

3.4 Implementation Plan

3.4.1 Basic Policy

Taking into account that the Project be implemented under the Japanese grant aid system, basic policy for the construction is established as follows:

- Construction period is divided into two phases, each of which shall have a period of 12 calendar months.
- Construction schedule shall be established so as to avoid any conflicts with other road improvement projects which are being implemented on the project site.
- Execution plan shall be established to ensure safety of works against run-offs, floods, etc., particularly in the rainy season.
- A close communication between the client, the consultant and the contractor for the smooth project implementation shall be realized.
- Maximize use of labor, materials and equipment which are available in Laos shall be aimed at in order to increase local employment opportunities, facilitate technological transfer to the local people and to give positive impact to the local economy.

(1) Execution Plan

Scope of works in each phase is grouped as follows:

Phase 1 : Construction of 14 facilities within the section from Namkading to Banlao.
(Bridge No. 1A, 1B, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13 and 14)

Phase 2 : Construction of 12 bridges within the section from Banlao to Thakhek.
(Bridge No. 16, 17, 18, 19, 22, 23, 24, 26, 27, 28, 29 and 30)

1) Preparatory Work

"Highway Improvement Project" is underway for the section from Ban Lao to Thakhek , where several bridges are still in dangerous condition for the crossing of heavy trucks/trailers or even equipment used for the Project. Furthermore, communication, procurement of transportation cargoes, customs procedures in Vientiane are easier than those in Thakhek. Thus, Vientiane is recommended for procurement and import of construction equipment and materials for the Project.

Preparatory work shall be started soon after the acceptance of notice to proceed. Base and Sub-Base Camps for the construction purpose which comprise offices and residences for both consultant and contractor shall be established for each phase. Recommended location of the Base and Subbase camps in each phase are as follows:

- Phase 1 : Base camp / Bridge No. 8
Sub base camp / Bridge No. 3
- Phase 2 : Base camp / Bridge No. 22 Namhinboun
Sub base camp / Bridge No. 19

For every camp, electricity and drinking water are to be supplied by the contractor.

2) Abutment and Pier of Bridge

The works for abutments and piers are to be completed before start of the rainy season. Pile foundation work (Shinso method) for both abutments and piers shall be ensured by constructing cofferdams to divert the stream. As for Bridge No. 8 and 22, coffering shall be reinforced with steel sheet piles.

3) Superstructure of Bridge

Launching nose connected to the front end of the girder will be used for steel girder erection. Estimated duration for erection of girders with span lengths of 20~25m will take some 30 days. Construction of upper slab and floor will take some 60 days.

4) Box Culvert

The works for box culverts are to be completed before start of the rainy season. Duration required for completion of one box culvert will be some 90 days. Inlet and outlet shall be protected with gabions against wash-out. Wing walls with concrete block masonry shall be constructed at both upstream and downstream ends to ensure smooth water flow. Backfilling shall be made using crushed rock or natural gravel.

5) Bank Protection

The slope around the abutment shall be protected by concrete block masonry and gabion mattress. Rear face of the bricks shall be covered by geotextile filters to avoid washing out of backfilled materials.

6) Approach Road

3.4.2 Special Consideration during Works

1) Influence of Rain

The water level of the Mekong rises so significantly in the rainy season that great care shall be taken during the works, especially for tributaries of the Mekong during the rainy season. The extraction of sand and natural gravel from the Mekong becomes physically impossible in the rainy season, thus stockpiling during the dry season will be necessary.

2) Labor law

The contractor shall take adequate safety measures for his labor. The contractor shall also avoid conflict with local labor, by respecting the labor laws and practices in the Lao P.D.R.

3) As the works of the Project will overlap with those of the "Highway Improvement Project" between Namkading and Savannakhet on RN13, a close coordination for the interfaced works will be required between the authorities and the contractors.

3.4.3 Construction and Supervisory Plan

After signing the consulting service agreement, the consultant shall commence detailed design including preparation of tender documents and assistance in tendering. Japanese staff, comprising a project manager, a bridge engineer, etc. will undertake the consulting services.

During the construction stage, the Japanese resident engineer and Laotian staff will supervise the works. Organization of the consultant team is shown in Fig.3-13. Responsibilities of the key staff are as follows.

1) Project Manager

He shall be responsible for the management of all services concerning the detailed design, tendering and construction matters.

2) Resident Engineer/Bridge engineer

He shall be responsible for the detailed design of bridges and other structures included within the Project during the design stage, and for the supervision of the works during construction.

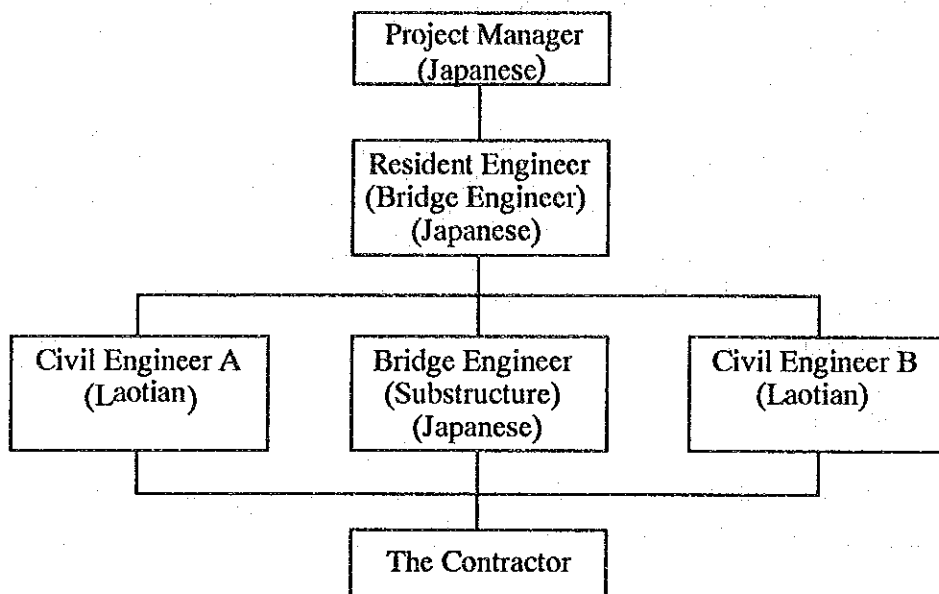


Fig. 3-13 Supervising Organization by the Consultant

3.4.4 Procurement Plan

(1) Labor

It would be difficult to recruit labor and operators immediately at the project sites. Most workers can be employed in Vientiane municipality, Thakhek and Savannakhet, and they will be mobilized to the sites, so they will be provided with accommodation near or at the site.

(2) Construction Materials

Construction materials, such as aggregates, timber, etc. can be procured from local sources. However, aggregate production from the Mekong is limited only to the dry season. Steel bars, cement, structural steel, etc. for the Project shall all be imported from other countries.

Availability of major material is as follows:

1) Sand/ Gravel

Sand and gravel are produced from the Mekong at Thakhek. There are also sand pits in Namkading, but dredging shall be carried out by the contractor. Crushed aggregates are produced at the crushing plant in Thakhek managed by a Chinese

contractor involved in the "Highway Improvement Project". This operation will continue for the Project period. Furthermore, aggregates can be procured from the state enterprise's plant in Namkading.

2) Timber

Timber be obtained from the sawmill factory in Thakhek.

3) Cement

A small amount of cement can be procured in Vientiane. As for larger amounts of cement, these are generally imported from Thailand whose products satisfy AASHTO standards. The quality of products from Vietnam or China are said to be less satisfactory.

4) Steel Bar

Steel bar products which are imported from Korea, Singapore or Thailand are acceptable in terms of quality.

5) Other Main Materials

Source countries for other main materials to Laos are shown in Table 3-5.

Table 3-5 Sources of Main Construction Materials

Material	Laos	Japan	Third Countries
Structural Steel (bridge use)		○	
Expansion Joint for bridge		○	
Admixture for cement		○	
Liner Plate for bored pile		○	
Structural Steel (general use)			○
Steel Sheet Pile			○
Asphalt Emulsion	○		

(3) Construction Equipment

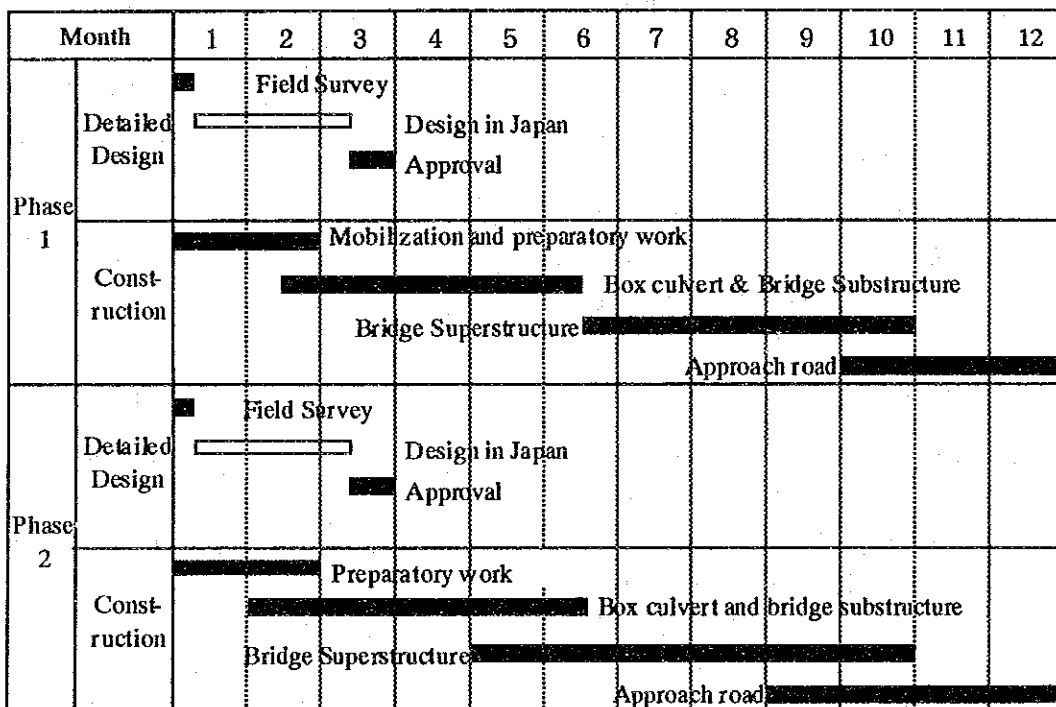
There are no private construction companies which have equipment to be hired out for road and bridge works and there are no equipment leasing firms either in Laos. While the state construction enterprises own the construction equipment mainly of previous

Soviet origin, almost all of them have deteriorated because of adequate repair and maintenance. Thus, procurement of the equipment from these local sources is impossible. On the other hand, leasing of equipment from Thai contractors is rather difficult due to the present high demand for equipment in Thailand, especially during the dry season, when the civil works will be concentrated. Therefore, the construction equipment shall be secured and mobilized from Japan in order for the Project to be completed within a short and limited period.

3.4.5 Implementing Schedule

The Project starts after signing of the Exchange of Notes. A possible implementing schedule is shown in Fig. 3-14.

Fig. 3-14 Implementing Schedule



(1) Detailed Design

The consultant shall carry out the detailed design and prepare the tender documents.

(2) Tendering

A contractor will be selected through open tender from the Japanese general construction contractors who pass a prequalification for competitive tender for the Project. Criteria for prequalification shall be approved by JICA. Prequalification will be carried out by the consultant on behalf of MCTPC of the Government of the Lao P.D.R.

The tender will be opened and the tender sum will be read in the presence of the tenderers and representatives of the Government of the Lao P.D.R. The consultant will start contract negotiation with the lowest tenderer in general, and prepare a tender evaluation report to be submitted to the Government of the Lao P.D.R for its approval.

The contract agreement becomes valid only after verification by the Government of Japan. The Government of the Lao P.D.R has to conclude a banking arrangement (B/A) with an authorized Japanese foreign exchange bank to open an account in order to receive aid funds from the Government of Japan and to make payments to the contractor.

(3) Construction

The Project is divided into the two phases. The existing bridges to be reconstructed in each phase are as follows:

1st phase Bridge No. 1A ~ No. 14

2nd phase Bridge No. 16 ~ No. 30

The Project consists of preparatory works, primary works and appurtenant works. Preparatory works comprize preparation of camps and plant yard, offices and storage houses, installation of temporary plant, etc. Appurtenant works include the execution of approach roads, slope protection, riverbed protection, etc.

3.5 Undertakings of the Government of the Lao P.D.R.

The following necessary measures should be taken by the Government of the Lao P.D.R. in case Japan's Grant Aid is extended, for the smooth implementation of the Project.

- 1) To secure land necessary for the execution of the Project and provide enough space for construction, such as temporary offices, working areas, stock pile yards and others.

- 2) To secure land necessary for borrow-pit or quarry operation, and if required to approve the parallel and adjacent use of existing borrow pits or quarries opened under projects other than this Project.
- 3) To complete the pavement works (sub-base, base course, double bituminous surface treatment and related works) on the subgrade of the approach roads to the facilities which will be constructed under the Project.
- 4) To provide facilities for supply and distribution of electricity necessary for the bridge lighting facilities on reconstructed No. 22 Bridge.
- 5) To adjust and coordinate the interfacing works with other projects during the Project.
- 6) To allow temporary use of existing and demolished bridge members or materials for construction purposes during the Project.
- 7) To ensure prompt unloading and customs clearance at the place of disembarkation in Laos and internal transportation of the products purchased under the Grant Aid.

CHAPTER 4 PROJECT EVALUATION AND CONCLUSION

CHAPTER 4 PROJECT EVALUATION AND CONCLUSION

4.1 Project Evaluation

Since the Project will resolve bottlenecks for the traffic between Namkading and Thakhek of National Road Route 13S (RN13S), providing reliable access between Vientiane municipality and the southern economic centers, i.e., Thakhek and Savannakhet, the following positive impacts are expected:

- (1) Increase of transit trade between Thailand and Vietnam through Laos
- (2) Increase of international trade of Laos with Thailand, Vietnam, China, Myanmar and Cambodia.
- (3) Increase of domestic trade between the northern and southern economic hubs, i.e. Luang Phrabang, Vientiane municipality and the Thakhek/Savannakhet area.
- (4) Acceleration of the integrated road improvement of RN13S along with the on-going "Highway Improvement Project".

In addition to the above direct effects, the Project will generate the following indirect benefits in the Project area:

- (1) expansion of local market
- (2) settlement of local population
- (3) rationalization of the local transport of goods
- (4) stabilization of livelihood of the local population
- (5) provision of reliable access to public services such as medical and educational facilities, etc. for the local population

4.2 Conclusion

The Project will contribute to vitalization of the economic activities, and to increase significantly social stability and public welfare of Laos, thus the implementation of Project under Japanese Grant Aid is strongly recommended.

It is also very desirable to reconstruct another 14 existing bridges which remain in badly deteriorated condition beyond Thakhek through Savannakhet, where "Highway Improvement Project" is underway, in order to facilitate the comprehensive road improvement of National Road 13S (RN13S).

APPENDICES

- | | |
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| Appendix-1 | Member List of Study Team |
| Appendix-2 | Survey Schedule |
| Appendix-3 | List of Officers met in Laos |
| Appendix-4 | Minutes of Discussions |
| Appendix-5 | Location of Bridges and Box Culverts |
| Appendix-6 | Borehole Logs |
| Appendix-7 | Photos of Existing Bridges |

Appendix-1 Member List of Study Team

1. First Survey (December 3rd to December 27th, 1993)

Name	Designation	Title
Takeo KAI	Team Leader	Development Specialist, JICA
Shozo YOSHIKAWA	Bridge Planner	Deputy Manager, Maintenance Planning Division, Maintenance Department, Honshu-Shikoku Bridge Authority
Kenji MAEKAWA	Project Coordinator	Second Basic Design Study Division, Grant Aid Study & Design Department, JICA
Kimio CHIBA	Chief Consultant	Construction Project Consultants Inc.
Nobuyuki SUZUKI	Bridge Designer	Construction Project Consultants Inc.
Toru KAWAKAMI	Natural Conditions Surveyor	Nippon Koei Co., Ltd.
Tetsu NAKAGAWA	Natural Conditions Surveyor	Nippon Koei Co., Ltd.
Yoichi HIGAKI	Construction Planner* Cost Estimator	Construction Project Consultants Inc.

2. Second Survey (January 16th to February 19th, 1994)

Name	Designation	Title
Kimio CHIBA	Chief Consultant	Construction Project Consultants Inc.
Tetsu NAKAGAWA	Natural Conditions Surveyor	Nippon Koei Co., Ltd.

3. Consultation of Draft Final Report (April 23rd to April 30th, 1994)

Name	Designation	Title
Senichi KIMURA	Team Leader	Deputy director, Second Basic Design Study Division, Grant Aid Study & Design Department, JICA
Shozo YOSHIKAWA	Bridge Planner	Deputy Manager, Maintenance Planning Division, Maintenance Department, Honshu-Shikoku Bridge Authority
Toshio RYO	Project Coordinator	Legal Affair Division, General Affairs Department, JICA
Kimio CHIBA	Chief Consultant	Construction Project Consultants Inc.
Nobuyuki SUZUKI	Bridge Designer	Construction Project Consultants Inc.

Appendix-2 Survey Schedule

First Survey

No.	Date	Members	Activities	Stay
1	Dec. 1993 3 (Fri.)	Suzuki, Nakagawa, Kawakami	Leave Narita for Laos	Bangkok
2	4 (Sat.)	Suzuki, Nakagawa, Kawakami	Move from Bangkok to Vientiane Discussion with Survey Company (Soil and topographic surveys)	Vientiane
3	5 (Sun.)	Suzuki, Nakagawa, Kawakami	Site visit for Mekong River Bridge Construction Project and factory of PC girder	Vientiane
4	6 (Mon.)	Suzuki, Nakagawa, Kawakami	Courtesy call to the Embassy of Japan and MCTPC	Vientiane
5	7 (Tue.)	Suzuki, Nakagawa	Site investigation (Namkading - Namhinboun)	Thakhek
		Kawakami	Site investigation (Bridge No. 3 and 8)	Paksan
6	8 (Wed.)	Suzuki, Nakagawa	Site investigation (Namhinboun - Thakhek)	Thakhek
		Kawakami	Inspection for boring (Bridge No. 3 and 8)	Paksan
7	9 (Thu.)	Suzuki	Site investigation (Thakhek - Namkading)	Thakhek
		Nakagawa	Site investigation (Thakhek - Savannakhet)	Paksan
		Kawakami	Inspection for boring (Bridge No. 22)	
		Chiba, Higaki	Leave Narita for Laos	Bangkok
8	10 (Fri.)	Suzuki	Site investigation (Namkading - Vientiane)	Vientiane
		Nakagawa	Site investigation (Thakhek - Savannakhet)	Thakhek
		Kawakami	Inspection for boring (Bridge No. 22)	
		Chiba, Higaki	Move from Bangkok to Vientiane	Vientiane
9	11 (Sat.)	Chiba, Higaki	Site investigation (Namkading - Thakhek)	Thakhek
		Nakagawa	Site investigation (Thakhek - Vientiane)	Vientiane
		Kawakami	Inspection for boring (Bridge No. 22)	Thakhek
		Suzuki	Data collection	Vientiane
10	12 (Sun.)	Chiba, Higaki, Kawakami, Nakagawa	Data collection	Thakhek
			Inspection for boring	
		Suzuki, Nakagawa	Data collection	Vientiane
		Kai, Yoshikawa, Maekawa	Leave Narita for Laos	Bangkok
11	Dec. 1993 13 (Mon.)	Chiba, Higaki, Kawakami	Site investigation (Thakhek - Savannakhet)	Thakhek
			Geological survey	
		Suzuki, Nakagawa	Data collection	Vientiane
		Kai, Yoshikawa, Mackawa	Move from Bangkok to Vientiane Courtesy call to the Embassy of Japan, MCTPC, discussion with Embassy of Australia	

No.	Date	Members	Activities	Stay
12	14 (Tue.)	Kai, Yoshikawa, Suzuki, Nakagawa	Site investigation (Namkading - Thakhek)	Thakhek
		Chiba, Higaki, Kawakami	Site investigation (Thakhek - Savannakhet)	
			Discussion with survey company	
13	15 (Wed.)	Kai, Yoshikawa, Maekawa, Suzuki, Higaki, Nakagawa, Kawakami	Site investigation (Thakhek - Savannakhet) Internal meeting	Thakhek
14	16 (Thu.)	Kai, Yoshikawa, Maekawa, Suzuki, Higaki, Nakagawa,	Site investigation (Thakhek - Namkading)	Vientiane
		Kawakami	Inspection for boring	Thakhek
15	17 (Fri.)	Kai, Yoshikawa, Maekawa, Suzuki, Higaki, Nakagawa,	Conference with MCTPC on draft Minutes of Discussion	Vientiane
		Kawakami	Inspection for traffic survey	Thakhek
16	18 (Sat.)	Kai, Yoshikawa, Maekawa, Suzuki, Higaki, Nakagawa,	Conference with MCTPC on draft Minutes of Discussion	Vientiane
		Kawakami	Inspection for geological survey	Thakhek
17	19 (Sun.)	Kai, Yoshikawa, Maekawa, Chiba, Higaki	Site visit for factory of PC girder and bridge construction project site	Vientiane
		Suzuki, Nakagawa	Data collection	
		Kawakami	Inspection for geological survey	Thakhek
18	20 (Mon.)	Kai, Yoshikawa, Maekawa, Chiba Higaki, Suzuki, Nakagawa	Signing of the Minutes of Discussions Reporting to the Embassy of Japan	Vientiane
		Kawakami	Inspection for geological survey	Thakhek
19	21 (Tue.)	Kai, Yoshikawa, Maekawa, Chiba Higaki, Suzuki, Nakagawa	Internal meeting, data collection	Vientiane
		Kawakami	Inspection for geological survey	Thakhek
20	Dec. 1993 22 (Wed.)	Kai, Yoshikawa, Maekawa, Chiba, Higaki	Leave Laos	Bangkok
		Suzuki, Nakagawa	Data collection	Vientiane
		Kawakami	Move from Thakhek to Vientiane	
21	23 (Thu.)	Suzuki, Nakagawa Kawakami	Data collection	Vientiane
22	24 (Fri.)	Suzuki	Data collection	Vientiane
		Nakagawa, Kawakami	Visit bridge construction site (Vientiane - Honghong)	

No.	Date	Members	Activities	Stay
23	25 (Sat.)	Suzuki, Kawakami, Nakagawa	Site visit for factory of PC girder	Vientiane
24	26 (Sun.)	Suzuki, Kawakami, Nakagawa	Leave Laos	Bangkok
25	27 (Mon.)	Suzuki, Kawakami, Nakagawa	Arrived at Narita	

Second Survey

No.	Date	Members	Activities	Stay
1	Jan. 1994 16 (Sun.)	Chiba, Kawakami	Leave Narita for Laos	Bangkok
2	17 (Mon.)	Chiba, Kawakami	Move from Bangkok to Vientiane Courtesy call to the Embassy of Japan	Vientiane
3	18 (Tue.)	Chiba, Kawakami	Reporting to MCTPC on the results of 1st survey, Contract with survey company	Vientiane
4	19 (Wed.)	Chiba, Kawakami	Discussion with MCTPC	Vientiane
5	20 (Thu.)	Chiba	Data collection from MCTPC	Vientiane
		Kawakami	Interview with the local contractors	
6	21 (Fri.)	Chiba	Leave Laos	Bangkok
		Kawakami	Site investigation (Vientiane - Pakse)	Pakse
7	22 (Sat.)	Kawakami	Site investigation	Paksan
8	23 (Sun.)	Kawakami	Data collection	Paksan
9	24 (Mon.)	Kawakami	Site investigation	Paksan
10	25 (Tue.)	Kawakami	Site investigation	Paksan
11	26 (Wed.)	Kawakami	Site investigation	Paksan
12	27 (Thu.)	Kawakami	Site investigation	Paksan
13	28 (Fri.)	Kawakami	Site investigation	Paksan
14	29 (Sat.)	Kawakami	Site investigation	Paksan
15	30 (Sun.)	Kawakami	Site investigation	Paksan
16	31 (Mon.)	Kawakami	Site investigation, Completion of topographic survey	Paksan
17	Feb. 1994 1 (Tue.)	Kawakami	Site investigation	Thakhek
18	2 (Wed.)	Kawakami	Site investigation	Thakhek
19	3 (Thu.)	Kawakami	Site investigation	Thakhek
20	4 (Fri.)	Kawakami	Site investigation	Thakhek
21	5 (Sat.)	Kawakami	Site investigation, Completion of boring survey	Thakhek
22	6 (Sun.)	Kawakami	Data collection	Thakhek

No.	Date	Members	Activities	Stay
23	7 (Mon)	Kawakami	Interview with the Chinese contractors	Thakhek
24	8 (Tue.)	Kawakami	Interview with the Chinese contractors	Thakhek
25	9 (Wed.)	Kawakami	Interview with the Chinese contractors	Thakhek
26	10 (Thu.)	Kawakami	Discussions with MCTPC	Thakhek
27	11 (Fri.)	Kawakami	Travel (Thakhek - Vientiane)	Vientiane
28	12 (Sat.)	Kawakami	Data collection	Vientiane
29	13 (Sun.)	Kawakami	Data collection	Vientiane
30	14 (Mon.)	Kawakami	Discussion with boring company	Thakhek
31	15 (Tue.)	Kawakami	Interview with local contractors	Vientiane
32	16 (Wed.)	Kawakami	Interview with local contractors	Vientiane
33	17 (Thu.)	Kawakami	Discussion with survey company	Vientiane
34	18 (Fri.)	Kawakami	Leave Laos	Bangkok
35	19 (Sat.)	Kawakami	Arrived at Narita	

Consultation of Draft Final Report

No.	Date	Members	Activities	Stay
1	Apr. 1994 23 (Sat.)	Kimura, Yoshikawa Ryo, Chiba, Suzuki	Leave Narita for Laos	Bangkok
2	24 (Sun.)	Kimura, Yoshikawa Ryo, Chiba, Suzuki	Move from Bangkok to Vientiane	Vientiane
3	25 (Mon.)	Kimura, Yoshikawa Ryo, Chiba, Suzuki	Discussion with Embassy of Japan Consultation of draft final report with MCTPC	Vientiane
4	26 (Tue.)	Kimura, Yoshikawa Ryo, Chiba, Suzuki	Visit Mekong bridge at Thanaleng Consultation of draft final report and discussion on draft Minutes of Discussion with MCTPC	Vientiane
5	27 (Wed.)	Kimura, Yoshikawa Ryo, Chiba, Suzuki	Signing of Minutes of Discussion Visit bridge construction site at Thagone	Vientiane
6	28 (Thu.)	Kimura, Yoshikawa Ryo, Chiba, Suzuki	Report to Embassy of Japan Discussion with Embassy of Australia on aid of bridge construction in Laos	Vientiane
		Kimura	Leave Laos	
7	29 (Fri.)	Yoshikawa, Ryo, Chiba, Suzuki	Leave Laos	Bangkok
8	30 (Sat.)	Yoshikawa, Ryo, Chiba, Suzuki	Arrived at Narita	

Appendix-3 List of Officers Met in Laos

1. Embassy of Japan
 - Mr. Masao WADA Ambassador
 - Mr. Toshikatsu AOYAMA Councilor
 - Mr. Saburo SATO First Secretary
 - Mr. Kiyoshi OMAMEUDA Second Secretary

2. Ministry of Communication, Transport, Post and Construction (MCTPC)
 - Mr. Khamlouat Sidlakone Vice Minister
 - Mr. Math Sounmala Director of Communication Department
 - Dr. Khamheng Sayakone Deputy Director of Communication Department (Head of Technical Division)
 - Mr. Khanngoun Khamvongsa Deputy Director of Department of International Relation
 - Mr. Phetsamone Viraphanth Deputy Permanent Secretary, Planning and International Relation
 - Ms. Khempeng Pholsena Vice Chairman of Committee of Planning and Cooperation
 - Mr. Thong Phachanh Director of Committee of Planning and Cooperation
Sonnasine
 - Mr. Bountheuang Mounlasy Deputy Director of Committee of Planning and Cooperation
 - Mr. Somphouthone Arkhavong Project Manager of Namkading - Savannakhet Road Project
 - Mr. Khamphone Deputy Project Manager of Namkading - Savannakhet Road Project
 - Mr. Chancy Nouantialy Deputy Chief of International Relation
 - Mr. Sommad Deputy Director of Communication Department
 - Mr. Bounchanh Sinthavong Deputy Director of Communication Department (Head of Maintenance Division)

3. Consulting Engineering Services PVT LTD.
 - Mr. Dulal Chandra De Project Coordinator of Namkading - Savannakhet Road Project

Appendix-4 Minutes of Discussions

MINUTES OF DISCUSSIONS


BASIC DESIGN STUDY
ON
THE PROJECT FOR RECONSTRUCTION OF BRIDGES
ALONG
NATIONAL ROUTE NO.13
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

In response to the request from the Government of Lao People's Democratic Republic, (hereinafter referred to as "the Lao PDR"), the Government of Japan decided to conduct a Basic Design Study on the Project for Reconstruction of Bridges along National Route No. 13 (hereinafter referred to as "the Project"), and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to Lao PDR a study team, which is headed by Mr. Takeo KAI, Development Specialist, JICA, and is scheduled to stay in the country from December 4 to 26, 1993. The Team held discussions with the officials concerned of the Government of Lao PDR and conducted field surveys at the study area.

In the course of discussions and field surveys, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Vientiane, December 20, 1993



Mr. Takeo KAI
Team Leader
Basic Design Study Team
JICA



Mr. Math SOUNMALA
Director
Department of Communication,
MCTPC LAO PDR

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve national transportation along national route No. 13 by reconstruction of bridges along the route.

2. Project sites

The project sites are located along the national route No. 13 from Nam-kading to Savannakhet, which is shown in ANNEX-I.

3. Responsible Ministry

Ministry of Communication, Transport, Post and Construction (MCTPC) has all responsibility about the implementation of the Project.

4. Items requested by the Government of Lao PDR

After discussions with the Basic Design Study Team, the items which are shown in ANNEX-II were requested by the Government of the Lao PDR.

However, the final components of the Project will be decided after further studies.

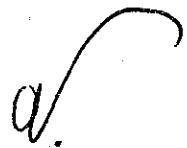
5. Grant Aid system

- 1) The Government of Lao PDR has understood the system of Japan's Grant Aid explained by the Team.
- 2) The Government of Lao PDR will take necessary measures, described in ANNEX-III for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

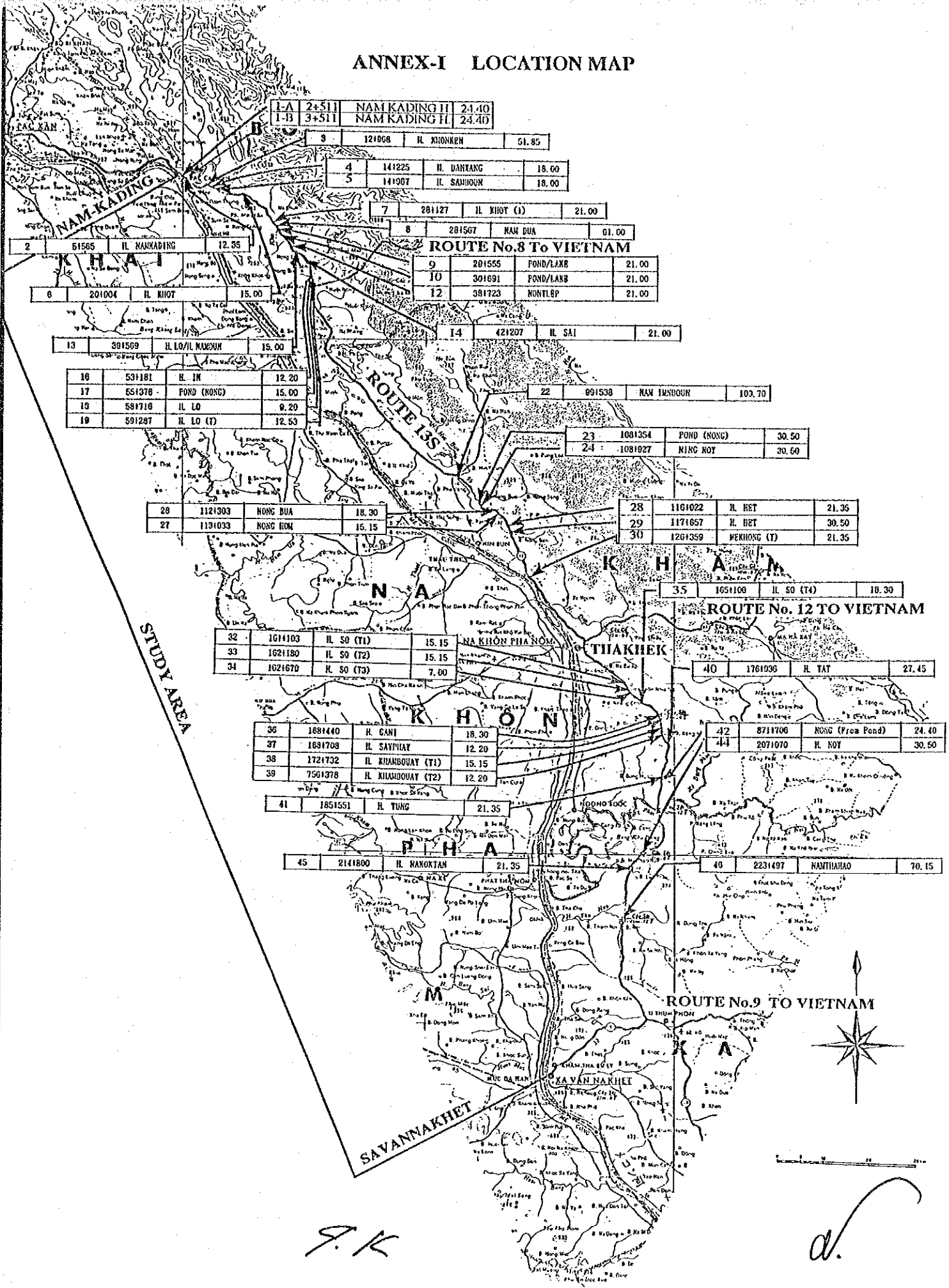
6. Schedule of the Study

- 1) The consultants will proceed to further studies in Lao PDR until December 26, 1993.
- 2) The consultants will carry out additional field survey in Lao PDR in January, 1994.
- 3) JICA prepare the draft report in English and dispatch a mission in order to explain its contents around April, 1994.
- 4) In case that the contents of the report is accepted in principle by the Government of Lao PDR, JICA will complete the Final Report and send it to the Government of Lao PDR by June, 1994.

P.K



ANNEX-I LOCATION MAP



I-A	2+511	NAM KADING H.	24.40
I-B	3+511	NAM KADING H.	24.40

3	121008	H. KHONHEN	51.85
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4	141225	H. DANHANG	18.00
5	141907	H. SAHOUN	18.00

7	281127	H. KHOT (I)	21.00
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8	281507	NAM DUA	61.00
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ROUTE No. 8 To VIETNAM

9	281555	POND/LAKH	21.00
10	301691	POND/LAKH	21.00
12	381723	HONTLEP	21.00

14	421207	H. SAI	21.00
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22	891538	NAM KHOUN	103.70
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23	1081354	POND (NONG)	30.50
24	1081027	RING ROY	30.50

28	1121303	NONG DUA	18.30
27	1131033	NONG HON	16.15

28	1161022	H. HET	21.35
29	1171057	H. HET	30.50
30	1261359	MEKHONG (T)	21.35

35	1651100	H. SO (T1)	18.30
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ROUTE No. 12 TO VIETNAM

32	1611103	H. SO (T1)	15.15
33	1621180	H. SO (T2)	15.15
34	1621670	H. SO (T3)	7.00

40	1761038	H. TAT	27.45
----	---------	--------	-------

36	1681440	H. CANH	18.30
37	1681708	H. SAYPIAY	12.20
38	1721732	H. KHANOUAY (T1)	15.15
39	7561378	H. KHANOUAY (T2)	12.20

42	8711706	NONG (Pond)	24.40
44	2071070	H. NOY	30.50

41	1851551	H. TUNG	21.35
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45	2141800	H. NANTAN	21.35
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46	2231497	NANTHARAO	70.15
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ROUTE No. 9 TO VIETNAM

P.K

d.

ANNEX-II

1. The prioritized group of bridges requested by the Government of Lao PDR are as follows :

Priority A Bridge No.	Water Course	Location in Km from Nam-kading
1A	Nam-kading H.	2.5
1B	Nam-kading H.	3.5
2	H. Nam-kading	5.5
3.	H. Khonken	12.9
4	H. Danxang	14.2
5	H. Samboun	15.0
6	H. Khot	20.9
7	H. Khot (1)	28.1
8	Nam Dua	28.6
9	Pond / Lake	29.6
10	Pond / Lake	30.7
12	Nontkep	38.7
13	H. Lo / H. Namoun	41.5
14	H. Sai	42.1

Priority B Bridge No.	Water Course	Location in Km from Nam-kading
22	Nam Hinboun	99.0
46	Nam Thahao	223.8

Priority C1 Bridge No.	Water Course	Location in Km from Nam-kading
16	H. In	52.9
17	Pond (Nong)	55.0
18	H. Lo	58.4
19	H. Lo (T)	58.9
23	Pond (Nong)	107.9
24	Ningnoy	108.4
26	Nong Bua	111.9
27	Nong Hom	112.65
28	H. Het	115.70
29	H. Het	117.40
30	Mekhong (T) Namkhong (T)	126.10

Priority C2 Bridge No.	Water Course	Location in Km from Nam-kading
32	H. So (T1)	161.0
33	H. So (T2)	162.0
34	H. So (T3)	162.6
35	H. So (T4)	165.0
36	H. Ghai	168.3
37	H. Sayphay	168.6
38	H. Kam Bouay (T1)	172.7

J.K.

d.

39	H. Kham Bouny (T2)	175.3
40	H. Tat	176.8
41	H. Tung	185.5
42	Nong (From Pond)	187.7
44	H. Noy	207.7
45	H. Nakoktan	214.8

2. The Bridges shall be designed as " first class trunk road bridge " in accordance with "Japan Highway Bridge Standard ".
3. The Bridges shall be designed as " 2 lane width bridge " stipulated in the 2nd Draft of "Road Manual Part I , 1993 by MCTPC, Lao PDR ".
4. The Project includes minimum approach roads for the bridges less than 100 m long on both sides, in the case no road alignment is diverted. In the case road alignment shall be diverted, minimum approach roads for the bridges less than 200 m long on both sides are included.

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ANNEX-III

Necessary measures to be taken by the Government of Lao PDR;

1. To secure the sites of the Project.
2. To permit the use of radio call equipment with assignment of specified frequency which is necessary for the implementation of the Project.
3. To bear commission to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement (A/B).
4. To ensure prompt unloading and customs clearance at ports of disembarkation in Lao PDR and internal transportation therein of the products purchased under the Grant.
5. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Lao PDR with respect to the supply of the products and services under the verified contracts.
6. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contract such facilities as may be necessary for their entry into Lao PDR and stay therein for the performance of their work.
7. To maintain and use properly and effectively that the facilities constructed under the Grant.
8. To bear all the expenses other than those to be borne by the Grant, necessary for the Project.
9. To coordinate and solve any issues related to the Project which may be raised from third parties and inhabitants in the Project areas during implementation of the Project.

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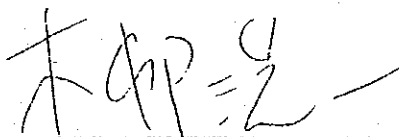
MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
THE PROJECT FOR RECONSTRUCTION OF BRIDGES
ALONG
NATIONAL ROAD ROUTE 13
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
(CONSULTATION OF DRAFT REPORT)

In December 1993, Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the project for Reconstruction of Bridges along National Road Route 13 (hereinafter referred to as " the Project ") to Lao People's Democratic Republic, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Lao side on the draft report, JICA sent to Laos a study team, which is headed by Mr. Senichi Kimura, Deputy director of Second Basic Design Study Div., JICA, and is scheduled to stay in the country from April 23 to 30, 1994.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Vientiane, April 27, 1994



Mr. Senichi KIMURA
Team Leader
Basic Design Study Team
JICA



Mr. Math SOUNMALA
Director
Department of Communication
MCTPC , LAO PDR

ATTACHMENT

1. Draft report

The Government of Lao PDR has agreed and accepted in principle the draft report proposed by the Team.

2. Japan's Grant Aid System

- (1) The Government of Lao PDR has understood the system of Japan's Grant Aid explained by the Team.
- (2) The Government of Lao PDR will take necessary measures, described in the Annex for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.
- (3) Regarding No. 4 of the Annex, the Government of LAO PDR has strongly requested that the pavement works of the approach road for the second phase bridges would be covered by the Grant Aid Assistance.
- (4) LAO PDR has strongly requested that the lighting facility on No. 22 Bridge (New Hinboune Bridge) including lightning poles and on - bridge wiring would be covered by the Grant Aid Assistance .

The team has agreed to convey the above requests to the Government of Japan.

3. The team will make the final report in accordance with the confirmed items, and send it to the Government of Lao PDR by May, 1994.

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Annex

Following necessary measures should be taken by the Government of LAO PDR in case that Japan's Grant Aid is executed.

- 1) To provide data and informations necessary for the Project.
- 2) To secure land necessary for the execution of the Project and provide enough space for construction, such as temporary offices, working areas, stock pile yards and others.
- 3) To secure land necessary for borrow-pit or quarry operation, and if required to approve the parallel and adjacent use of existing borrow pits or quarries opened under the project other than this Project.
- 4) To complete the pavement works (sub-base, base course, surface treatment and the related works) on the subgrade of bridge approaches which will be constructed under the project
- 5) To provide facilities for supply and distribution of electricity necessary for the bridge lightning facilities on No. 22 Bridge.
- 6) To adjust and coordinate the interfaced works due of other projects during the Project.
- 7) To allow temporary use of existing and demolished bridge member or materials for the construction purposes during the Project.
- 8) To bear commissions (banking charge) to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
- 9) To ensure prompt unloading and customs clearance at the place of disembarkation in Laos and internal transportation therein of the products purchased under the Grant.
- 10) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Laos with respect to the supply of the products and services under the verified contracts.
- 11) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contract such facilities may be necessary for their entry into Laos and stay therein for the performance of their work.

(50)

dl.

- 12) To maintain use properly and effectively the facilities constructed under the Grant.
- 13) To bear all the expenses, other than those to be borne by the Grant, necessary for the execution of the project.
- 14) To coordinate in solving any issues related to the Project which may arise with third parties and inhabitants living around the Project area during implementation of the Project.

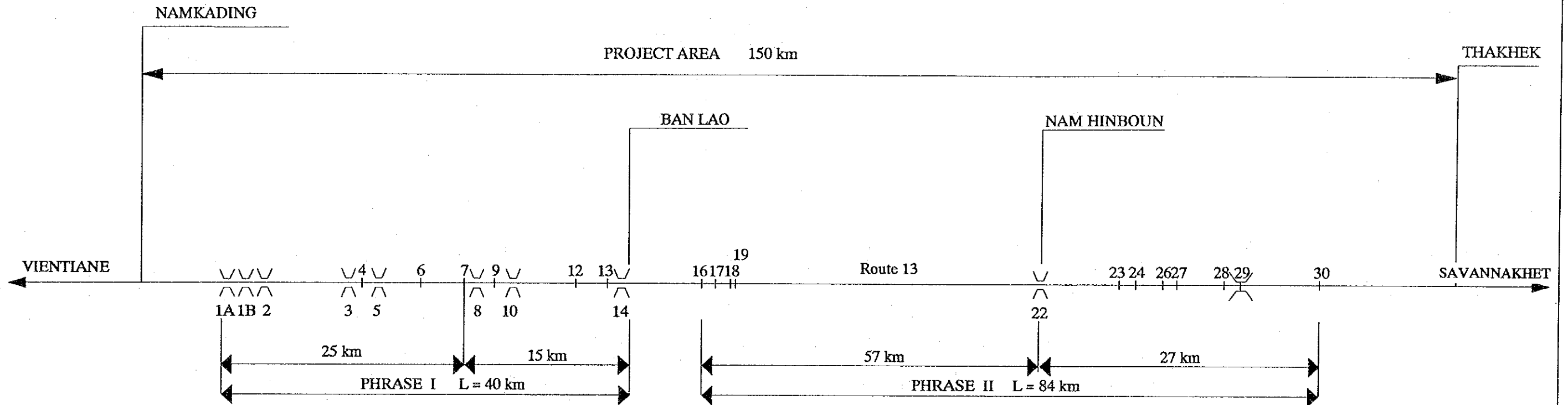
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APPENDIX-5 LOCATION OF BRIDGES AND BOX CULVERTS

Index

- ∨ Bridge
- ∧ RC Box Culvert
- | RC Box Culvert



Phase I



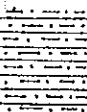
No.	Bridge No.	Distance from Namkading (km)	Name of Stream	Type	Length (m)	Width (m)
1	1A	2+500	Stream to Namkading	Single span steel plate girder	25.6	6.5
2	1B	3+511	Stream to Namkading	Single span steel plate girder	20.5	6.5
3	2	5+565	Tributary to Namkading	Single span steel plate girder	25.6	6.5
4	3	12+968	Khonken	3-span simply supported steel plate girder	52.3	6.5
5	4	14+225	Danxang	RC Box culvert	16.6	6.5
6	5	14+987	Samboun	Single span steel plate girder	25.6	6.5
7	6	20+904	Khot	RC Box culvert	13.5	6.5
8	7	28+127	Khot	RC Box culvert	6.0	6.5
9	8	28+567	Namdua	3-span simply supported steel plate girder	61.3	6.5
10	9	29+555	Pond	RC Box culvert	16.6	6.5
11	10	30+691	Pond	Single span steel plate girder	25.6	6.5
12	12	38+723	Nontlep	RC Box culvert	16.3	6.5
13	13	39+569	Lo/Namthon	RC Box culvert	16.6	6.5
14	14	42+207	Sai	Single span steel plate girder	20.5	6.5

Phase II

No.	Bridge No.	Distance from Namkading (km)	Name of Stream	Type	Length (m)	Width (m)
15	16	53+181	In	RC Box culvert	13.3	6.5
16	17	55+376	Pond	RC Box culvert	13.3	6.5
17	18	58+716	Lo	RC Box culvert	13.3	6.5
18	19	59+287	Lo	RC Box culvert	13.3	6.5
19	22	99+538	Namhinboun	3-span continuous steel plate girder	124.0	6.5
20	23	108+354	Pond	RC Box culvert	16.6	6.5
21	24	108+927	Ning Noy	RC Box culvert	16.6	6.5
22	26	112+303	Nongbua	RC Box culvert	13.3	6.5
23	27	113+33	Nonghom	RC Box culvert	13.3	6.5
24	28	116+22	Het	RC Box culvert	13.3	6.5
25	29	117+657	Het	Single span steel plate girder	25.6	6.5
26	30	126+359	Tributary to the Mekong	RC Box culvert	16.6	6.5

Appendix 6 Borehole Logs

Bridge No.	Nos. of Borehole
1A	1
1B	1
2	1
3	2
4	1
5	1
8	3
10	1
14	1
22	3
28	1
29	1
46	2

SITE	BRIDGE NO. 1A		HOLE NO.1		COORDINATE										
DATE	19/01/94 - 20/01/94		DRILL RIG	UGB-50	DRILLED	BouaSy	LOGGED	Khampha							
DEPTH	9.50 m	INCLINATION	Vert.	ELEVATION	154.29 m	AVERAGE CORE RECOVERY		%							
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							DE P TH	
							cm								
	m						10	20	30	40	50	60	70	m	
	1		Silty clay and sand.		No Ground Water									1	
	2														2
	3														3
	4		Silty clay and gravel.												4
	5														5
	6														6
	7														7
	8		Siltstone.												8
	9													9	
	10													10	
	11													11	
	12													12	
	13													13	
	14													14	
	15													15	
	16													16	
	17													17	
	18													18	
	19													19	
	20													20	
	21													21	
	22													22	
	23													23	
	24													24	
	25													25	
	26													26	
	27													27	
	28													28	
	29													29	
	30													30	

SITE		BRIDGE NO.1B		HOLE NO. 1		COORDINATE																	
DATE		21/01/94 - 23/01/94		DRILL RIG		UGB-50		DRILLED		BouaSy		LOGGED		Khamphai									
DEPTH		13.10 m		INCLINATION		Vert		ELEVATION		156.15 m		AVERAGE CORE RECOVERY		%									
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY		STANDARD PENETRATION TEST							D E P T H								
						%	cm	10	20	30	40	50	60	70									
	1	Sandy clay and gravel.															1						
	2																					2	
	3																						3
	4	Silty clay.															4						
	5																					5	
	6																						6
	7																						7
	8																						8
	9	Siltstone.															9						
	10																					10	
	11																						11
	12																12						
	13																13						
	14																14						
	15																15						
	16																16						
	17																17						
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	29																29						
	30																30						

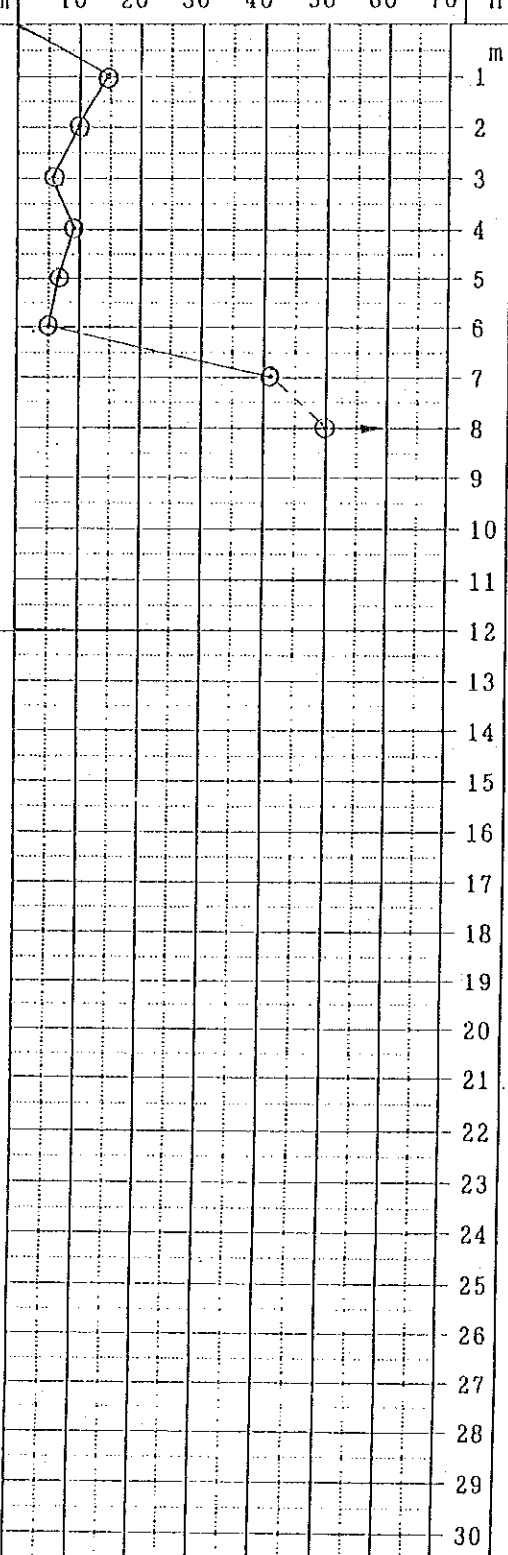
SITE	BRIDGE NO. 02	HOLE NO.1	COORDINATE													
DATE	23/01/94 - 24/01/94		DRILL RIG	UGB-50	DRILLED	BouaSy	LOGGED	Khampha								
DEPTH	6.52 m	INCLINATION	Vert	ELEVATION	150.70 m	AVERAGE CORE RECOVERY		%								
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							DE P TH m		
							cm	10	20	30	40	50	60		70	
	1	Sandy clay.			83%										1	
	2															2
	3															3
	4	Siltstone.			83%										4	
	5															5
	6				Water level 1.90 m, date 24/01/94, time 8:00										6	
	7															7
	8															8
	9															9
	10															10
	11															11
	12															12
	13															13
	14															14
	15															15
	16															16
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	18															18
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	21															21
	22															22
	23															23
	24															24
	25															25
	26															26
	27															27
	28															28
	29															29
	30															30

SITE		BRIDGE NO. 03		HOLE NO. 1		COORDINATE												
DATE		13 / 12/93 -14 / 12/93		DRILL RIG		acker		DRILLED		BoonLom		LOGGED		PhetSone				
DEPTH		4.80 m		INCLINATION		Vert.		ELEVATION		143.30 m		AVERAGE CORE RECOVERY 87.5%						
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER VEL	CORE RECOVERY		STANDARD PENETRATION TEST							DEPTH			
						%	cm	10	20	30	40	50	60	70				
	1		Grey silty clay very soft.		No Ground Water												1	
	2		Grey silty clay with some debris rock.															2
	3		Clay grey with angled cobble & blocken rock with coarse sand filling joint.															3
	4		Fissured sandstone. Sandstone very hard.															4
	5																5	
	6																6	
	7																7	
	8																8	
	9																9	
	10																10	
	11																11	
	12																12	
	13																13	
	14																14	
	15																15	
	16																16	
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	23																23	
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	25																25	
	26																26	
	27																27	
	28																28	
	29																29	
	30																30	

SITE	BRIDGE NO. 03	HOLE NO. 2	COORDINATE																	
DATE	10/12 / 93	-11 / 12 / 93	DRILL RIG	UGB-50	DRILLED	Bouasy	LOGGED	PhetSone												
DEPTH	8.56m	INCLINATION	Vert	ELEVATION	157.00 m	AVERAGE CORE RECOVERY		94 %												
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							D E P T H						
							cm	10	20	30	40	50	60		70					
	1	Yellowish-brown reddishbrown & greyish-white silty clay & loam silt white laterite.			No Ground Water											1				
	2																			2
	3																			
	4	Same as above but with rare laterite.			No Ground Water											4				
	5																			5
	6	Reddish brown silty clay with some gravel/ laterite.			No Ground Water											6				
	7																			7
	8																			
	9	Weathered sandstone.			No Ground Water											9				
	10																			10
	11	Weathered sandstone.			No Ground Water											11				
	12																			12
	13																			
	14	Sandstone; 100% core recovery.			No Ground Water											14				
	15																			15
	16																			
	17															17				
	18															18				
	19															19				
	20															20				
	21															21				
	22															22				
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	24															24				
	25															25				
	26															26				
	27															27				
	28															28				
	29															29				
	30															30				

SITE	BRIDGE NO. 04	HOLE NO.1	COORDINATE												
DATE	26/01/94 - 27/01/94	DRILL RIG	UGB-50	DRILLED	BouaSy	LOGGED	Khampha								
DEPTH	12.10m	INCLINATION	Vert.	ELEVATION	153.78 m	AVERAGE CORE RECOVERY	%								
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	STANDARD PENETRATION TEST							D E P T H		
						%	cm	10	20	30	40	50		60	70
	1		Clay.											1	
	2														2
	3														3
	4														4
	5													5	
	6		Sandy clay.											6	
	7		Sandstone.											7	
	8														8
	9														9
	10														10
	11													11	
	12													12	
	13													13	
	14													14	
	15													15	
	16													16	
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	24													24	
	25													25	
	26													26	
	27													27	
	28													28	
	29													29	
	30													30	

Water level 3.20 m, date 27/01/94, time 9:09



SITE		BRIDGE NO. 05		HOLE NO.1		COORDINATE																					
DATE		03/02/94 - 04/02/94		DRILL RIG		UGB-50	DRILLED		BouaSy	LOGGED		Khamphai															
DEPTH		15.00 m	INCLINATION		Vert.	ELEVATION		153.50 m	AVERAGE CORE RECOVERY		%																
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOVERY		STANDARD PENETRATION TEST							DEPTH												
						%	cm	10	20	30	40	50	60	70													
	1	Sandy clay.																1									
	2																								2		
	3																									3	
	4																									4	
	5	Sand.			▼														5								
	6																									6	
	7																										7
	8																										8
	9																										9
	10																										10
	11	Sandstone.																		11							
	12																										12
	13																										
	14																				14						
	15																				15						
	16																				16						
	17																				17						
	18																				18						
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	30																				30						

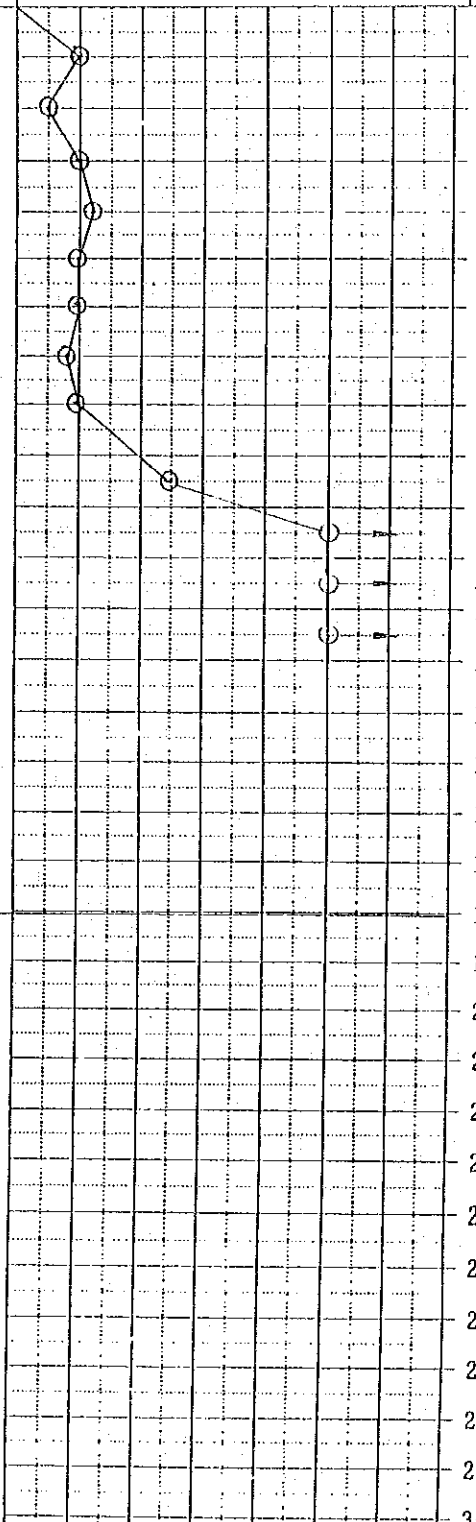
Water level 4.70 m, 04/02/94, time 7:15

SITE		BRIDGE NO. 08		HOLE NO.1		COORDINATE													
DATE		12 /12 /93 -13 /12 /93		DRILL RIG		UGB-50		DRILLED		BouaSy		LOGGED		Khamphai					
DEPTH		9.50 m		INCLINATION		Vert		ELEVATION		147.60 m		AVERAGE CORE RECOVERY		82 %					
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY		STANDARD PENETRATION TEST								D E P T H			
						%	cm	10	20	30	40	50	60	70					
	1 m		Sand medium & fine greyish dark.		No Ground Water												1 m		
	2																		2
	3		1.4-1.6m membred.																3
	4		Coarse-medium sand.																4
	5		Coarse sand with silty clay.																5
	6		Gravel with coarse sand & silty clay.																6
	7		Dark yellow clay.																7
	8																		8
	9																		9
	10		Intrusive rock dark-green, very hard.															10	
	11																	11	
	12																	12	
	13																	13	
	14																	14	
	15																	15	
	16																	16	
	17																	17	
	18																	18	
	19																	19	
	20																	20	
	21																	21	
	22																	22	
	23																	23	
	24																	24	
	25																	25	
	26																	26	
	27																	27	
	28																	28	
	29																	29	
	30																	30	

SITE	BRIDGE NO. 08	HOLE NO. 2	COORDINATE				
DATE	14 / 12 / 93 - 15 / 12 / 93	DRILL RIG	UGB-50	DRILLED BouaSy	LOGGED Khamphai		
DEPTH	18.04 m	INCLINATION	vert.	ELEVATION	152.00 m	AVERAGE CORE RECOVERY	97 %

DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY	STANDARD PENETRATION TEST							D E P T H		
							%	cm	10	20	30	40	50		60	70
	1 m		Very fine and fine sand.													1 m
	2															2
	3		Silty clay yellow green.													3
	4															4
	5		Boulder and gravel.													5
	6															6
	7		Clay & gravel.													7
	8															8
	9		Boulder and gravel													9
	10															10
	11		Clay, gravel, sand.													11
	12		Boulder, metamorphic clay, sand.													12
	13															13
	14															14
	15		Intrusive rock.													15
	16															16
	17															17
	18															18
	19															19
	20															20
	21															21
	22															22
	23															23
	24															24
	25															25
	26															26
	27															27
	28															28
	29															29
	30															30

NO Ground Water



SITE	BRIDGE NO.08		HOLE NO. 3		COORDINATE										
DATE	15/12/93 - 16/12/93		DRILL RIG	UGB-50	DRILLED	BouaSy	LOGGED	Khamphai							
DEPTH	22.45 m	INCLINATION	Vert.	ELEVATION	152.72m	AVERAGE CORE RECOVERY		%							
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							DE P T H m	
							%		cm						
	1														1
	2														2
	3														3
	4														4
	5														5
	6														6
	7		Silty soil with												7
	8		little fine												8
	9		gravel & sand.												9
	10														10
	11														11
	12														12
	13														13
	14														14
	15														15
	16														16
	17														17
	18														18
	19		Sandstone.												19
	20														20
	21														21
	22														22
	23														23
	24														24
	25														25
	26														26
	27														27
	28														28
	29														29
	30														30

No Ground Water

SITE	BRIDGE NO. 10	HOLE NO. 1	COORDINATE											
DATE	27/01/94 - 28/01/94	DRILL RIG	UGB-50	DRILLED	BouaSy	LOGGED	Khampha							
DEPTH	8.45 m	INCLINATION	Vert.	ELEVATION	150.167m	AVERAGE CORE RECOVERY	%							
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							DEPTH
							cm	10	20	30	40	50	60	
	1	Clay.			No Ground Water		10	20	30	40	50	60	70	1
	2						10	20	30	40	50	60	70	2
	3						10	20	30	40	50	60	70	3
	4						10	20	30	40	50	60	70	4
	5						10	20	30	40	50	60	70	5
	6						10	20	30	40	50	60	70	6
	7	Limestone.			No Ground Water		10	20	30	40	50	60	70	7
	8						10	20	30	40	50	60	70	8
	9													9
	10													10
	11													11
	12													12
	13													13
	14													14
	15													15
	16													16
	17													17
	18													18
	19													19
	20													20
	21													21
	22													22
	23													23
	24													24
	25													25
	26													26
	27													27
	28													28
	29													29
	30													30

SITE	BRIDGE NO.14	HOLE NO. 1	COORDINATE				
DATE	30/01/94 - 03/02/94	DRILL RIG	UGB-50	DRILLED BouaSy	LOGGED Khampha.		
DEPTH	16.85 m	INCLINATION	Vert	ELEVATION	156.97 m	AVERAGE CORE RECOVERY	%

DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY	STANDARD PENETRATION TEST							D E P T H	
							%	cm	10	20	30	40	50		60
	1 m		Clay & gravel.												1 m
	2		Clay.												2
	3		Sandy clay.												3
	4		Clay and Gravel.												4
	5		Clay and Gravel.												5
	6		Clay and Gravel.												6
	7		Clay and Gravel.												7
	8		Clay and Gravel.												8
	9		Clay and Gravel.												9
	10		Clay.												10
	11		Clay and gravel.												11
	12		Dark clay.												12
	13		Black shale.												13
	14		Clay.												14
	15		Limestone												15
	16														16
	17														17
	18														18
	19														19
	20														20
	21														21
	22														22
	23														23
	24														24
	25														25
	26														26
	27														27
	28														28
	29														29
	30														30




Water level 3.40 m, date 03/01/94, time 7:00

SITE		BRIDGE NO. 22		HOLE NO.1		COORDINATE													
DATE		21 / 12 / 93 - 23 / 12 / 93		DRILL RIG		JGB-50		DRILLED		BouaSy		LOGGED		Khampha					
DEPTH		12.40m		INCLINATION		Vert		ELEVATION		144.50 m		AVERAGE CORE RECOVERY		97 %					
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOVERY		STANDARD PENETRATION TEST							DEPTH				
						%	cm	10	20	30	40	50	60	70					
	1	~ ~ ~ ~	Clay.		No Ground Water												1		
	2	~ ~ ~ ~																	2
	3	~ ~ ~ ~																	3
	4	~ ~ ~ ~																	4
	5	~ ~ ~ ~	Sandy clay.															5	
	6	~ ~ ~ ~																	6
	7	~ ~ ~ ~																	7
	8	~ ~ ~ ~	Sandy clay/gravel.															8	
	9	~ ~ ~ ~																	9
	10	~ ~ ~ ~	Siltstone with opening 10-20 cm															10	
	11	+ + + +																	11
	12	+ + + +																12	
	13																13		
	14																14		
	15																15		
	16																16		
	17																17		
	18																18		
	19																19		
	20																20		
	21																21		
	22																22		
	23																23		
	24																24		
	25																25		
	26																26		
	27																27		
	28																28		
	29																29		
	30																30		

SITE	BRIDGE NO. 22	HOLE NO. 2		COORDINATE													
DATE	23/12/93 - 24/12/93	DRILL RIG	acker	DRILLED	BoonLom	LOGGED	Phetsone										
DEPTH	3.32m	INCLINATION	Vert	ELEVATION	131.70 m	AVERAGE CORE RECOVERY	%										
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY %	CORE RECOV ERY cm	STANDARD PENETRATION TEST							D E P T H m		
								10	20	30	40	50	60	70			
	1	Coarse sand with boulder.															1
	2	Limestone.															2
	3	Limestone cave															3
	4	Limestone.															4
	5																5
	6																6
	7																7
	8																8
	9																9
	10																10
	11																11
	12																12
	13																13
	14																14
	15																15
	16																16
	17																17
	18																18
	19																19
	20																20
	21																21
	22																22
	23																23
	24																24
	25																25
	26																26
	27																27
	28																28
	29																29
	30																30





SITE	BRIDGE NO. 22	HOLE NO3	COORDINATE					
DATE	23 / 12 / 93	- 24 / 12 / 93	DRILL RIG	UGB-50	DRILLED	BouaSy	LOGGED	Khamphai
DEPTH	14.50 m	INCLINATION	Vert	ELEVATION	143.70 m	AVERAGE CORE RECOVERY	95 %	

DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							D E P T H						
							cm	10	20	30	40	50	60		70					
	1	~ ~ ~ ~ ~	Silty clay with fine sand.		No Ground Water											1				
	2	~ ~ ~ ~ ~																		2
	3	~ ~ ~ ~ ~																		3
	4	~ ~ ~ ~ ~																		4
	5	~ ~ ~ ~ ~																		5
	6	~ ~ ~ ~ ~																		6
	7	~ ~ ~ ~ ~																		7
	8	~ ~ ~ ~ ~																		8
	9	~ ~ ~ ~ ~																		9
	10	~ ~ ~ ~ ~																		10
	11	▒ ▒ ▒ ▒ ▒	Limestone.		No Ground Water											11				
	12	▒ ▒ ▒ ▒ ▒																	12	
	13	▒ ▒ ▒ ▒ ▒																	13	
	14	▒ ▒ ▒ ▒ ▒																	14	
	15															15				
	16															16				
	17															17				
	18															18				
	19															19				
	20															20				
	21															21				
	22															22				
	23															23				
	24															24				
	25															25				
	26															26				
	27															27				
	28															28				
	29															29				
	30															30				

SITE		BRIDGE NO.28		HOLE NO. 1		COORDINATE													
DATE		01/02/94 - 01/02/94		DRILL RIG		UGB-50		DRILLED		Bouasy		LOGGED		Khampha					
DEPTH		4.75 m		INCLINATION		Vert		ELEVATION		143.66m		AVERAGE CORE RECOVERY		%					
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY		STANDARD PENETRATION TEST							D E P T H				
						%	cm	10	20	30	40	50	60	70					
	1 m		Sandy clay & gravel.		No Ground Water	95%										1 m			
	2			Limestone.															2
	3			Clay & gravel.															
	4		Limestone.														4		
	5																5		
	6																6		
	7																7		
	8																8		
	9																9		
	10																10		
	11																11		
	12																12		
	13																13		
	14																14		
	15																15		
	16																16		
	17																17		
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	20																20		
	21																21		
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	24																24		
	25																25		
	26																26		
	27																27		
	28																28		
	29																29		
	30																30		

SITE	BRIDGE NO.29	HOLE NO.1	COORDINATE																					
DATE	02/02/94 - 03/02/94		DRILL RIG	UGB-50	DRILLED	Bouasy	LOGGED	Khamphai																
DEPTH	15.30m	INCLINATION	Vert	ELEVATION	147.59 m	AVERAGE CORE RECOVERY		%																
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY	STANDARD PENETRATION TEST							D E P T H										
							%	cm	10	20	30	40	50		60	70								
	1	Sandy clay & gravel.															1							
	2																					2		
	3																						3	
	4																						4	
	5																						5	
	6	Clay and gravel.			No Ground Water													6						
	7																						7	
	8																							8
	9																							9
	10																							10
	11																							11
	12																							12
	13																							13
	14	Limestone.																	14					
	15																							15
	16																		16					
	17																		17					
	18																		18					
	19																		19					
	20																		20					
	21																		21					
	22																		22					
	23																		23					
	24																		24					
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	26																		26					
	27																		27					
	28																		28					
	29																		29					
	30																		30					

SITE		BRIDGE NO. 46		HOLE NO.1		COORDINATE												
DATE		18 /12 /93 - 19 /12/ 93		DRILL RIG		UGB-50		DRILLED		BouaSy		LOGGED		Khamphai				
DEPTH		12 .17 m		INCLINATION		Vert		ELEVATION		148 .00 m		AVERAGE CORE RECOVERY		%				
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY		STANDARD PENETRATION TEST							DE P T H			
						%	cm	10	20	30	40	50	60	70				
	1		Very fine sand yellowish white.		No Ground Water												1	
	2		Fine sand greyish white.															2
	3																	3
	4																	4
	5		Greyish dark clay medium stiff.															5
	6																	6
	7																	7
	8		Sandstone.															8
	9		Very fine sandstone.															9
	10																	10
	11		Sandstone.															11
	12							95%										12
	13																13	
	14																14	
	15																15	
	16																16	
	17																17	
	18																18	
	19																19	
	20																20	
	21																21	
	22																22	
	23																23	
	24																24	
	25																25	
	26																26	
	27																27	
	28																28	
	29																29	
	30																30	

SITE	BRIDGE NO. 46	HOLE NO.2	COORDINATE																
DATE	24 / 12/93	-24 /12 /93	DRILL RIG	acker	DRILLED	BoonLom	LOGGED	PhetSone											
DEPTH	3 .10 m	INCLINATION	Vert.	ELEVATION	142 .00 m	AVERAGE CORE RECOVERY		76 %											
DATE	DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION	BIT DIA MET ER	GR. WA TER LE VEL	CORE RECOV ERY %	STANDARD PENETRATION TEST							DE P TH					
							cm	10	20	30	40	50	60		70				
	1 m		Yellowish grey sandy clay.												1				
	2		Yellowish coarse sand.													2			
	3		Strong weathered sandstone greyish white.													3			
	4		Greyish white sandstone.			85%										4			
	5																	5	
	6																		6
	7																		7
	8																		8
	9																		9
	10																		10
	11															11			
	12															12			
	13															13			
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	26															26			
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	28															28			
	29															29			
	30															30			