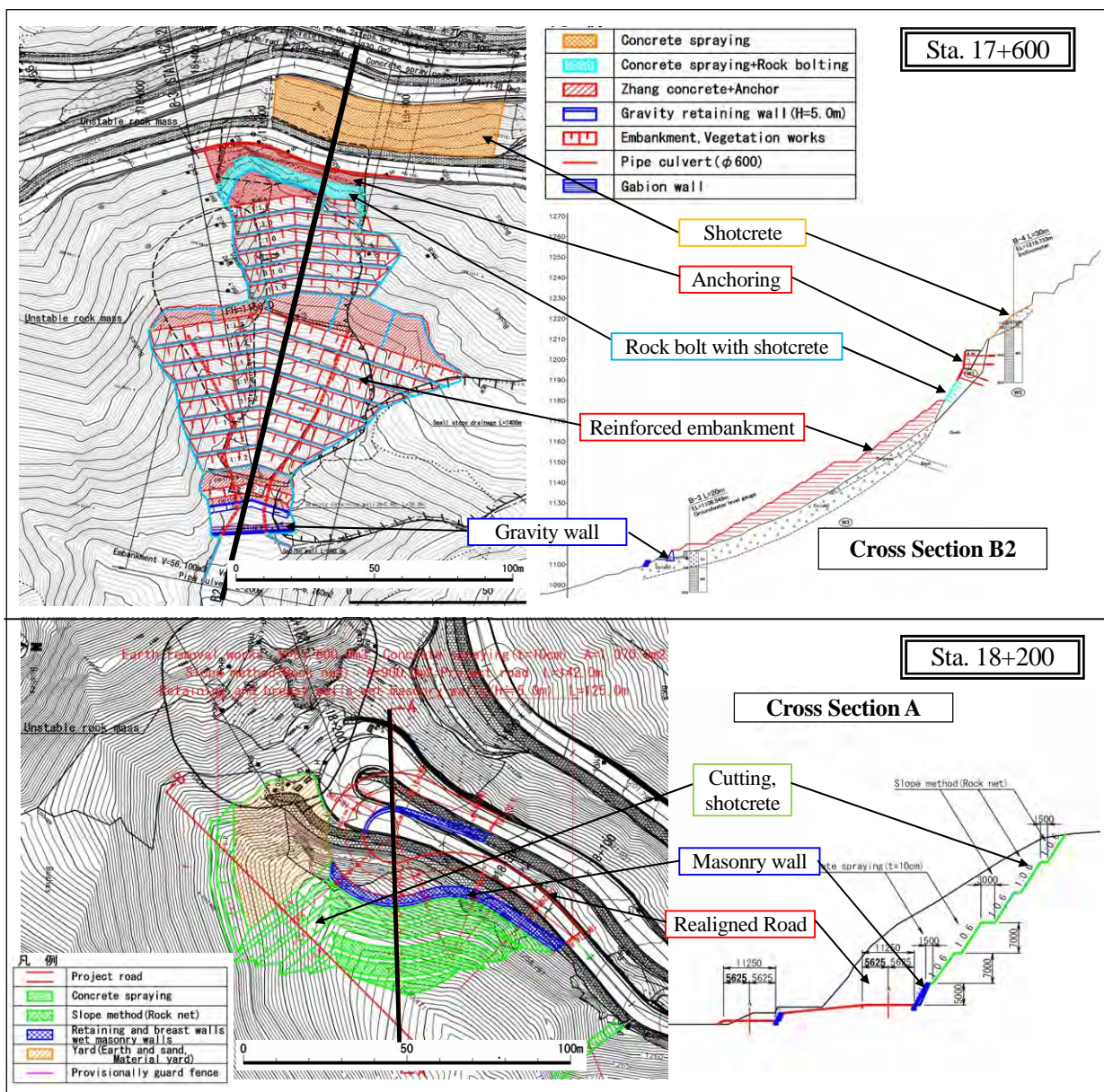
(3) Objectives and Components of the Project

The objective of the project is to implement the permanent countermeasures for the two abovementioned damaged sites in order to keep the sustainable traffic function of the road.

The project components include the following:

- Road realignment, and subsequent excavation and slope protection work construction at Sta. 18+200
- Installation of anchor against landslide at Sta. 17+600
- Construction of reinforced earth wall and related works to stabilize landslide at Sta. 17+600

The proposed countermeasures of the project are shown in Figure 2 and summarized in Table 3.



Source: JICA Study Team

Figure 2 General Plan and Section of the Proposed Countermeasures

Table 3 Outline of the Countermeasures Proposed for the Project

Site/Section	Countermeasures	Remarks
Sta. 17+600	<ul style="list-style-type: none"> Anchor works Crib works Reinforced earth wall Sheet sodding (bioengineering works) Shotcrete 	
Sta. 18+200	<ul style="list-style-type: none"> Road realignment towards the mountainside Earth removal works (excavation), Shotcrete Masonry retaining wall Vegetation (bioengineering works) 	Construction spoils due to excavation of road realignment will be used as embankment material of the reinforced earth wall at Sta. 17+600.

Source: JICA Study Team

4 PRESENT ENVIRONMENTAL CONDITIONS OF THE PROJECT AREA

The present environmental conditions are based on the review of the previous EIA for Section II, Sindhuli Bazar – Khurkot Road under the Banepa – Sindhuli – Bardibas Road Project, conducted by GEOCE Consultants (P) Ltd in October 1999, as well as a brief site visit conducted by the JICA Study Team during the survey.

(1) Topography and Geology

The project area is located in the northwest slope of Mahabarat Mountain Range that has been formed by successive tertiary geotectonic movement. The geology of the project site consists of precambrian schistose rocks. Schistose rocks are generally hard and less to slightly fractured at outcrop. However, they are locally very intensely fractured and sheared. The fractured and sheared rocks or zones, which are presumably due to Mahabarat Thrust, are highly susceptible to landslides.

(2) Climate and Rainfall

The project site has a seasonable climate with average annual maximum and minimum temperatures of 28°C and 16°C, respectively. The highest temperature is 27°C in April and the lowest temperature is 19°C in January. The annual rainfall around the project site generally exceeds 1,000 mm. Rainfall is concentrated, and more than 90% of the annual rainfall occurs during the monsoon months beginning from May to October. The months between November and April are dry and any rainfall is sporadic.

Table 4 Monthly Rainfall at the Project Site

Month \ Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Accumulation (mm/year)
2003	-	-	-	-	-	-	457.5	291	328.5	44.5	0	0	1121.5
2004	0	0	0	36	105.5	207.5	764	216.5	264	129.5	0	0	1723.0
2005	0	0	0	0	56	86.5	362.5	746	239.5	142	0	0	1632.5
2006	0	0	0	0	323.5	556.5	281.5	243	534.5	26.5	0	0	1965.5
2007	0	0	0	59.5	190.5	546	796	465	540	217.5	0	0	2814.5
2008	0	0	0	14	205	554.5	540.5	475	339.5	138	0	0	2266.5
2009	0	0	0	15	120	87	352.5	295.5	0	0	0	0	870.0
2010	0	0	0	0	0	15.5	439.5	478	377	74.5	1.5	0	1386.0
2011	4.5	18.5	39	117.5	201	328	166.5	145	2.5	-	-	-	1022.5
max	4.5	18.5	39.0	117.5	323.5	556.5	796.0	746.0	540.0	217.5	1.5	0.0	2,815
min	0	0	0	0	0	15.5	166.5	145	0	0	0	0	870
mean	1.0	2.0	5.0	30.0	150.0	298.0	462.0	373.0	292.0	97.0	0.0	0.0	1,710

Source: JICA Study Team

(3) Land Use

Project site is surrounded by denuded land and limited cultivated area as shown in Figure 3. Inhabited area is situated in the western part of the project site along the road. Rice, maize wheat, millet and potato are generally found in the cultivated field. Mainly, shorea robusta, and schima wallichii are the trees found in the forest area.

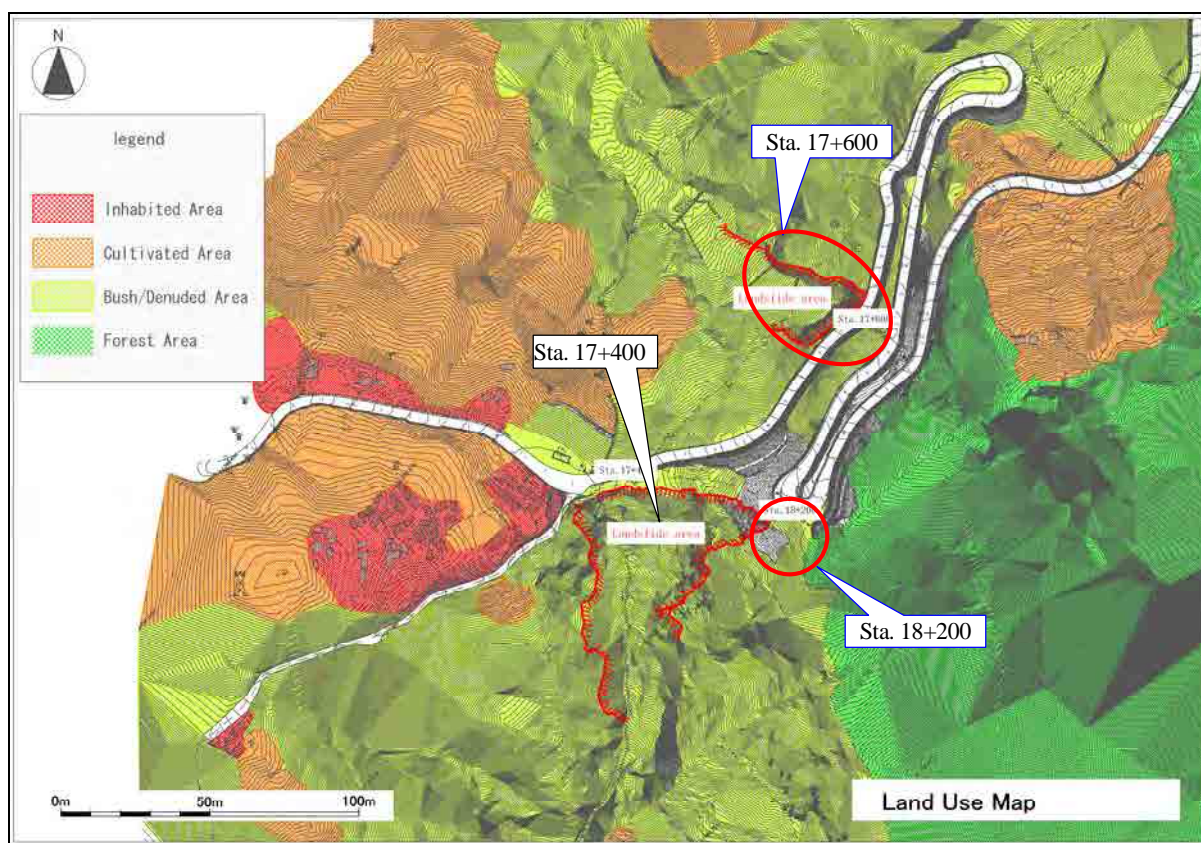


Figure 3 Land Use Map Around the Project Site (Source: JICA Study Team)

Table 5 Major Crops in Bhadrakali VDC

Yields for Various Crop Types (t/ha)									
Rice		Maize		Wheat		Millet		Potato	
Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield
220	638	442	974.4	137	343.6	250	384	24	192

Source: District Agriculture Department 2009

(4) Vegetation and Forest Type

The project site lies in the tropical to sub-tropical region within the sub-humid bio-climate zone. This area consists of mixed forest of shorea robusta and schima wallichii. VDC consists both community forest and national forest.

Table 6 Forest Area in Sindhuli District

SN	Types	Area (ha)
1	Well-stocked forest	1875
2	Moderately stocked forest	120629
3	Poorly stocked forest	36273
4	Forest and shrub land	1414
<i>Total Area</i>		<i>160191</i>

Source: DDC Profile 2008

Table 7 Community Forest in Bhadrakali VDC

VDC	Number of Community Forests	User Groups	Area of Community Forest (ha)
Bhadrakali	8	976	1203.55

Source: DDC Profile 2008

(5) Population and Ethnicity

The project site is located in Dungere Bhanjyan Village of Bhadrakali VDC in Sindhuli District of Janakapur Zone. The proposed project sites fall in the territory of Bhadrakali VDC and the demographic information of VDC is shown in Table 8.

Table 8 Demography of Bhadrakali VDC

VDC	Ward	Household	Female	Male	Total
Bhadrakali	1	110	301	309	610
	2	116	379	366	745
	3	88	298	257	555
	4	176	489	522	1011
	5	77	257	230	487
	6	50	164	180	344
	7	42	173	165	338
	8	104	309	330	639
	9	88	272	263	535
<i>Total</i>		851	2,642	2,622	5,264

Source: CBS 2009

The Dungere Bhanjyan Village where the project area lies consists of only 25 households with a total population of 181. They are living by subsistence farming and only four households are engaged in small-scale store and trading business.

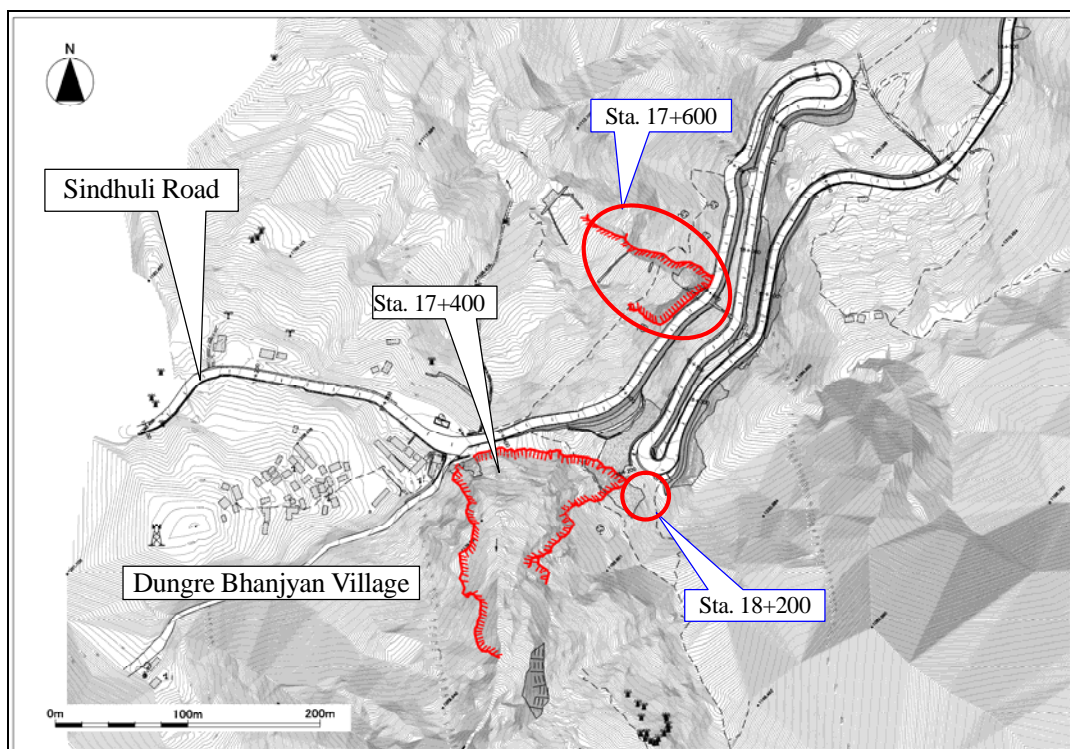


Figure 4 Distribution of House and Population Around the Project Site

Table 9 Household and Population Around the Project Site

Ward No.	Household	Population		
		Total	Male	Female
1	18	132	62	70
2	7	49	25	24

<i>Total</i>	<i>25</i>	<i>181</i>	<i>87</i>	<i>94</i>
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Source: JICA Study Team 2010

Sindhuli District is one of the multi-caste as well as multilingual parts of Nepal. There are altogether 74 identified castes and ethnic groups. Among them, Kshetri, Bahun, Tamang and Magar have great numbers. Minorities like Thamis, Hayus, Raji, Meche, Dura, Bhobi and Pahari also exist in the district.

Table 10 Ethnic Composition of the Bhadrakali VDC

Ethnic Group									
Tamang	Chhetri	Brahman	Gurung	Magar	Newar	Tharu	Dalit	Sunuwar	Other
2,047	516	219	5	773	468	2	440	116	5

Source: CBS 2001

(6) Occupation and Income

The environmental characteristics and their manifestation have largely shaped the socio-economic characteristics of Sindhuli District. The microclimatic variability is manifested by the climatic niche existing in the mountains making specific areas suitable for specific activities like cultivation, manufacturing, establishment of tourist centers, etc.

Table 11 Economically Active Population in Bhadrakali VDC Excluding Agriculture

Occupation	Number	Occupation	Number
Manufacture	2	Transport	2
Business	14	Services	8
Others	10	Total	36

Source: CBS 2001

(7) Education Profile

Education often yields higher earnings, opens career opportunities, improves health, widens social circles, and increases political activity. Education, therefore, is one of the major indicators of social development. The status of education in any society is its responsiveness towards modern civilization. Hence, the study of educational status in a society is a major area of social science.

Although the country has a 54% literacy rate, Sindhuli District has to persevere hard to catch up with the national figure. According to the census of 2001, the district's literacy rate shows a meager figure of 39.28%. Female literacy rate is 26.04% while male literacy rate is 52.53%.

Table 12 Literacy Status (Population of Six Years Old and Over) in Bhadrakali VDC

Total			Can't Read and Write			Can Read Only			Can Read and Write			Not Stated		
Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
3876	1939	1936	1739	591	1148	409	251	158	1706	1089	617	22	9	13

Source: CBS 2001

Table 13 Total Number of Schools by Grades and Levels in Bhadrakali VDC

Total		
Primary (1-5)	Lower Secondary (6-8)	Secondary (9-10)
10	2	1

Table 14 Primary Level's Total School Student Enrollment by Grades in Bhadrakali VDC

Grades 1 to 5		
Girls	Boys	Total
937	487	1,811

Source: School Level Educational Statistics of Nepal (Flash Report I 2004 (2061))

(8) Drinking Water and Sanitation

Water is an indispensable element of life, which therefore, has turned out to be a major indicator of social and economic development. Poverty is prevalent mostly in areas with shortages of water. Water-related issues such as access to drinking water and sanitation are closely linked with poverty and are strongly advocated to be prioritized in national policies. The issues of safe drinking water and proper sanitation facilities are key areas of development as they are closely associated with human health, which may lead to prosperity.

Table 15 Drinking Water Status and Sanitation of Bhadrakali VDC

Particular			
Total No. of Households	826		
Households using pipe (%)	62.8	No. of households using unsafe well water	228
No. of households using hand pump	0	No. of households using river water	68
No. of households using safe well water	11	No. of households with toilet	164

Source: CBS 2009

5 REVIEW OF ENVIRONMENTAL REGULATIONS AND GUIDELINES AND RELEVANT ORGANIZATIONS

(1) JICA Guidelines Requirements

The JICA Guidelines for Environmental and Social Considerations (April 2010) classify projects into the following four categories:

- **Category A:** Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. The project proponents must submit EIA report for Category A projects. For projects that will result in large-scale involuntary resettlement, a resettlement action plan (RAP) also must be submitted. For projects that will require measures for indigenous people, an indigenous people plan (IPP) must be submitted as well. EIA and other reports need to be submitted through the project proponent for JICA environmental reviews.
- **Category B:** Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. These impacts are generally site-specific, few if any are irreversible, and in most cases, normal mitigation measures can be designed more readily. The project proponent is in principle required to submit an initial environment examination (IEE) report for JICA environmental reviews.
- **Category C:** Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.
- **Category FI:** Proposed projects are classified as Category FI if they satisfy all of the following requirements:

a) JICA's funding of projects is provided to a financial intermediary or executing agency; b) the selection and appraisal of the sub-projects are substantially undertaken by such an institution only after JICA's approval of the funding and therefore the sub-projects cannot be specified prior to JICA's approval of funding; and c) those sub-projects are expected to have a potential impact on the environment.

(2) Requirements for the ADB Guidelines

Similar to the JICA guidelines, the Asian Development Bank (ADB) Environmental Assessment Guidelines (2003) classify projects into the following three categories:

- **Category A:** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An EIA level study including an environmental management plan (EMP) is required.
- **Category B:** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An IEE level study including an EMP is required.
- **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. An EIA or IEE study is not required, although environmental implications need to be reviewed.

(3) Nepalese Procedures and Requirements for Environmental Assessment

The main and fundamental Nepalese laws and regulations for environmental assessment (EA) are as follows: Environmental Protection Act, 1996 (EPA), Environmental Protection Rules, 1997 (EPR) as well as its amendments in 1999 and 2008.

As per the requirements by the Government of Nepal (GoN), an EA is required under the EPA. Moreover, assessment and reporting requirements are set out under the EPR.

Schedule 1 of Section 2 of the EPR gives the details of projects which require varying levels of study, such as IEE and EIA, as shown in Table 16 in the road sector with comparison of the requirements prescribed by the World Bank (WB).

Table 16 Legal Criteria for Selecting an IEE or EIA in the Road Sector Together with Comparison of Requirements Prescribed by the WB.

Type of Project	Type of EA Required	EA Category as per WB
1) Construction of national highways	EIA	A
2) Construction of major feeder roads	EIA	A
3) Construction of minor feeder roads	IEE	B
4) Construction of district roads	IEE	B
5) Construction of urban roads	IEE	B
6) Construction of rural roads	IEE	B
7) Construction of 1 to 5 km long ropeways	IEE	B
8) Construction of more than 5 km long ropeways	EIA	A
9) Construction of 1 to 5 km long cable car	IEE	B
10) Construction of more than 5 km long cable car	EIA	A

Type of Project	Type of EA Required	EA Category as per WB
11) Construction of major bridges	IEE	B
12) Construction of minor or medium bridges	Exempted	C
13) Construction of tunnels	IEE	B
14) Routine, recurrent, periodic, and emergency maintenance	Exempted	C
15) Upgrading, rehabilitation and reconstruction of national highways and feeder roads	IEE	B
16) Any project which requires deforestation, clearance felling or rehabilitation of national forest of an area up to 5 ha	IEE	B
17) Project which requires deforestation, clearance, felling or rehabilitation of national forest of an area more than 5 ha	EIA	A
18) Project which is to be constructed within a sensitive area*	EIA	A
19) Project with investment cost ranging from Rs.10 million up to Rs.100 million	IEE	B
20) Project with investment cost of over Rs.100 million	EIA	A
21) Project which involves the extraction of boulders, gravel, sand or soil from national forest area	IEE	B
22) Project which involves the extraction of boulders, gravel, sand or soil from riverbed with volume of over 50 t or 50 m ³ per day	EIA	A
23) Project which involves the extraction of boulders, gravel, sand or soil from riverbed with volume of less than 50 t or 50 m ³ per day	IEE	
24) Project which involves the extraction of construction materials from medium to large quarries	EIA	
25) Stone crushing plants	IEE	
26) Mechanical workshops with area of over 3 ha	EIA	

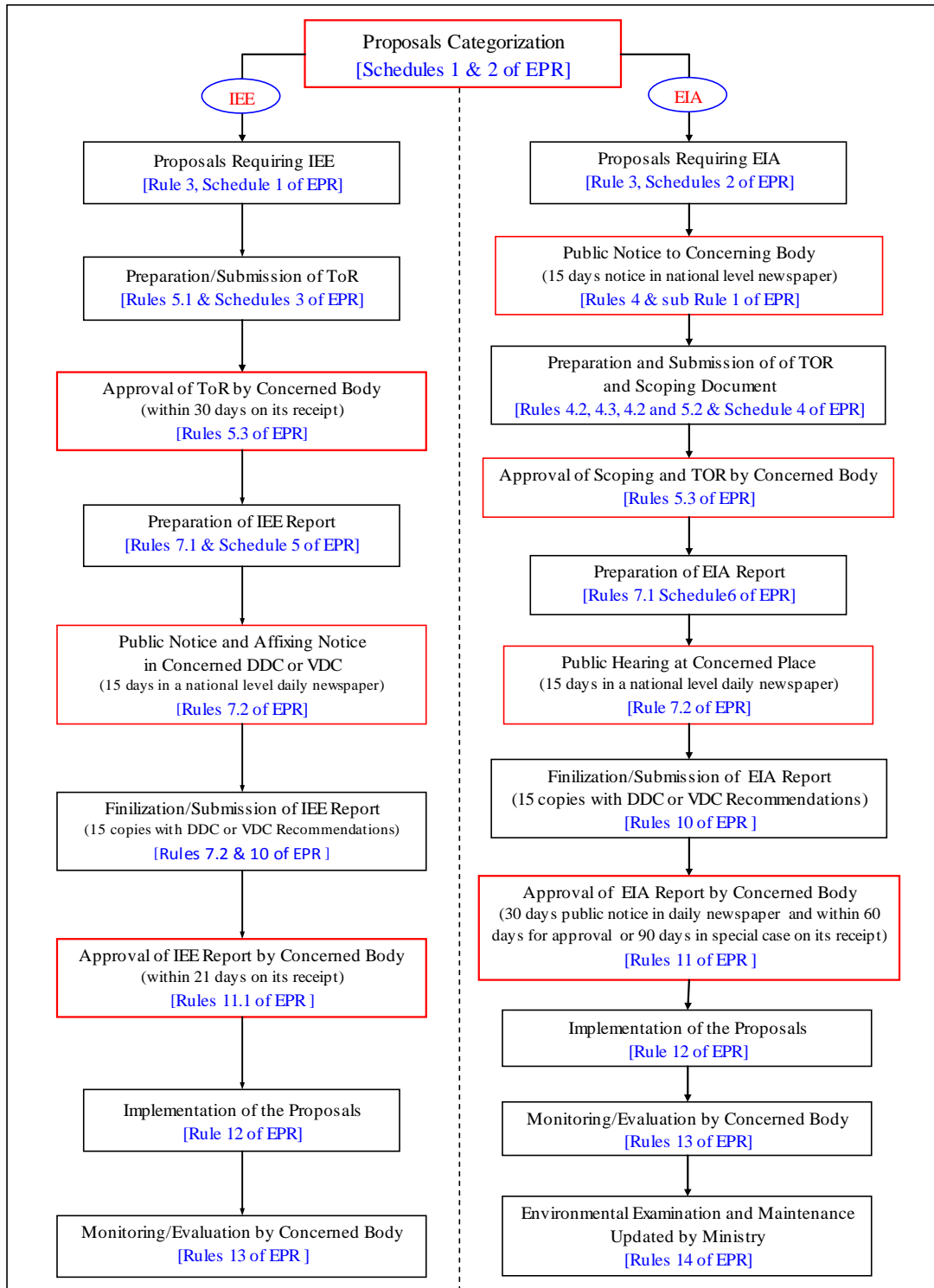
Source: Modified from EPR 1997 and Environmental and Social Management Framework (April, 2007) and Environmental Assessment in the Road Sector of Nepal, GESU/DoR (January, 2000)

Note: Sensitive areas include: Historical, cultural and archaeological areas; Ecologically sensitive and wetland area; National park, wildlife sanctuaries and conservation area; Semi-arid, mountainous and Himalayan regions; Flood-prone and other dangerous areas; Residential areas, school and hospital areas; and Areas that are main sources of public water supply.

All road development projects require the conduct of either an IEE or EIA study, depending on road classes, road length and project costs as shown Table 16.

The project is a construction of countermeasure against landslide for Sindhuli Road or just rehabilitation of national highways. According to Table 16 above, the project falls in the category of IEE. Furthermore, from the reviews of requirements by the abovementioned international agencies, the project also needs to conduct an EA at the IEE level.

For projects requiring an IEE study, the proponent should start by preparing the terms of reference (ToR) following the format specified in Schedule 3 of EPR and submit it to the concerned ministry through the concerned department. Figure 5 shows the overall IEE/EIA approval process in accordance with EPR 1997 and its amendments in 1999 and 2008.



Note: EPR = Environmental Protection Rules, 1997 and its amendment in 1999 and 2008

Figure 5 Steps for IEE/EIA Study and Approval in Nepal

(4) Relevant Environmental Organizations and Their Tasks

In Nepal, the Ministry of Environment (MoE) is in charge of environmental control and management for all sector agencies. The MoE has the responsibility to provide adequate environmental and social safeguards in the design and implementation of the strategic road network (SRN). In the case of an EIA study, the approval of the ToR for EIA and the EIA report lies with the MoE.

On the other hand, the concerned ministry has overall responsibility for environmental monitoring of the projects implemented under it. For projects requiring an IEE, the proponent shall prepare the ToR for IEE study and submit it to the concerned ministry through the concerned department. The ministry has the responsibility for the environmental monitoring and final approval of the ToR and IEE report.

The proponent of the project is the DoR under the MoPPW. Accordingly, the DoR will prepare the ToR for the IEE study and IEE report, and submit them to the MoPPW through the Geo-Environment and Social Unit (GESU). The MoPPW will be responsible for the approval of ToR and IEE reports for the project.

6 INTERVIEWS WITH PROJECT-AFFECTED COMMUNITY AND RELATED DDC/OFFICERS

Stakeholder meetings have been planned to be held during the IEE study in order to discuss some environmental issues with local stakeholders and related organizations. The JICA Study Team visited the project site and interviewed some members of the project-affected community and DDC. The interview focused mainly on local opinions and concerns about the project as summarized below:

- Local community has no objection to the project.
- Construction activities will need temporary use of approximately 9,000 m² of farmland for access road, material/equipment piling and worker camps. Interview with some landowners show that they have no objection to the use of their land with reasonable compensation and recovery after the construction activity.
- A primary school (65 students) is close to the project site. The principal and teachers require minimizing noise pollution during school hours and strengthening safety measures for children, especially during commuting time to school and back to their houses.

7 ENVIRONMENTAL IMPACT IDENTIFICATION AND ASSESSMENT

Preliminary environmental impact identification and assessment is summarized as follows (Refer to Appendix 1: Environmental Check List):

(1) Activities due to the Implementation of the Project

Expected activities due to project implementation are shown in Table 17.

Table 17 Activities Due to Project Implementation

Stage	Activity	Remarks
Planning	1) Land acquisition	

	2) Change of plan for use of lands and local resources	
Construction	1) Engineering works for earthmoving, cutting and filling	
	2) Installation of anchor and related structures	
	3) Bioengineering works (plant and vegetation)	
	4) Installation of stockpiling and worker's camps, etc.	
	5) Operation of construction equipment, machines and vehicles	
Operation	Not eligible	

(2) Scoping of Possible Adverse Environmental Impacts

The adverse environmental and social impacts due to project implementation are identified, predicted and evaluated with rating for 31 items of social environment, natural environment and environmental pollution according to the scoping procedure of the JICA Guidelines for Environmental and Social Considerations as well as in consideration of the project features. The result of environmental scoping is summarized in Table 18.

Table 18 Scoping of Potential Adverse Environmental Impacts (During Planning/Construction)

No.	Potential Impact	Rating	Description of Impact
Pollution			
1	Air pollution	B-	Dusts and gases are anticipated during construction.
2	Water pollution	B-	Petroleum and hydraulic fluid spills from heavy equipment might occur and cause water pollution.
3	Spoils and waste	B-	Excavation materials will be used as fill material and the other wastes will be disposed of at the designated place.
4	Soil contamination	C-	Petroleum and hydraulic fluid spills and leaks from heavy equipment might cause soil contamination on farmlands.
5	Noise and vibration	B-	Noise and vibration will be expected due to the use of machines and equipment for the construction activity.
6	Ground subsidence	D	No ground subsidence effect is expected at the project area.
7	Offensive odor	D	No offensive odor effect is expected at the project area.
8	Bottom sediment	D	No bottom sediment effect is expected at the project area.
Natural Environment			
9	Topography/geology	B-	Small-scale topographical reformation or alteration will be required due to realignment and subsequent excavation.
10	Slope stability	A+	The landslides will be stabilized, and all excavation slopes will be protected with appropriate structures.
11	Soil erosion	C-	Excavation/embankment works might cause soil erosion.
12	Hydrological situation	D	No hydrological situation effect is anticipated at the proposed construction site (material source from riverbed).
13	Groundwater	D	Adverse impacts might be very small due to anchor installation.
14	Nature preserve	D	No natural preserves exist within the project area.
15	Ecosystem	D	No ecosystems exist within the project area.
Socio-economic Environment			
16	Involuntary resettlement	D	No involuntary resettlements are expected.
17	Poor people and groups	D	No poor people exist at the project area.
18	Ethnic and indigenous people	D	Ethnic people exist at the project area. However, adverse impacts of the project to the ethnic people may be expected to be very minimal.
19	Local economy such as employment and livelihood	C-	Construction activity might create some temporary traffic blockage and affect economic activities.
20	Land use and utilization of local resources	B-	Private lands will be temporarily used for the access road, stockpiling, and workers' camp.
21	Use of and right for water	C-	Some natural springs at the project area are the major source of drinking water for local people. No water right exists at the project area.

No.	Potential Impact	Rating	Description of Impact
22	Existing social infrastructure and services	C-	The removal of existing water supply pipe will be required. The restriction and control of existing traffic may be temporarily anticipated.
23	Maldistribution of benefit and damage	D	Adverse impacts may be very small.
24	Local conflict of interest	D	No local conflict of interest exists at the project area.
25	Cultural heritage	D	Bhadrakali Temple at Sta. 17+000 is close to the project area, but the adverse impacts to the temple may be expected to be very small.
26	Landscape	D	Adverse impacts may be minimal due to small-scale earthwork.
27	Labor environment	C-	Defective management of safety and health for workers may be expected during construction activity.
28	Sanitation	D	No sanitation problem exists at the project area.
29	Hazards (risks)	C-	Rockfall may be expected to occur around the upper slope.
Others			
30	Accidents	B-	Construction activity and temporary traffic blockage may cause traffic accidents.
31	Global warming	D	Adverse impacts may be small.
Overall Rating		B-	It is necessary to give landowners compensation and recovery prior to construction. Moreover, mitigation measures against traffic safety, noise, dust and vibration should be taken.

Rating: A+/- = Significant positive/negative impact is expected, B+/- = Positive/negative impact is expected to some extent, C+/- = Extent of positive/negative impact is unknown or may be small at this stage, and D = No impact is expected.

As a result, one item is categorized as A+, seven items are categorized as B-, and seven items as C-. The others are categorized as D. Accordingly, the implementation of the project will be expected to contribute positive environmental effects considerably but to some extent cause negative environmental impacts.

8 MITIGATION MEASURES

The following assumed items were recommended and discussed concerning avoidance and mitigation measures.

Table 19 Mitigation Measures

No.	Potential Impact	Rating	Conceivable Mitigation Measures
Pollution			
1	Air pollution	B-	<u>A. Construction Stage:</u> a) Periodical watering around the implementation area will be carried out to prevent blowing of dust.
2	Water pollution	B-	<u>A. Construction Stage:</u> a) Provision by proper construction plan and management.
3	Spoils and waste	B-	<u>A. Plan and Design Stage:</u> a) Excavated material is planned to be reused for filling purpose. <u>B. Construction Stage:</u> a) The wastes will be disposed off at the dedicated places.
4	Soil contamination	C-	<u>A. Construction Stage:</u> a) Provision by suitable planning and management of project implementation.
5	Noise and vibration	B-	<u>A. Plan and Design Stage:</u> a) Machines/equipment of adequate capacity and low noise/vibration are planned to be used for each activity. <u>B. Construction Stage:</u> a) Installation of soundproof wall, and b) Limiting the operation time during holidays, local event festivals, etc.
Natural Environment			

No.	Potential Impact	Rating	Conceivable Mitigation Measures
6	Topography/geology	B-	<u>A. Plan and Design Stage:</u> a) Cutting and filling slopes are planned/designed to minimize the changes in topography, and b) Only approved material and sources will be used for embankment and crushed aggregate.
7	Soil erosion	C-	<u>A. Plan and Design Stage:</u> a) Proper slope protection works are provided. <u>B. Construction Stage:</u> a) Limiting and controlling progress of earthworks during rainfalls.
Socio-economic Environment			
8	Local economy such as employment and livelihood	C-	<u>A. Construction Stage:</u> a) At the beginning of project implementation, provide adequate information to bus companies and relevant local organizations, b) Provide adequate compensation for landowners, and c) Give local residents a chance to participate in the construction work.
9	Land use and utilization of local resources	B-	<u>A. Plan and Design Stage:</u> a) Prepare construction plan to limit the use of private lands. <u>B. Construction Stage:</u> a) Provide adequate compensation for landowners, and b) Restore to the original status after construction.
10	Use of and right for water	C-	<u>A. Construction Stage:</u> a) Periodical check for amount of water use, and b) Proper compensation to local community.
11	Existing social infrastructure and services	C-	<u>A. Construction Stage:</u> a) Move the water supply pipe at the beginning of project implementation.
12	Labor environment	C-	<u>A. Construction Stage:</u> a) Provide proper construction plan and management to consider the health, safety, and security of the workers for the implementation of the project.
13	Hazards (risks)	C-	<u>A. Construction Stage:</u> a) Periodical inspection of upper slopes, b) Helmet use, and c) Installation of rockfall protection net, if necessary.
Others			
14	Accidents	B-	<u>A. Construction Stage:</u> a) Construction work signs and traffic controller will be provided accordingly, and b) Consideration to the primary school nearby should be given.

Rating: B- = Negative impact is expected to some extent, C- = Extent of negative impact is unknown or may be small at this stage.

9 ENVIRONMENTAL MONITORING (DURING CONSTRUCTION PHASE)

Environmental monitoring will be implemented to provide a basis for logical comparison of the predicted and actual impacts due to project implementation, to further identify any unpredicted impacts, and to implement necessary measures to minimize the environmental impacts of the project.

The GESU under the DoR has integrated environmental aspects in the road development and maintenance project. The GESU will be responsible for the implementation of the environmental monitoring of the project. The monitoring plan is tentatively proposed and given in the following table. Moreover, monitoring result shall be reported in the prescribed format which will be prepared by GESU (Refer to Appendix 2 Monitoring Form) .

Table 20 Monitoring Plan

No.	Potential Impact	Rating	Monitoring			
			Parameter	Frequency	Method	Responsibility
Pollution						
1	Air pollution	B-	Dust, odors	Once a month	Observation	GESU
2	Water pollution	B-	pH, turbidity	Once a month	Measuring	GESU

No.	Potential Impact	Rating	Monitoring			
			Parameter	Frequency	Method	Responsibility
					and inspection	
3	Spoils and waste	B-	Construction spoil, waste, etc.	Once a month	Drawings and inspection	GESU/Project
4	Soil contamination	C-	Dust, hazardous materials and oils	Once a month	Inspection and hearing	GESU
5	Noise and vibration	B-	Sound source	Once a month	Observation and hearing	GESU/Project
Natural Environment						
6	Topography/geology	B-	Land alteration	Once a month	Drawings and observation	GESU
7	Soil erosion	C-	Collapse and soil loss	Once a month	Drawings and observation	GESU
Socio-economic Environment						
8	Local economy such as employment and livelihood	C-	Compensation, and traffic blockage	Once in six months	Hearing	GESU
9	Land use and utilization of local resources	B-	Land use area	Once a month	Drawings and observation	GESU
10	Use of and right for water	C-	Natural springs	Once a month	Hearing	GESU
11	Existing social infrastructure and services	C-	Shifting of water supply pipe	Once a month	Hearing and inspection	GESU
12	Labor environment	C-	Holidays and insurance	Once a month	Hearing	GESU
13	Hazards (risks)	C-	Rockfall and slope collapse	Once a month	Inspection	GESU/Project
Others						
14	Accidents	B-	Accidents by vehicle and due to construction	Once a month	Hearing and inspection	GESU/Project

Rating: B- = Negative impact is expected to some extent, C- = Extent of negative impact is unknown or may be small at this stage.

Appendix 1 Environmental Check List

Environmental Check List(1) Permits and Public Explanation

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) IEE and Environmental Permits	<p>(a) Have IEE reports been already prepared in the official process?</p> <p>(b) Have IEE reports been approved by the authorities of the Nepalese government?</p> <p>(c) Have IEE reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?</p> <p>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host Nepalese government?</p>	<p>(a) N (b) N (c) N (d) N</p>	<p>(a) IEE is being carried out by DoR which will be completed in April 2012</p> <p>(b) IEE reports will be submitted to MoPPW in April for approval.</p> <p>(c) It is expected that the report will be unconditionally approved.</p> <p>(d) Required environmental permits will be obtained in accordance to the laws, regulations of Nepal and IEE recommendation.</p>
(2) Explanation to the Local Stakeholders	<p>(a) Have contents of the project and the potential impacts been adequately explained to the local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the local stakeholders?</p> <p>(b) Have the comments from the stakeholders (such as local residents) been reflected in the project design?</p>	<p>(a) N (b) N</p>	<p>(a) Contents of the project will be explained to the local stakeholders in the process of IEE.</p> <p>(b) Comments and requirements from the stakeholders will be introduced to the project design and execution.</p>
(3) Examination of Alternatives	<p>(a) Have alternative plans of the project been examined with social and environmental considerations?</p>	<p>(a) Y</p>	<p>Alternative plan has been studied in the preparatory study implemented by JICA.</p>

Environmental Check List(2) Pollution Control

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Air Quality	<p>(a) Is there a possibility that air pollutants emitted from project-related sources such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken?</p> <p>(b) If air quality already exceeds the country's standards near the route, is there a possibility that the project will make air pollution worse?</p>	<p>(a) Y (b) N</p>	<p>(a) Dust and gas are anticipated during construction.</p> <p>(b) Existing air quality is clean and good. Periodical watering around the project area will be carried out to reduce blowing of dust.</p>
(2) Water Quality	<p>(a) Is there a possibility that soil runoff from bare lands resulting from earthmoving activities, such as cutting and filling, will cause water</p>	<p>(a) Y (b) Y</p>	<p>(a) Petroleum and hydraulic fluid spills from heavy equipment might occur and cause water pollution during construction.</p>

	<p>quality degradation in the downstream water areas?</p> <p>(b) Is there a possibility that the project will contaminate water sources such as well water?</p>		<p>(b) Petroleum and hydraulic fluid spills from heavy equipment will be minimized by careful construction management.</p>
(3) Noise and Vibration	<p>(a) Do noise and vibrations from the vehicle comply with the country's standards?</p> <p>(b) Do low frequency sound from the vehicle comply with the country's standards?</p>	<p>(a) Y (b) Y</p>	<p>(a) Noise and vibration generated by heavy machines and equipment are expected to comply with the Nepalese Standards.</p> <p>(b) Low frequency sound from machines/equipment is expected to comply with the Nepalese Standards.</p>

Environmental Check List(3) Natural Environment

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	No issues on protected area.
(2) Ecosystem	<p>(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats, e.g., coral reefs, mangroves, or tidal flats?</p> <p>(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?</p> <p>(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?</p> <p>(c) Are adequate protection measures taken to prevent impacts such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?</p> <p>(d) Is there a possibility that the installation of access roads will cause impacts such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?</p>	<p>(a) N (b) N (c) N (d) N</p>	<p>(a) and (b) No issues on ecosystem in the project site.</p> <p>(c) Adequate protection measures will be taken in the construction stage to prevent impacts such as disruption of migration routes, habitat fragmentation, and traffic accidents of wildlife and livestock.</p> <p>(d) There is no possibility that installation of access roads will cause impacts such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems. Access road will be constructed in a farmland of millet which will be given reasonable compensation by DoR and restored after completion of the project.</p>
(3) Hydrology	(a) Is there a possibility that the alteration of topographic features and installation of structures such as tunnels will adversely affect	(a) N	No issues on hydrology in the project area.

	surface water and groundwater flows?		
(4) Topography and Geology	<p>(a) Are there unstable slopes that may cause landslides or slope failure? Are adequate measures considered to prevent landslide or slope failure where needed?</p> <p>(b) Is there a possibility that civil works such as cutting and filling will cause slope failures or landslides?</p> <p>(c) Is there a possibility that soil runoff will result from cut and fill area?</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) Y</p>	<p>(a) Many unstable slopes are developing in the project site which will be stabilized by the countermeasures implemented in the project.</p> <p>(b) Safe construction is planned, and cutting and filling works will be implemented safely by careful construction management.</p> <p>(c) Some amount of soil runoff during construction stage will be minimized by careful construction.</p>

Environmental Check List(4) Social Environment

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Resettlement	<p>(a) Is involuntary resettlement being caused by project implementation? If yes, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is there land use and use of local resources? Is there adequate explanation on land use to landowners and will reasonable compensation be given?</p>	<p>(a) N</p> <p>(b) Y</p>	<p>(a) No involuntary resettlement is caused by the project.</p> <p>(b) Private field will be used for temporary road which will be given reasonable compensation. After completion of the project, the used land will be restored.</p>
(2) Living and Livelihood	<p>(a) Is there a possibility that the project will affect the existing means of transportation and the associated workers?</p> <p>(b) Is there a possibility that the project will cause significant impacts such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(c) Is there any possibility that the project will adversely affect the living conditions of the inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(d) Is there any possibility that diseases, including infectious diseases such as HIV, will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(e) Is there any possibility that the project will adversely affect road traffic in the surrounding areas,</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) Y</p> <p>(f) Y</p> <p>(g) N</p>	<p>(a) Traffic regulation during construction will disturb the traffic which will be minimized by careful construction management.</p> <p>(b) There is no significant impact on land use and local sources.</p> <p>(c) There is no possibility that the project will adversely affect the living conditions of the inhabitants</p> <p>(d) Advance safety and healthcare directive and management are carried out.</p> <p>(e) Traffic regulation during construction will disturb the traffic, which will be minimized by careful construction management.</p> <p>(f) Same as above.</p> <p>(g) There is no possibility that facilities generated by the project will cause sun shading and radio interference.</p>

	e.g., increase of traffic congestion and traffic accidents? (f) Is there any possibility that the project will disturb the movement of inhabitants? (g) Is there any possibility that the facilities generated by the project will cause sun shading and radio interference?		
(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no heritage in the project area.
(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Cut and fill slope will be treated by suitable vegetation and protection work.
(5) Ethnic Minorities and Indigenous People	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous people? (b) Are all of the rights of ethnic minorities and indigenous people, in relation to land and resources, respected?	(a) Y (b) Y	(a) and (b) No issues on ethnic minorities and indigenous people.
(6) Working Conditions	(a) Does the project observe Nepalese labor laws and regulations? (b) Are tangible safety considerations in place for individuals involved in the project such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project such as the establishment of a safety and health program, safety training (including traffic safety and public health) for workers, etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project will not violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) The project will be implemented observing Nepalese labor laws and regulations strictly. (b) The project will be implemented under advanced safety management. (c) Advanced safety management plan will be established which will be strictly applied during project implementation. (d) Security management plan will be established which involves local police.

Environmental Check List(5) Others

Environmental Item	Main Check Items	Yes: Y No: N	Methods of Environmental Considerations
(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts	(a) Y (b) Y	(a), (b), (c),

	<p>during construction, e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce the impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce the impacts?</p>	(c) Y	Adequate measures and considerations will be taken for any kind of environmental impact such as pollution to natural and social environment.
(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) An Environmental Monitoring Unit (EMU) will be established by DoR which will be responsible for the execution of the monitoring program.</p> <p>(b) Major items of monitoring include “permit and public explanation”, “pollution control”, and “social environment”</p> <p>(c) DoR will establish an EMU.</p> <p>(d) The monitoring program by DoR will include the monitoring method and the regulations to be followed.</p>

Appendix 2 Monitoring Form (Example)

Monitoring Form

As environmental review indicates the need for monitoring the items shown below, the Ministry of Public Works should undertake monitoring for necessary items and report to JICA monthly.

1 Permit and Public Explanation

Table 1.1 Monitoring on Permit and Public Explanation

Monitoring Item	Date	Monitoring Result
Implementation of IEE		
Approval of IEE		
Explanation of project		

2 Pollution Control

2.1 Air Quality

Table 2.1 Monitoring on Air Quality

Monitoring Item	Date	Monitoring Result
Visual observation on air quality		

2.2 Water Quality

Table 2.2 Monitoring on Water Quality

Measurement Item	Unit	Measured Value	Nepalese Standard	Remarks
PH	mg/L			
BOD	mg/L			
SS	mg/L			
DO	mg/L			
Bacillus Coli	MPN/100 mL			

2.3 Noise/Vibration (measurement point: the nearest house from the site)

Table 2.3 Monitoring on Noise/Vibration

Measurement Item	Unit	Measured Value	Nepalese Standard	Remarks
Noise level	mg/L	dB		
Vibration level	mg/L	dB		

3. Natural Environment

- No issues on natural environment-







4. Social Environment

Table 1.1 Monitoring on Permit and Public Explanation

Monitoring Item	Date	Monitoring Result
Agreement on private lands		
Compliance on labor laws		

Compliance on safety system		
Compliance on health program		
Situation of security guard		

Appendix-5.2
Environmental Photographs

	
<p>Whole view of the project site</p>	<p>Dhungre Bhanjyang village around the project site</p>
	
<p>Local Name: Sal, Scientific Name: Shorea Robusta Shorea Robusta distributes mainly in the forest area</p>	<p>Local Name: Chilaune, Scientific Name: Schima wallichii Schima wallichii mainly growing in the forest area</p>
	
<p>Local Name: Utis, Scientific Name: Alnus nepalensis Silk tree (used as fuel material)</p>	<p>Local Name: Kutmiro, Scientific Name: Listea Polyanthra Listea tree distributed around the farm lands</p>



The planned site for stockpiling (farm land)



The planned site for construction access road (farm and denuded lands)



Water supply pipe within the location of the planned anchor installation (need to be removed)



Tap of drinking water for Dhungre Bhanjyang village



Traveling bus on the Sinduuli road (several times per day)



Sand mining location for aggregate materials (Kamalaka riverbed material)



Interview with the Shree Prathamik Primary School






Sinduuli Gadhi (a Monument built about 240 years age)



Bhadrakali Temple close to the project site




Appendix-5.3
Construction photographs

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 1</p> <p>DATE : 06 October 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 16+106-16+200</p>
	<p>Photo No. 2</p> <p>DATE : 06 October 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+100-17+000</p>
	<p>Photo No. 3</p> <p>DATE : 06 October 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+300-18+400</p>

A5-3-1

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 1</p> <p>DATE : 19 November 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 12+082-15+000</p>
	<p>Photo No. 2</p> <p>DATE : 19 November 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 16+025-16+200</p>
	<p>Photo No. 3</p> <p>DATE : 19 November 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+400-18+000</p>

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 10</p> <p>DATE : 15 December 2002</p> <p>DESCRIPTION : High Embankment - Center Drainage UD-3 Foundation Bedding Inspection by the Consultant</p> <p>LOCATION : Sta. 12+180</p>
	<p>Photo No. 11</p> <p>DATE : 08 December 2002</p> <p>DESCRIPTION : Gabion Wall - Base Foundation Inspection by the Consultant</p> <p>LOCATION : Sta. 06+794-16+812</p>
	<p>Photo No. 12</p> <p>DATE : 19 December 2002</p> <p>DESCRIPTION : Monthly Safety Patrolling by NK and HTV</p> <p>LOCATION : Sta. 17+180</p>

AS-3-2

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 4</p> <p>DATE : 16 December 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+350-18+500</p>
	<p>Photo No. 5</p> <p>DATE : 15 December 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 19+400-19+500</p>
	<p>Photo No. 6</p> <p>DATE : 15 December 2002</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 20+000-20+100</p>

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 13
DATE :
 29 December 2002
DESCRIPTION :
 Gabion Wall - Foundation
 Bedding Inspection by the
 Consultant
LOCATION :
 Sta. 17+608-17+620



Photo No. 14
DATE :
 12 January 2003
DESCRIPTION :
 Reinforced Earth Wall - B
 Foundation Bedding Inspection
 by the Consultant
LOCATION :
 Sta. 17+549-17+558



Photo No. 15
DATE :
 20 January 2003
DESCRIPTION :
 Reinforced Earth Wall - B
 Anchor Pull Out Strength
 Test Inspection by the
 Consultant
LOCATION :
 Sta. 17+529-17+533

A5-3-3

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 4
DATE :
 19 November 2002
DESCRIPTION :
 General View of Road
 Construction
LOCATION :
 Sta. 17+400-18+400



Photo No. 5
DATE :
 18 November 2002
DESCRIPTION :
 General View of Road
 Construction
LOCATION :
 Sta. 19+300-19+400



Photo No. 6
DATE :
 18 November 2002
DESCRIPTION :
 General View of Road
 Construction
LOCATION :
 Sta. 19+900-20+900

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 16
DATE :
 09 January 2003
DESCRIPTION :
 Reinforced Earth Wall - B
 3rd Layer Compaction by
 1 ton Roller
LOCATION :
 Sta. 13+048-13+072



Photo No. 17
DATE :
 20 January 2003
DESCRIPTION :
 Reinforced Earth Wall - B
 7th Layer Construction
LOCATION :
 Sta. 13+048-13+072

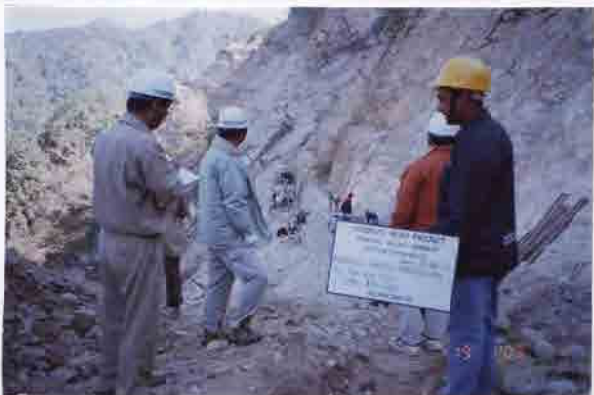


Photo No. 18
DATE :
 19 January 2003
DESCRIPTION :
 Monthly Safety Patrolling
 by NK and HTJV
LOCATION :
 Sta. 17+500

A5-3-4

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 16
DATE :
 05 February 2003
DESCRIPTION :
 Monthly Safety Patrolling
 by DOR, NK and HT-JV
LOCATION :
 Sta. 17+500



Photo No. 17
DATE :
 04 February 2003
DESCRIPTION :
 Monthly Safety Instruction
 Meeting at Sta. 14+300
LOCATION :
 Sta. 14+300

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 13
DATE :
 18 February 2003
DESCRIPTION :
 Construction of Reinforced Earth Wall
LOCATION :
 Sta. 17+521-17+582



Photo No. 14
DATE :
 14 February 2003
DESCRIPTION :
 Reinforced Earth Wall Foundation Inspection by the Consultant
LOCATION :
 Sta. 17+620-17+646



Photo No. 15
DATE :
 05 February 2003
DESCRIPTION :
 Monthly Meeting by DOR, NK and HT-JV
LOCATION :
 HT-JV Site Office Dhungebas

A5-3-5

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 19
DATE :
 05 March 2003
DESCRIPTION :
 Reinforced Earth Wall - B Anchor Pulling Test Inspection by the Consultant
LOCATION :
 Sta. 17+620-17+648



Photo No. 20
DATE :
 06 March 2003
DESCRIPTION :
 Reinforced Earth Wall - A Field Density Inspection by the Consultant
LOCATION :
 Sta. 15+850



Photo No. 21
DATE :
 14 March 2003
DESCRIPTION :
 Road Pavement - Sub-Grade Proof Rolling Inspection by the Consultant
LOCATION :
 Sta. 16+500-17+000

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 7
DATE :
 20 January 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 17+400-18+300



Photo No. 8
DATE :
 20 January 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 17+450-17+600



Photo No. 9
DATE :
 20 January 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 19+950

A5-3-6

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 10
DATE :
 29 March 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 17+500-17+700



Photo No. 11
DATE :
 20 March 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 17+650-17+500



Photo No. 12
DATE :
 29 March 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 18+700-18+600

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 10
DATE :
 18 April 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 17+400-18+300



Photo No. 11
DATE :
 18 April 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 17+500-17+700



Photo No. 12
DATE :
 18 April 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 19+300-19+000

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 13
DATE :
 18 April 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 19+400-19+500



Photo No. 14
DATE :
 18 April 2003
DESCRIPTION :
 General View of Road Construction
LOCATION :
 Sta. 19+550-19+750



Photo No. 15
DATE :
 16 April 2003
DESCRIPTION :
 Reinforced Earth Wall
 1st Layer Panel Setting, Geo
 Grid Laying & Gabion Bedding
 Inspection by the Consultant
LOCATION :
 Sta. 17+706-17+719

AS-3-7

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 19
DATE :
 06 May 2003
DESCRIPTION :
 Gabion Wall Foundation
 Bedding Inspection by the
 Consultant.
LOCATION :
 Sta. 17+738-17+745



Photo No. 20
DATE :
 09 May 2003
DESCRIPTION :
 Reinforced Earth Wall - B
 8th Layer Field Density
 Inspection by the Consultant
LOCATION :
 Sta. 17+706-17+719



Photo No. 21
DATE :
 10 May 2003
DESCRIPTION :
 Construction of Temporary
 Access Road
LOCATION :
 Sta. 18+650-17+850

A5-3-8

PHOTOGRAPHS OF WORKS EXECUTED



Photo No. 10
DATE :
 15 June 2003
DESCRIPTION :
 General View of Road
 Construction
LOCATION :
 Sta. 16+577-16+660





Photo No. 11
DATE :
 15 June 2003
DESCRIPTION :
 General View of Road
 Construction
LOCATION :
 Sta. 16+750-16+700



Photo No. 12
DATE :
 15 June 2003
DESCRIPTION :
 General View of Road
 Construction
LOCATION :
 Sta. 17+400-18+300

PHOTOGRAPHS OF WORKS EXECUTED




	<p>Photo No. 13</p> <p>DATE : 15 June 2003</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+700-17+750</p>
	<p>Photo No. 14</p> <p>DATE : 15 June 2003</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 18+650-18+700</p>
	<p>Photo No. 15</p> <p>DATE : 15 June 2003</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 19+400-19+000</p>

AS-3-9




PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 7</p> <p>DATE : 19 November 2003</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+300-18+600</p>
	<p>Photo No. 8</p> <p>DATE : 19 November 2003</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+950-17+900</p>
	<p>Photo No. 9</p> <p>DATE : 19 November 2003</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 15+000-18+300</p>

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 7</p> <p>DATE : 17 December 2003</p> <p>DESCRIPTION : General View of Road Construction</p>
	<p>Photo No. 8</p> <p>DATE : 18 December 2003</p> <p>DESCRIPTION : General View of Road Construction</p>
	<p>Photo No. 9</p> <p>DATE : 18 December 2003</p> <p>DESCRIPTION : General View of Road Construction</p>

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 25</p> <p>DATE : 25 December 2003</p> <p>DESCRIPTION : Reinforced Earth Wall - "B" Field Density Inspection by the Consultant</p>
	<p>Photo No. 26</p> <p>DATE : 20 January 2004</p> <p>DESCRIPTION : Safety Fence</p>
	<p>Photo No. 27</p> <p>DATE : 18 January 2004</p> <p>DESCRIPTION : Safety Fence (H-Beam Type) Under Construction</p>

PHOTOGRAPHS OF WORKS EXECUTED

	Photo No. 10
	DATE: 20 March 2004
	DESCRIPTION: General View of Road Construction
	LOCATION: Sta. 18+050-18+200

	Photo No. 11
	DATE: 20 March 2004
	DESCRIPTION: General View of Road Construction
	LOCATION: Sta. 18+300-18+500

	Photo No. 12
	DATE: 20 March 2004
	DESCRIPTION: General View of Road Construction
	LOCATION: Sta. 18+600-18+400

PHOTOGRAPHS OF WORKS EXECUTED


	Photo No. 7
	DATE: 14 April 2004
	DESCRIPTION: General View of Road Construction
	LOCATION: Sta. 15+550-15+350

	Photo No. 8
	DATE: 14 April 2004
	DESCRIPTION: General View of Road Construction
	LOCATION: Sta. 16+025-16+200

	Photo No. 9
	DATE: 14 April 2004
	DESCRIPTION: General View of Road Construction
	LOCATION: Sta. 17+300-18+000

A5-3-11

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 7</p> <p>DATE : 16 August 2004</p> <p>DESCRIPTION : General View of Road Construction</p>
	<p>Photo No. 8</p> <p>DATE : 16 August 2004</p> <p>DESCRIPTION : General View of Road Construction</p>
	<p>Photo No. 9</p> <p>DATE : 16 August 2004</p> <p>DESCRIPTION : General View of Road Construction</p>




A5-3-12

PHOTOGRAPHS OF WORKS EXECUTED

	<p>Photo No. 10</p> <p>DATE : 16 August 2004</p> <p>DESCRIPTION : General View of Road Construction</p>
	<p>Photo No. 11</p> <p>DATE : 16 August 2004</p> <p>DESCRIPTION : General View of Road Construction</p>
	<p>Photo No. 12</p> <p>DATE : 16 August 2004</p> <p>DESCRIPTION : General View of Road Construction</p>

PHOTOGRAPHS OF WORKS EXECUTED

A5-3-13

	<p>Photo No. 7</p> <p>DATE : 17 February 2004</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 15+380-15+540</p>
	<p>Photo No. 8</p> <p>DATE : 16 February 2004</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 16+400-16+700</p>
	<p>Photo No. 9</p> <p>DATE : 16 February 2004</p> <p>DESCRIPTION : General View of Road Construction</p> <p>LOCATION : Sta. 17+300-18+500</p>

Appendix-5.4
Results of Geophysical Exploration

1. Investigation Quantity

Investigation quantity is shown in Table 1.1.

Table 1.1 List of Investigation Quantity

Surface Wave Prospecting		
Line	Length (m)	Remarks
1	24	Sta. 17+600 Slope crossing direction Survey interval 2 m
2	22	Sta. 17+600 Slope crossing direction Survey interval 2 m
3	22	Sta. 17+600 Slope crossing direction Survey interval 2 m
4	26	Sta. 17+600 Slope crossing direction Survey interval 2 m
5	22	Sta. 17+600 Slope crossing direction Survey interval 2 m
6	17	Sta. 17+600 Slope crossing direction Survey interval 1 m
7	18	Sta. 17+600 Slope crossing direction Survey interval 2 m
Sum	151	

Seismic Prospecting		
Line	Length (m)	Remarks
B-2	150	Sta. 17+600 Vertical section direction Survey interval 5 m
1	24	Sta. 17+600 Slope crossing direction Survey interval 2 m
2	22	Sta. 17+600 Slope crossing direction Survey interval 2 m
3	22	Sta. 17+600 Slope crossing direction Survey interval 2 m
4	26	Sta. 17+600 Slope crossing direction Survey interval 2 m
5	22	Sta. 17+600 Slope crossing direction Survey interval 2 m
6	17	Sta. 17+600 Slope crossing direction Survey interval 1 m
7	18	Sta. 17+600 Slope crossing direction Survey interval 2 m
C	130	Sta. 18+200 Vertical section direction Survey interval 5 m
C1	75	Sta. 18+200 Crossing direction Survey interval 5 m
C2	75	Sta. 18+200 Crossing direction Survey interval 5 m
C3	35	Sta. 18+200 Crossing direction Survey interval 5m
Sum	616	(Sta. 17+600 301m、 Sta. 18+200 315 m)

2. Surface Wave Prospecting

Surface wave exploration was carried out at 7 Line (151 m) in the slope of Sta. 17+600.

2.1 Outline of Prospecting

The velocity of Rayleigh wave (the surface wave which transmits around the surface of the heterogeneous geological layers) changes according to its frequency. The velocity is faster if the frequency is higher. The S-wave structure of the heterogeneous layers can be interpreted by the velocity of layers.

2.2 Features of Prospecting

- The investigation of S-wave structure at 20 m depth is simple.
- Trigger efficiency is high (Surface wave: 67%, S-wave: 26%, P-wave: 7%).
- The surface wave method can be applied even if the velocity of the shallow layer is faster than the deeper layer.
- The S-wave is well correlated to the N-value.
- It is difficult to be applied in a complicated topographical condition.

2.3 Method of Prospecting

- (a) Setting of receiver: There will be 24 receivers to be installed from the starting point of the survey line with an interval of 2 m.
- (b) Spread: Receivers are connected to a measuring instrument with a takeout cable.
- (c) Triggering and measurement: Triggering is performed at the edges of the spread using a sledgehammer. The triggering shall be performed upon the signal of the operator when wind and traffic noise are minimal.

(d) Movement of triggering point and receivers: Triggering point and receivers are moved by 2 m and repeated.

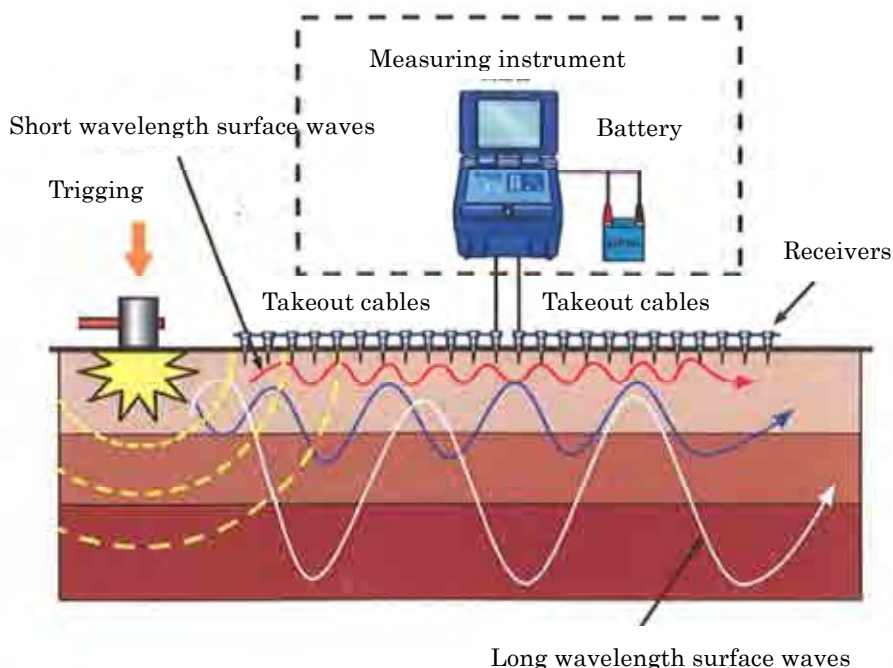


Figure 2.3-1 Exploration Concept Diagram

2.4 Measuring Equipment

Table 2.4-1 shows the list of equipment used for this survey.

Table 2.4-1 List of Equipment for S-Wave Survey and Seismic Survey

Equipment		Specification	Quantity
Measuring instrument	McSEIS-SXWXP	Numbers of Channels: 24 ch, Preamp Gains: 16,64,256,1024 times Frequency band: 2-4600 Hz	1 set
Receivers	Geophone	Natural frequency: 4.5 Hz	24 sets
Takeout cables, etc.		5 m interval cables (S-wave) 2 m interval cables (Seismic) Telephone line (Seismic)	2 sets 2 sets 100 m

2.5 Analysis Result

Good data from the surface wave survey was not obtained. The seismic survey by refraction method was carried out in addition to the surface wave survey. It is considered that the reasons why good data was not obtained are as follows:

- Ups and downs of the topography were too big.
- There were many big stones in the vicinity of the surface.

The dispersion curve reflects the velocity structure and becomes a smooth curve or a straight line. Figure 2.5-1 is a general dispersion curve. The analysis is carried out after cutting noise and high mode plots.

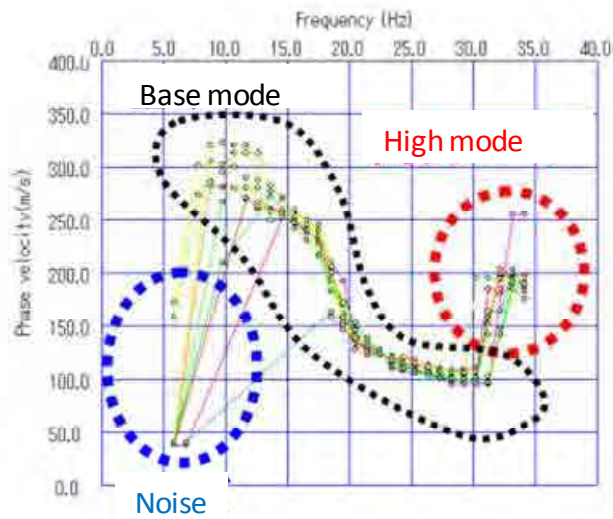


Figure 2.5-1 General Dispersion Curve

Figure 2.5-2 is an on-site dispersion curve and shows an example of the analysis which was able to acquire good data. The dispersion curve that cuts the original dispersion curve and noise does not show a big difference. Also, the curve changes smoothly.

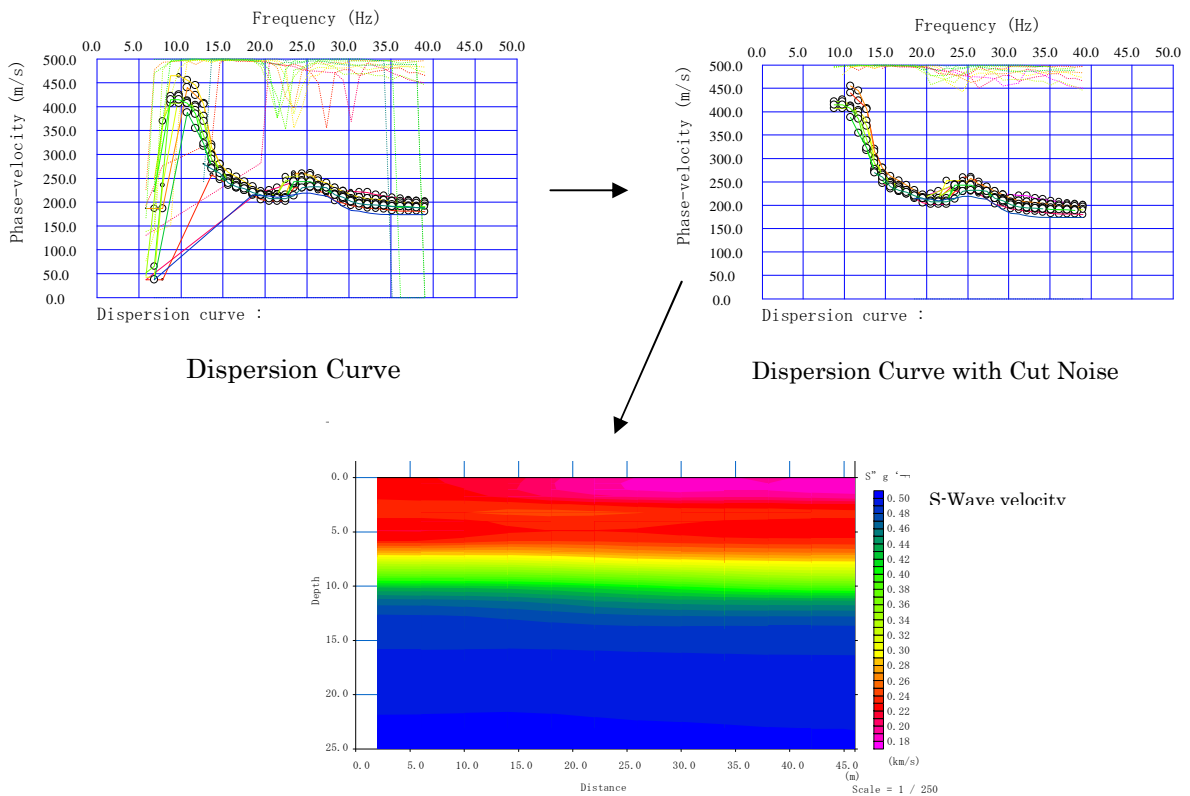


Figure-2.5-2 Analysis Example of Good Data

Figure 2.5-3 is a dispersion curve of Sta. 17+600, 1 line. It is impossible to analyze because there are many noises.

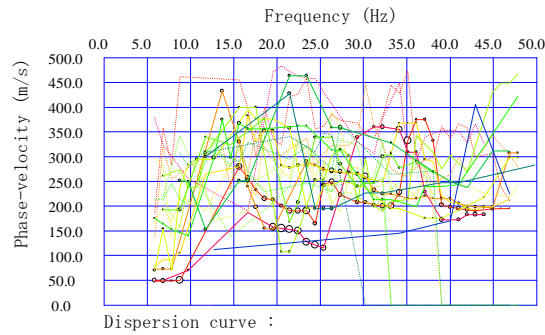


Figure 2.5-3 Sta. 17+600, 1 Line Dispersion Curve

Because there were relatively few noises in 2 line, analysis was possible. Result of analysis is shown in Figure 2.5-4.

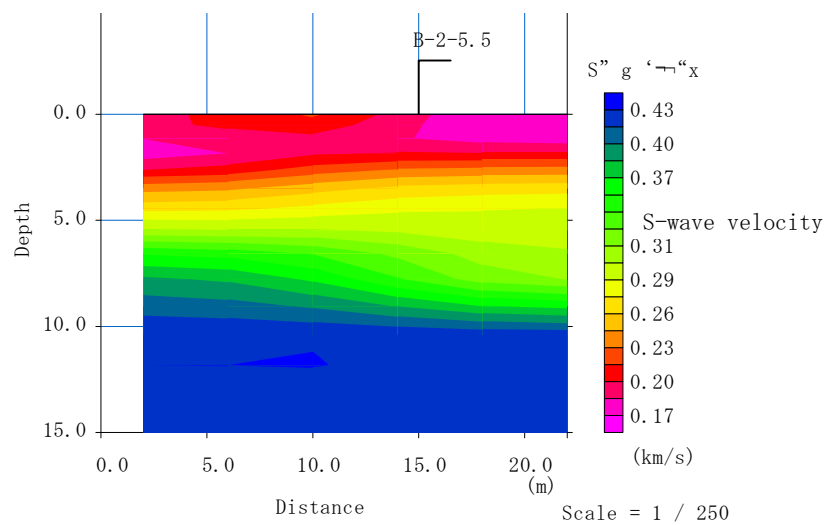


Figure 2.5-4 Surface Wave Analysis Result for 2 Line

Analysis result indicates that weathering rocks exist from a depth of approximately 10 m. The analysis result is similar with the result of the seismic refraction method shown later. Other dispersion waves obtained by the surface wave exploration are shown in Figures 2.5-5 to 2.5.11.

Surface wave prospecting dispersion curve

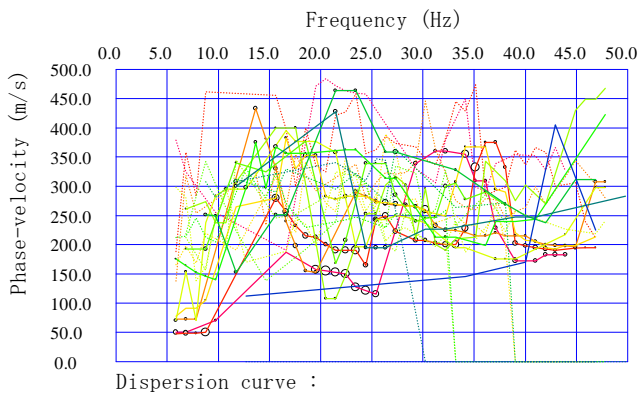


Figure-2.5-5 Dispersion curve 1Line

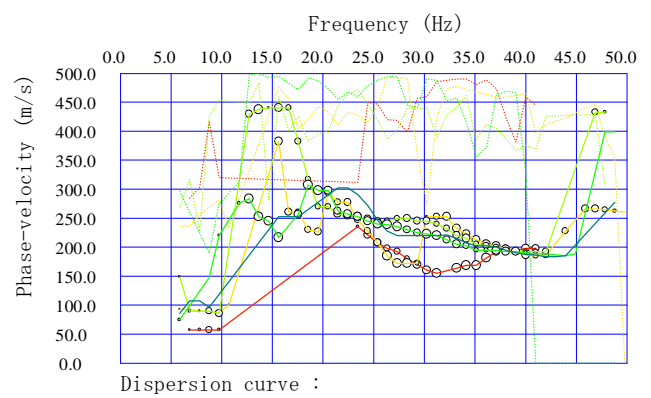


Figure-2.5-6 Dispersion curve 2Line

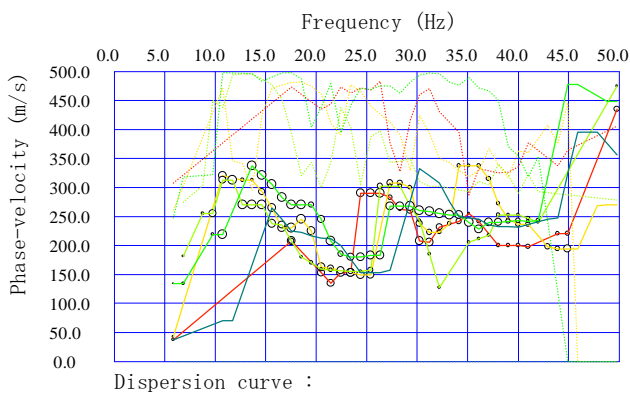


Figure-2.5-7 Dispersion curve 3Line

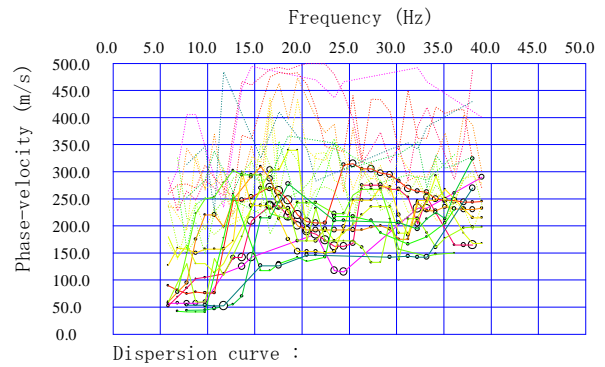


Figure-2.5-8 Dispersion curve 4Line

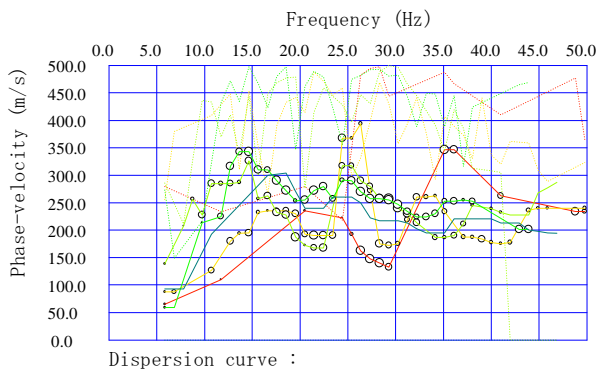


Figure-2.5-9 Dispersion curve 5Line

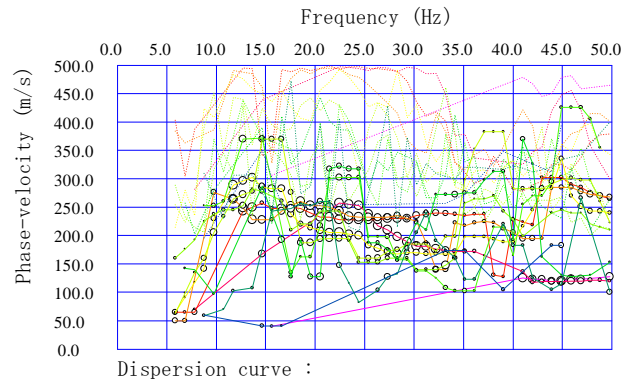


Figure-2.5-10 Dispersion curve 6Line

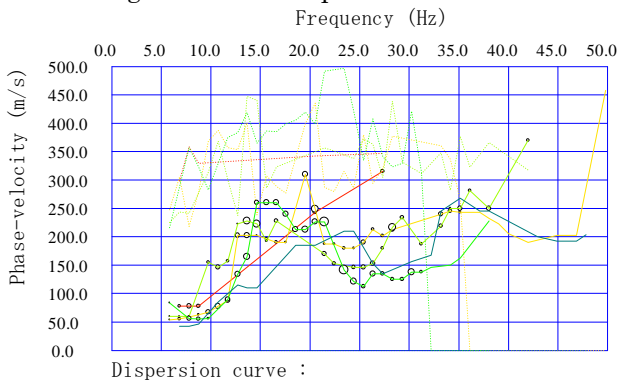


Figure-2.5-11 Dispersion curve 7Line

3. Seismic Prospecting

Seismic prospecting by refraction method was carried out at 8 line (301 m) in Sta. 17+600 and at 4 line (315 m) in Sta. 18+200.

3.1 Outline of Prospecting

The refraction method of seismic prospecting produces artificial seismic waves by blasting or with the use of a large hammer. The seismic wave is refracted at the underground geological boundary and comes back to the surface. This refracted wave (P-wave) is measured by a surface instrument and the underground velocity structure (thickness of geological layer, velocity of seismic wave, etc.) is interpreted.

3.2 Feature of Prospecting

- Elastic wave speed (P-wave) and rippability have an intimate correlation. Therefore, the drillability can be easily judged.
- Elastic wave prospecting is applied in the field of civil engineering, such as the evaluation of in-situ rock and bedrocks. It is also often used to get the important index of an unstable soil mass.
- When the speed of a shallow layer is faster than the speed of a deep layer, elastic prospecting is not applicable.

3.3 Method of Prospecting

- Setting of receiver: There will be 24 receivers to be installed from the starting point of the survey line with an interval of 2.5 m.
- Spread: Receivers are connected to a measuring instrument with a takeout cable.
- Triggering and measurement: Triggering is performed every 10 m using a sledgehammer. The triggering shall be performed upon the signal of the operator when the wind and traffic noise are minimal.
- Acquisition of data: The stacking method shall be employed when the received signal from triggering is small.
- Movement of triggering point and receivers: A new receiver line shall be overlapped with the previous line by more than two receivers at their ends.

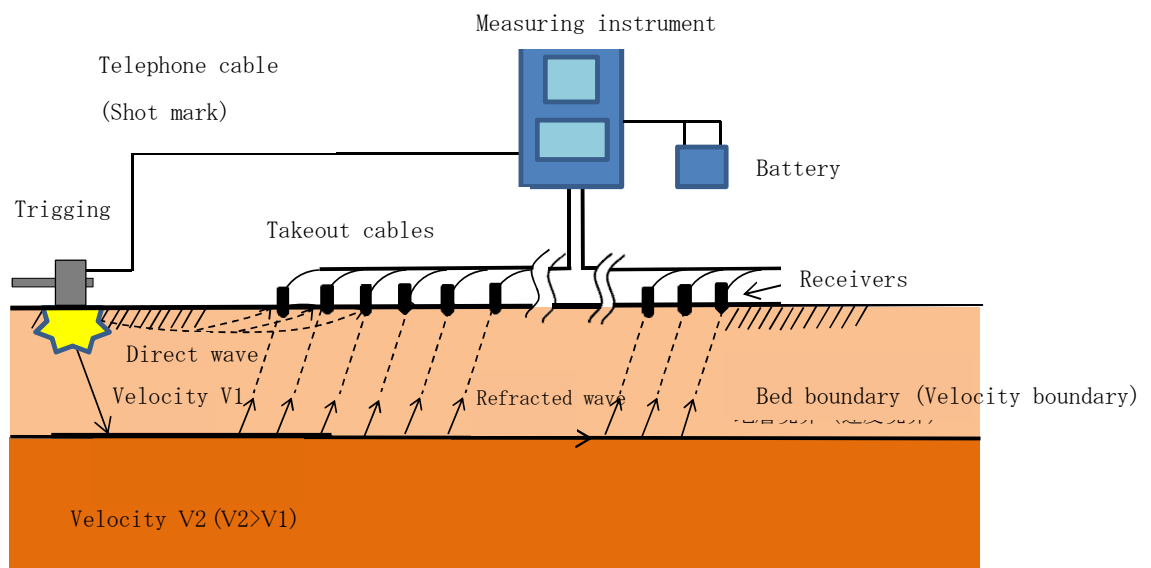


Figure 3-1 Exploration Concept Diagram

3.4 Analysis Result

3.4-1 Elastic Wave Velocity and Geologic Relations

The seismic prospecting analysis result is shown as an analysis cross section. The velocity layer provided by analysis is classified in four laminar structures.

The survey point is classified in Sta. 17+600 of the collapse area and Sta. 18+200 of natural ground. A difference is seen in the geological feature of each velocity layer in both districts.

(1) Sta. 17+600 District

Table 3.4-1 explains the geological feature situation estimated by an elastic wave velocity result offered in this district.

Table 3.4-1 Elastic Wave Velocity and Estimated Geological Feature Situation (Sta. 17+600)

Velocity Layer	Elastic Wave Velocity (km/s)	Geology
First velocity layer	0.4-0.5	Soft gravel soil
Second velocity layer	0.8-1.0	Semi-consolidated gravel soil
Third velocity layer	1.8-2.0	Quartz schist which is weathered
Fourth velocity layer	3.7-3.9	Quartz schist (fresh part)

1) First velocity layer (0.4-0.5 km/s)

This velocity layer is gravel including loose sand.

2) Second velocity layer (0.8-1.0 km/s)

This velocity layer is relatively consolidated compared to the first velocity layer. Also, there is much quantity of gravel.

3) Third velocity layer (1.8-2.0 km/s)

This velocity layer is quartz schist which is weathered.

4) Fourth velocity layer (3.7-3.9 km/s)

This velocity layer is fresh bedrock (quartz schist)

(2) Sta. 18+200 District

Table 3.4-2 explains the geological feature situation estimated by an elastic wave velocity result offered in this district. Because the first velocity layer and second velocity layer are distributed thickly in this district, it was not possible for "hagitori" when analyzed. Therefore, the depth of the second velocity layer is estimated except 120 m from 80 m of the C line. The third velocity layer and fourth velocity layer have estimated depths too (displayed in the dotted line on the analysis cross section).

Table 3.4-2 Elastic Wave Velocity and Estimated Geological Feature Situation (Sta. 18+200)

Velocity Layer	Elastic Wave Velocity (km/s)	Geology
First velocity layer	0.4-0.5	Gravel soil
Second velocity layer	0.9-1.1	Semi-consolidated gravel soil
Third velocity layer	1.4-1.6	Consolidated gravel or bitterly weathered schist layer
Fourth velocity layer	1.8-2.0	Quartz schist which is weathered

1) First velocity layer (0.4-0.5 km/s)

This velocity layer has surface soil and gravel soil (including large gravel).

2) Second velocity layer (0.9-1.1 km/s)

This velocity layer is relatively consolidated compared to the first velocity layer. And there is much quantity of gravel.

3) Third velocity layer (1.4-1.6 km/s)

This velocity layer is consolidated gravel layer and zone of transition to quartz schist which is weathered.

4) Fourth velocity layer (1.8-2.0 km/s)

This velocity layer is quartz schist which is weathered.

3.3-2 Distribution Properties of the Elastic Wave Velocity in Both Districts

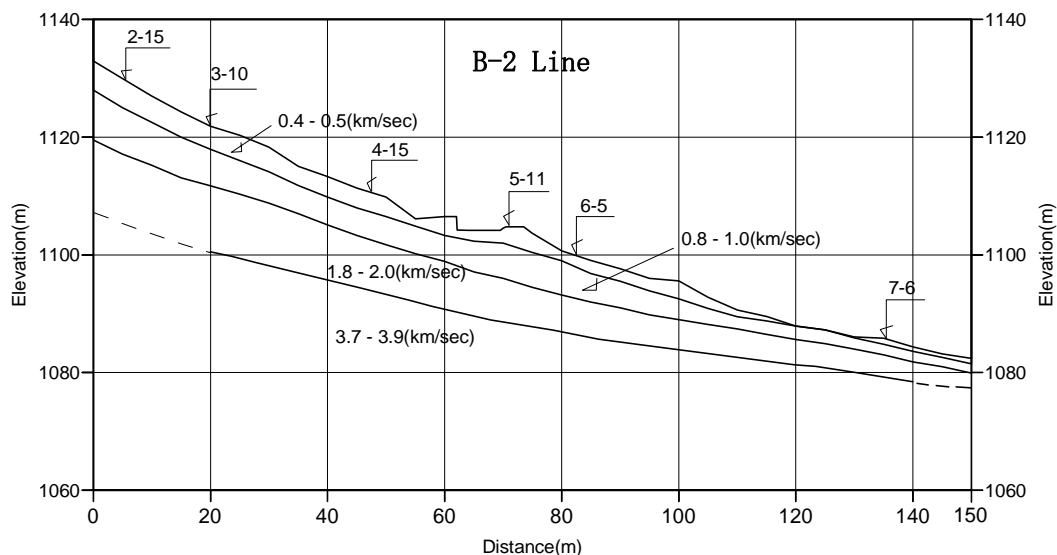
(1) Sta. 17+600

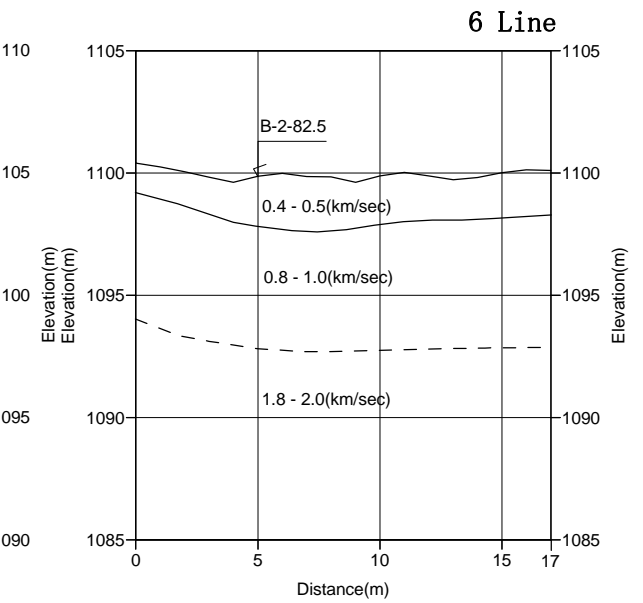
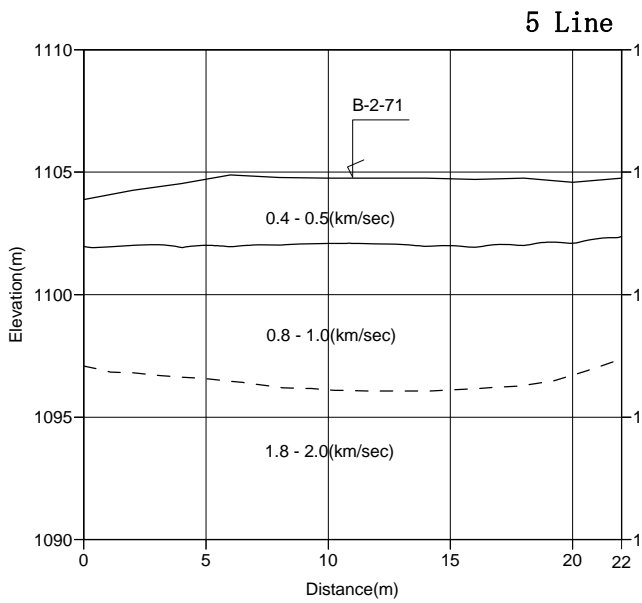
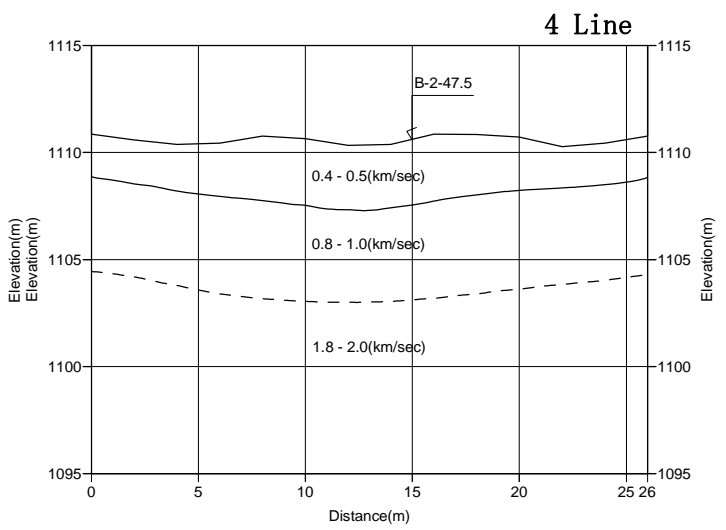
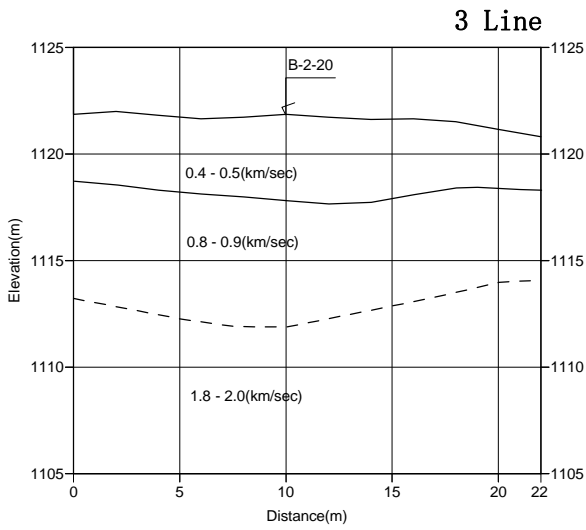
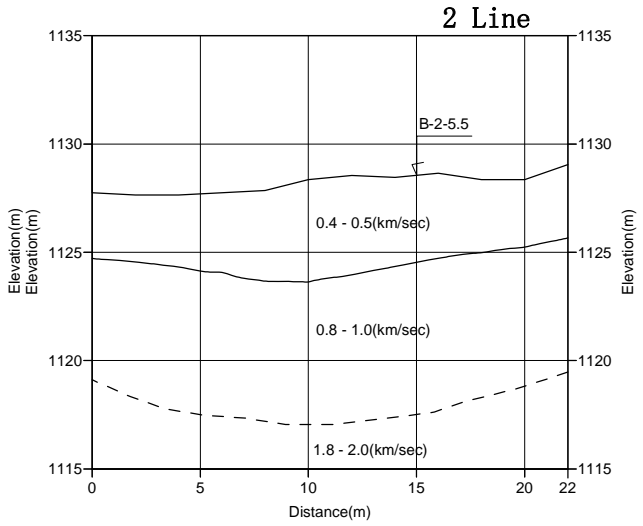
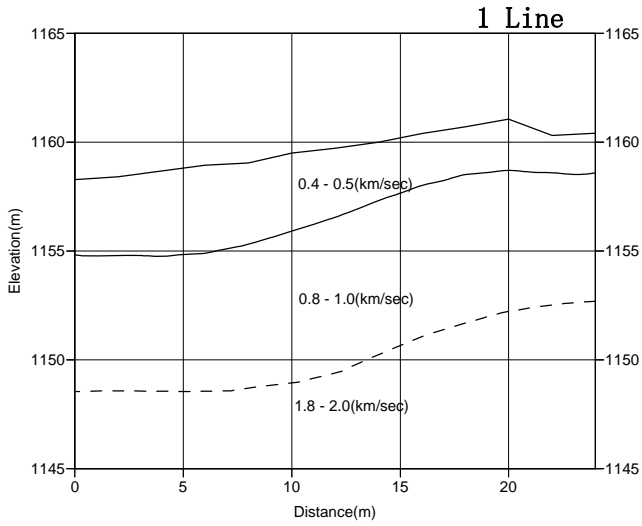
The first velocity layer is approximately 4 m in depth at the starting point of the B-2 line (upper direction of the collapse area). This layer becomes thin as it goes below, and it becomes rare approximately at the 120 m spot. At the starting point, the depth of the weathered rock is approximately 10 m, while on the terminal side, it is approximately 3 m. The 1 line above the starting point of B-2 line has same depth as the 2 line. Because the crossing line has short length, both ends are displayed as estimates. The second velocity layer may become a little thinner at both ends.

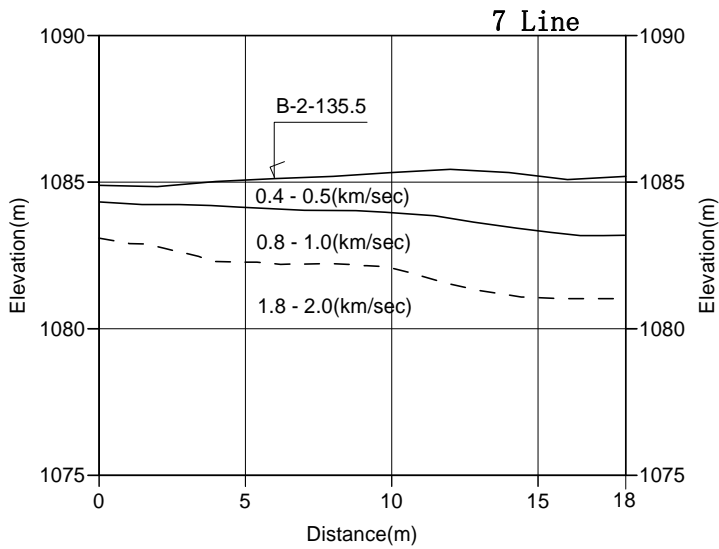
(2) Sta. 18+200

This district has large gravel on the surface. The first velocity layer has a depth of about 8 m around the mountain ridge. The thickness of the second velocity layer is about 12 m. The third velocity layer is regarded as a zone of transition from gravel to weathering rock, and the layer thickness is estimated to be approximately 20 m.

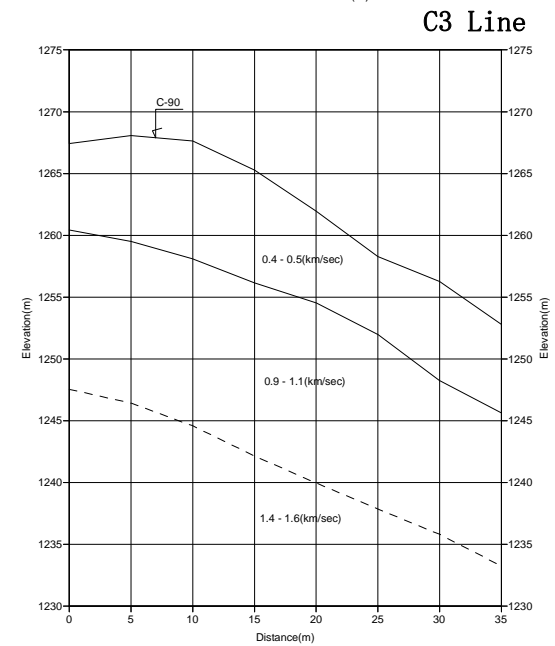
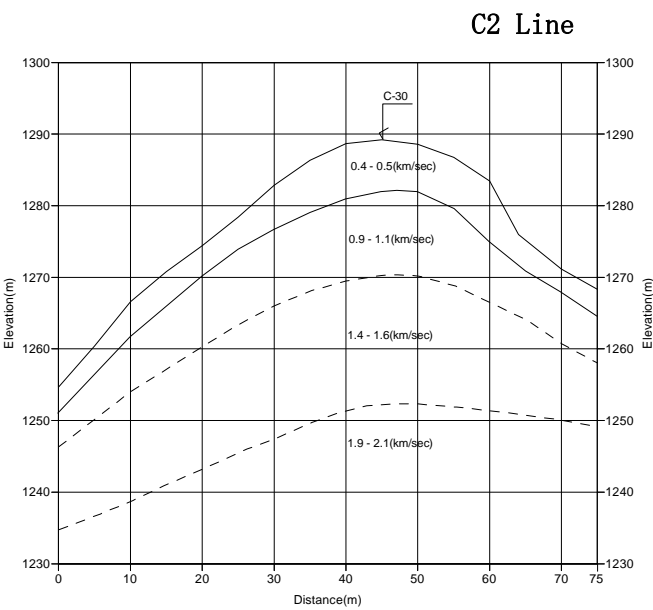
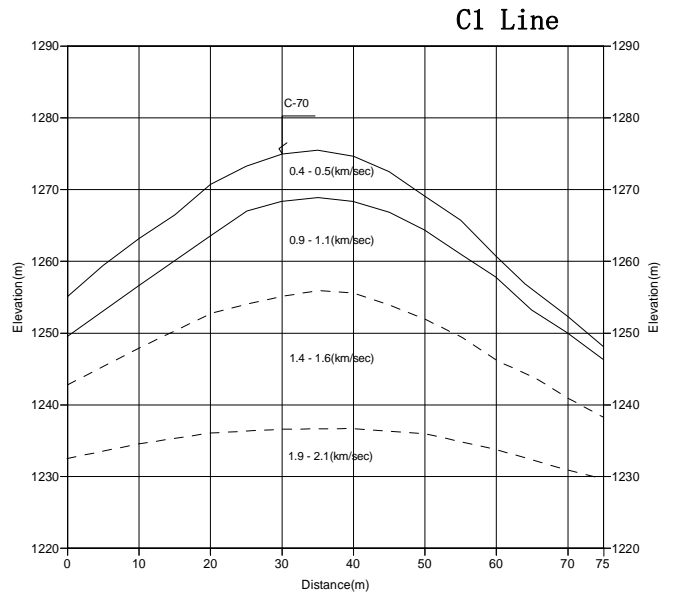
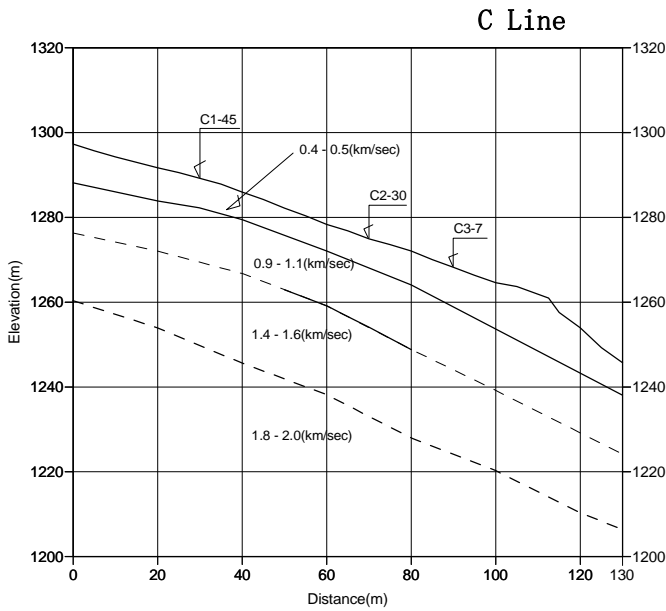
Seismic prospecting analysis cross section (STA.17+600)





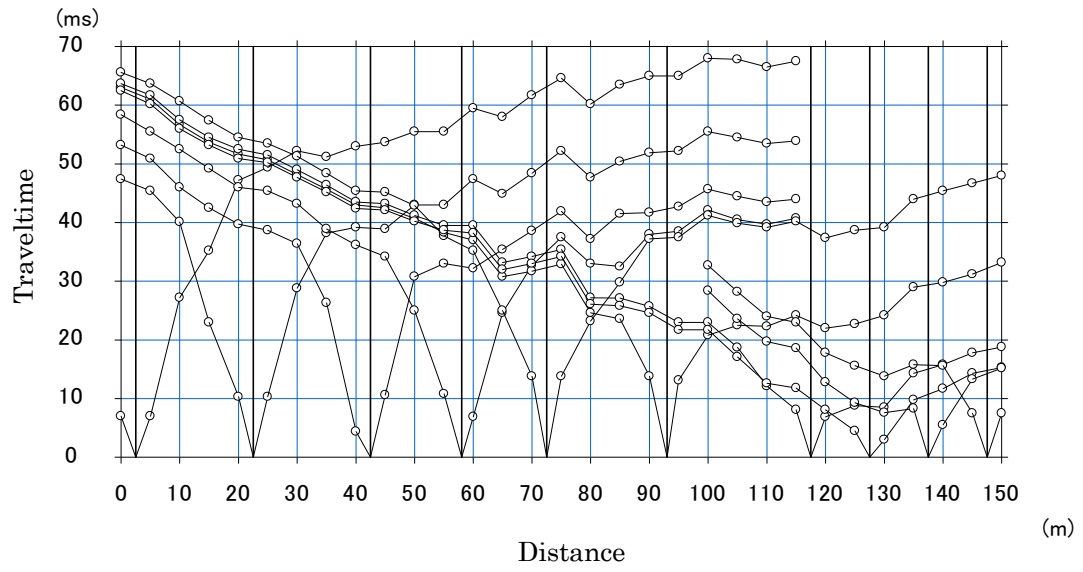


Seismic prospecting analysis cross section (STA.18+200)

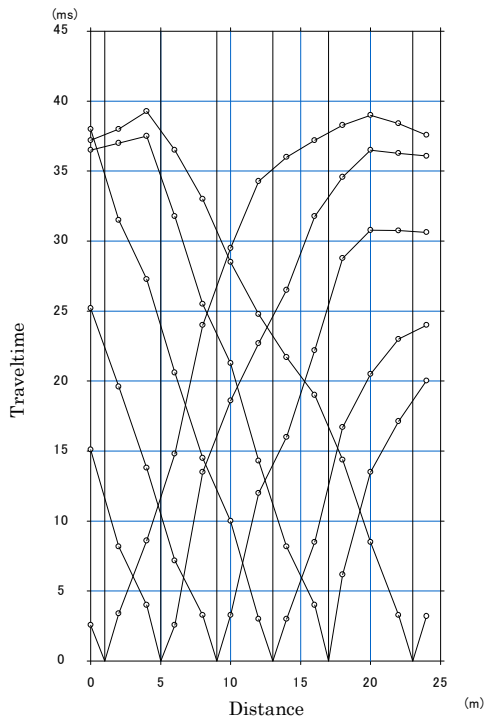


Seismic prospecting Traveltime curve (STA.17+600)

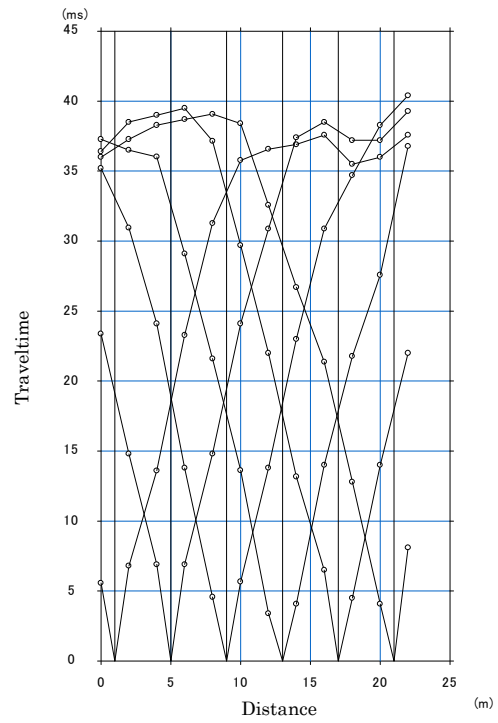
B-2 Line



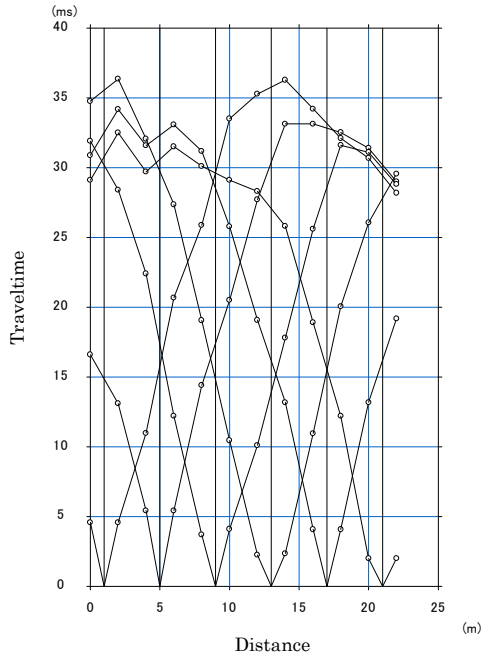
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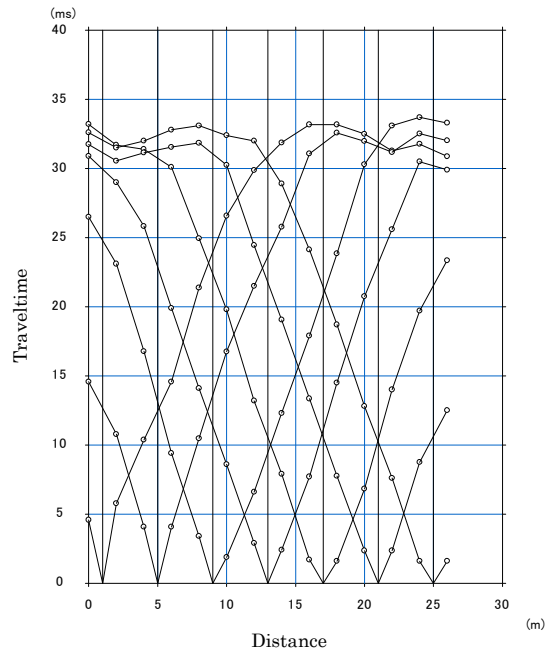
2 Line



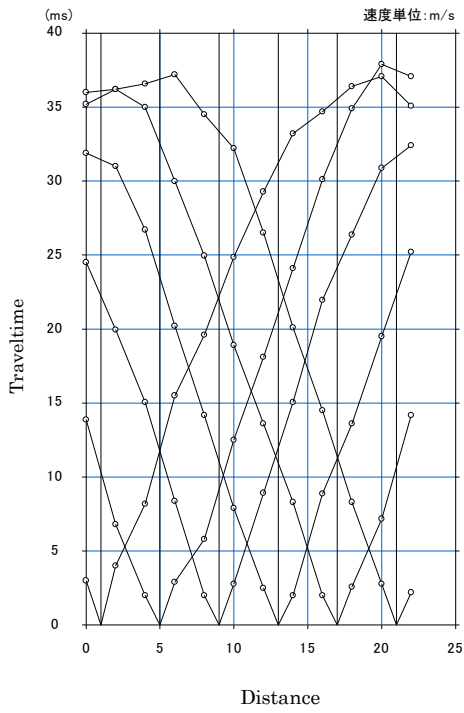
3 Line



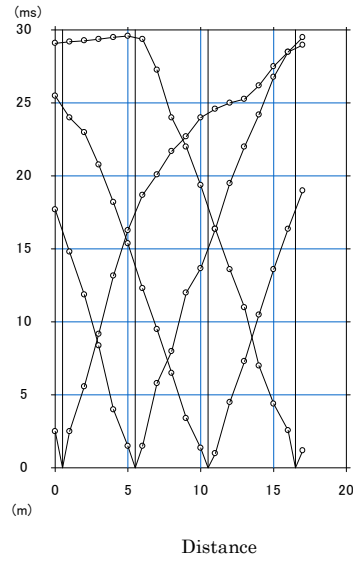
4 Line



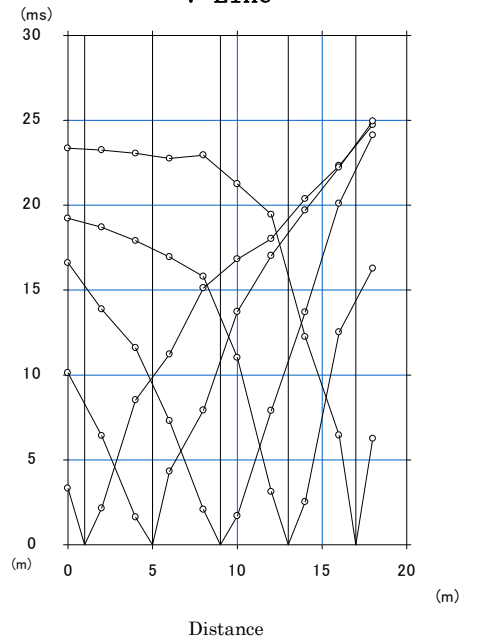
5 Line



6 Line



7 Line



Seismic prospecting Traveltime curve (STA.18+200)

