Minutes of Meetings

on

Progress Report of

the First Year (Latter) Work

(April 30, 1993)

MINUTES OF MEETINGS

FOR

THE TOPOGRAPHIC MAPPING

OF

BOLIKHAMXAI PROVINCE

IN

LAO PEOPLE'S DEMOCRATIC REPUBLIC

BETWEEN

JICA STUDY TEAM

AND

NATIONAL GEOGRAPHIC DEPARTMENT (NGD)

At Vientiane, 30th of April, 1993

Mr.Khamkhong DETCHANTHACHACK
Dupty Director of National
Geographic Department

Mr.Koichi MIKI
Deputy Leader of the JICA
Study Team

The JICA Study Team (referred to as the Team hereafter)headed by Mr.Tositomo KANAKUBO visited Lao P.D.R. on the 6th of March, 1993 to carry out the Second Year Part I work for technical cooperation of the Topographic Mapping of Bolikhamxai Province in Lao P.D.R.

The meeting was held at the National Geographic Department (referred to as the NGD hereafter) on the 8th-9th of March and 23th-28th of April, 1993 and the following items were discussed and mutually agreed upon between the NGD and the Team.

The list of the Attendants is shown in Annex.

1. The Team explained the contents of Study in the 1st year and submitted the draft study reports.

2. At the commencement of Study for 2nd year, the Team explained the study schedule based upon the Plan of Operation and NGD confirmed the undertakings.

3. The Team completed the all study of Phase II- Part I (Leveling and Pricking) and submitted the progress reports.

4. The Team completed establishment of the permanent monuments and GPS observation for six (6) new ground control points mentioned in the second item of Minutes of Meeting dated 24th Dec. 1992.

5. The NGD reconfirmed to leave the method for transfer of the spheroid to the Team.

6. Towards the next field verification by aerial photos, the Team requeted NGD would prepare a draft map simbol and their application and collect the necessary data for its preparation.

7. The NGD strongly requested the Team and the supervising team for the counterpart training, next succeeding mapping project, dispatchment of experts and supplying survey equipments for strengthening NGD and the Japanese side took note and promised to convey the above to JICA Head office.

ANNEX: List of the Attendants of the Meeting

Laos side

Mr.Thongpene SOUKLASENG	General Director of National Geographic Department
Mr.Boualay XAIGHASANE	Deputy Director of National Geographic Department
Mr.Khamkhong DETCHANTHACHACK	Deputy Director of National Geographic Department
Mr.Thongchanh MANIXAY	Chief of Planning Section
Mr.Bounkong SOUGNATY	Chief of Survey Division
Mr.Neuang XAIPANGNA	Chief of Cartography Division
Mr.Phouangphane SAYASANE	Deputy Chief of Cartography Division

Japanese side

Mr.Koichi MIKI	Deputy Leader
Mr.Yasuo TANAKA	Mapping Planner
Mr.Fujio ITO	Chief Surveyor
Mr.Hideaki SAKAI	Coordinator

PROGRESS REPORT
OF
THE FIELD WORK OF THE SECOND YEAR(PART I)
FOR
TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

MAY, 1993

STUDY TEAM
OF
TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

JAPAN INTERNATIONAL COOPERATION AGENCY

1. Outline of the Second Year Work(Part I)

1-1 Objectives

Objectives of the Study are : (1) To prepare 1/25,000 topographic maps covering the Bolikhamxai Province, (2) To transfer technology

to the counterparts of NGD through the implementation of the works, and (3) To establish the friendship between Lao PDR and Japan through the implementation of the Study..

The second year work (Part I) of the Study is consisting of the ground control survey-II(leveling and pricking) in Laos and the aerial triangulation in Japan.

1-2 Period of Survey Work

Field work

(Headquarters)	6 March, 1993 - 2 May, 1993
(Leveling)	6 March, 1993 - 2 May, 1993
(Pricking)	6 March, 1993 - 2 May, 1993

1-3 Formation of the Study Team

Deputy Leader	Mr. Koichi MIKI	5 March '93 - 3 May '93
Mapping Planner	Mr. Yasuo TANAKA	5 March '93 - 3 May '93
Chief Surveyor	Mr. Fujio ITO	5 March '93 - 3 May '93
Mechanical Engineer	Mr. Atsushi TANAKA	5 March '93 - 3 May '93
Ground Control Survey	Mr. Kiyofumi TAMARI	5 March '93 - 3 May '93
"	Mr. Hideya SAWAKI	5 March '93 - 3 May '93
"	Mr. Takao TERAJI	5 March '93 - 3 May '93
"	Mr. Masashi NARUMI	5 March '93 - 3 May '93
"	Mr. Hideto HOSODA	5 March '93 - 3 May '93
"	Mr. Seiichi FUKUTOMI	5 March '93 - 3 May '93
"	Mr. Hiroshi TAKEUCHI	5 March '93 - 3 May '93

"	Mr. Hiroshi SHIMAMURA	5 March '93 - 3 May '93
"	Mr. Yoshiharu SATO	5 March '93 - 3 May '93
Coordinator	Mr. Hideaki SAKAI	5 March '93 - 14 May '93 19 Apr. '93 - 28 Apr.'93

1-4 Amount of the Survey Work (Plan and Results)

Work in the Second year (Part I) are shown in the following Table1

Table 1

Item		Original Plan	Results
Leveling		580 km	610 km
Pricking	Control points	29 points	29 points
	New level line	580 km	610 km
	Existing level	150 km	150 km
Additional work	Monumentation		6 points
	GPS Survey		6 points

1-5 Co-operation of Counterparts of NGD

Headquarters	Mr. Thongpene SOUKLASENG Mr. Boualay XAIGNASANE Mr. Khamkhong DETCHANTHACHACK Mr. Thongchanh MANIXAY Mr. Bounkong SOUGNATY
Gound Control Point Survey-II (leveling and pricking)	Mr. Bounhom Mr. Khampheng Mr. Savath Mr. Kixai Mr. Saykham Mr. Boumi

1-6 Supervision of the Field work

During the second year field work(Part I),the following advisors were sent to Laos by JICA for technical meeting with NGD and supervision of the field work.

Mr.Kazushige ENDO — First Development Study Division
Social Development Study Department
Japan International Cooperation Agency

Mr.Yasuo IDE — Technical Management Officer
Topographical Department Geographical
Survey Institute,
Ministry of Construction

2 Field Work

2-1 Leveling

Minor order leveling was carried out covering about 580km at the Study area. Its closure discrepancy was $50mm\sqrt{s}$ as specified in Scope of Work,where s is distance in km.
The leveling routes were connected to the existing Bench Marks and also,connected to GPS points as much as posible to estimate the Geoidal height.
Cross-river leveling was conducted at Nam Theun.
Leveling routes are as shown in Fig.1

2-1-1 Monumentation

To accept the requests of NGD,Monumentation was made along the National road 13 and 8.
20 points were set on the parmanent structure and leveled.

2-1-2 Instrument employed.for Observation

Level : Wild NA2000
Staff : Bar-cord staff

2-1-3 Check measurement

Before or after observations, Check measurements of existing Bench Marks were made to observe between the start point and neighboring Bench Mark for the confirmation of its accuracy.
The results are follows:

Table 2

Section	Relative height (m)		Difference	Remarks
	Given	Measured		
BM.0624 --> BM.0684 (Thakhek)	- 4.985	- 4.995	0.010	
BM. 201 --> BM220 (B.Thangben)	- 0.181	- 0.165	0.016	
BM.0669 --> BM.0147 (B.Phonsa-At)	+ 10.880	+ 10.878	0.002	
BM.0655 --> BM.0169 (B.Naliang)	- 10.932	- 10.986	0.054	
BM.0602 --> BM.0504 (B.Lao)	- 18.239	- 18.235	0.004	
BM.0558 --> BM.0400 (Nam Kadin)	- 1.672	- 1.655	0.017	
BM.0631 --> BM.0609 (Pak xan)	+ 0.623	+ 0.619	0.004	

Given Points

Following points were adopted finally as given points for computation ;

BM.0624 BM.0602 BM.0147
BM.0655 BM.0400 BM.0609
BM.0220

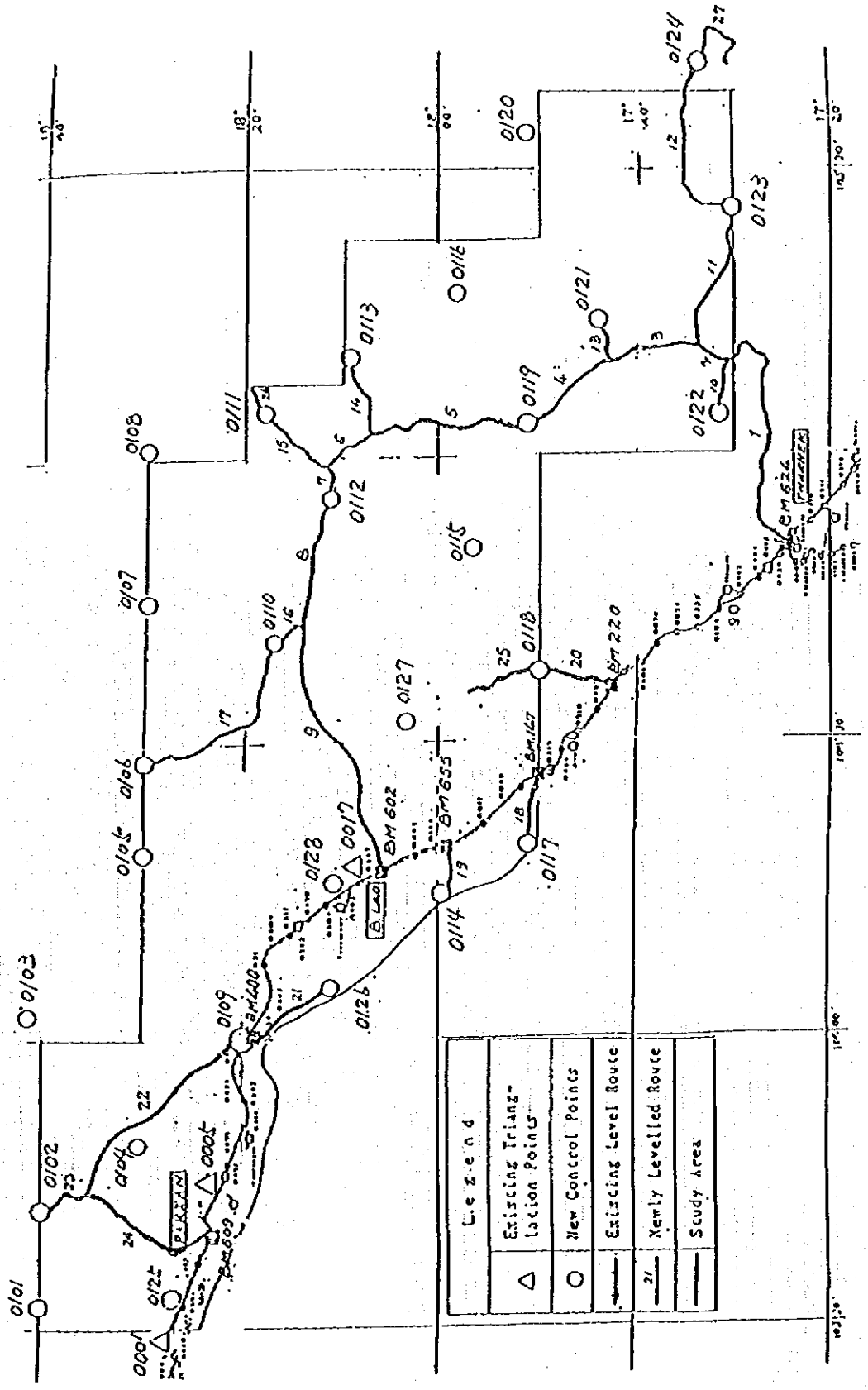
2-1-4 Closures and Tolerances

Closures for the respective route sections are as follows.

Table 3 Leveling clousures and tolerances

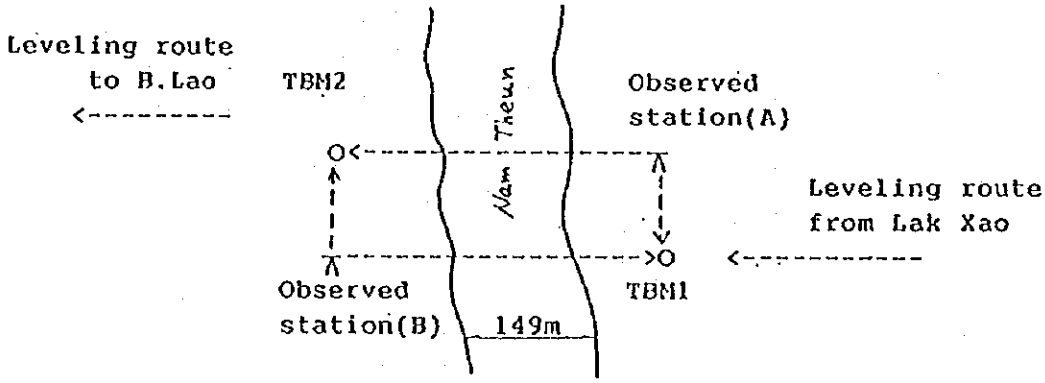
Route No.	Given BM	Dist.km	Clousure mm	Tolerance mm	Remarks
R1+R2+R3 +R4+R5+R6 +R7+R8+R9	BM 0624-->BM 0400	249	97	787	closed route
R22+R24	BM 0609-->GPS 0122	77	48	435	closed route
R10	TBM 0109-->GPS 0122	9	63	141	double-run
R11	TBM 0200-->GPS 0123	29	25	264	double-run
R12	GPS 0123-->GPS 0124	39	36	308	double-run
R13	TBM 0400-->GPS 0121	13	43	180	double-run
R14	TBM 6000-->GPS 0113	18	19	212	double-run
R15	TBM 7000-->GPS 0111	19	12	212	double-run
R16	TBM 8000-->GPS 0110	10	2	158	double-run
R17	GPS 0110-->TBM 1711	46	29	339	double-run
R18	BM 0147-->TBM 1804	9	61	150	double-run
R19	BM 0655-->GPS 0114	13	27	180	double-run
R20	BM 201-->GPS 0118	16	23	200	double-run
R21	BM 400-->GPS 0126	17	4	206	double-run
R23	TBM 2200-->GPS 0102	15	73	187	double-run
R25	GPS 0118-->TBM 2509	17	31	206	double-run
R26	TBM 2600-->TBM 2606	12	5	173	double-run
R27	GPS 0124-->TBM 2709	20	48	223	double-run

FIGURE 1. . INDEX MAP FOR LEVELLING



2-1-5 Cross-river leveling

Cross-river leveling across Nam Theun was conducted on the survey route 9.
The reciprocal leveling method was used to keep requested accuracy.
The results are as follows;



Reading station A	Set	Dist.(m)	Height difference(m)
	1	149	0.425
	2	149	0.429
	Mean	149 m	0.427 m

Reading station B	Set	Dist.(m)	Height difference(m)
	1	148	0.439
	2	149	0.441
	Mean	149 m	0.440 m

Final height difference

Mean between A and B	149 m	0.434 m

3. Pricking

Pricking of the horizontal and vertical control for aerial triangulation was conducted using the 2-times or 4-Times enlargements of aerial photos.

3-1 Horizontal control point

Pricking of 3 points of existing control poits and newly established 26 GPS points were performed on the 4-times enlargement photo.

Elements of eccentricity for pricking were conducted using by GPS and observation of the Sun.

Only one point located near Vietnam border was not pricked because of bad weather.

But, Pre-marking for this point was confirmed on the 4-times enlargement photo in plase of pricking.

3-2 Existing Bench Marks and spot heights

Pricking of existing Bench Marks and spot heights was conducted on the 2-times enlargement photos along the leveling routes.

Spot heights were calculated by leveling observed data and pricked every 2 or 3 km.

Routes of pricked leveling are as shown in Fig 1.

4. GPS Observation for the Datum conversion

For the datum conversion from Krossovsky spheroid to Everest, previously established GPS Net Work was connected to the existing points which has coordinates reffered to Everest spheroid in Pak xan and Thakek.

The calculation for Datum conversion shall be performed by the Net Re-Adjustment in Japan.

The observed result are as shown in table 4.

Table4 (Observed result)

Area	Station combination for Baseline		Computed Slope Distance	Accuracy
Pak xan	*0001	*0005	29,490.572 m	TD =130,434.390 m
	*0005	M0400	6,973.072	dx = -0.058
	M0400	M0500	35,660.777	dy = +0.004 dz = -0.004
	M0500	*0001	58,309.969	Ratio = 0.45 ppm
Thakek	*0021	0122	53,825.812	TD =129,243.289
	0122	M5014	32,255.241	dx = +0.193
	M5014	0335	22,474.351	dy = +0.323 dz = +0.030
	0335	*0021	20,687.886	Ratio = 2.92 ppm

RE; * : Existing points with krassovsky coodinates
M : Existing points with Everest coodinates
: Temporary point

Closing error between M0500(Pak xan)and M5014(Thakek) was found approx.1.5m to 202.7 km distance(approx.1/135,000).
It was confirmed those exising control points were useful for datum convesion.

5. Additional work

In responce to the request of NGD, 6 control points were monummented and observed by GPS at three areas(Pak xan,Lak Xao and Nakai) haveing the heigh potentiality to be developed in the future.
The coordinate closures of each group were as shown in table 4.

Table 5

Area	Station combination for Baseline		Computed Slope Distance	Accuracy
Pak xan	*0001	*0129	24,030.424 m	TD = 59,484.975 m
	*0129	*0005	5,963.240	dx = +0.066
	*0005	N0609	6,502.792	dy = -0.029 dz = -0.024
	N0609	*0001	22,988.520	Ratio = 1.28 ppm
Lak xao	N0112	N0130	1,969.898	TD = 41,137.713
	N0130	0111	18,138.825	dx = -0.285
	0111	N0131	15,651.872	dy = -0.035 dz = +0.048
	N0131	0112	5,377.118	Ratio = 7.08 ppm
Nakai	N0132	N0121	9,788.825	TD = 96,158.536
	N0121	0123	29,300.798	dx = -0.421
	0123	0122	35,903.923	dy = -0.101 dz = +0.022
	0122	N0132	21,164.990	Ratio = 4.51 ppm

RE; N : NEW established points
* : Existing points
: Temporary point

Minutes of Meetings

on

Plan of Operation of

the Second Year's Work

(October 1, 1993)

MINUTES OF MEETINGS
FOR
THE TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
BETWEEN
JICA STUDY TEAM
AND
NATIONAL GEOGRAPHIC DEPARTMENT (NGD)

The JICA Study Team (referred to as the Team hereafter) headed by Mr. Tositomo KANAKUBO visited Lao P.D.R. on the 25 th of September, 1993 to Second Year Work for technical cooperation of the Topographic Mapping of Bolikhamxai Province in Lao P.D.R.

The meeting was held at the National Geographic Department (referred to as the NGD hereafter) on the 28 th of September and the 1 st of October, 1993 and the following items were discussed and mutually agreed upon between the NGD and the Team.

The list of the Attendants is shown in the Annex.

1. The Team explained the first year work of Topographic Mapping of Bolikhamxai Province and submitted the reports on aerial photography and control point survey to NGD.

2. The Team also explained the second year work and submitted the plan of operation to NGD.

3. NGD accepted the above- mentioned reports and plan of operation and assigned the necessary counter part personnel during the second year.

4. The Team requested for the issue of ID. cards of new members of the Team and the extension of visas, and NGD undertook them.

5. Discussions shall be continued for the map symbols and their application rules of the topographic maps.

At Vientiane, 1 st of October, 1993

Mr. Boualay XAIGNASANE For General Director of National Geographic Department	Mr. Tositomo KANAKUBO Leader of the JICA Study Team

ANNEX: List of the Attendants of the Meeting

Laos side

Mr. Thongpene SOUKLASENG	General Director of National Geographic Department
Mr. Boualay XAIGNASANE	Deputy Director of National Geographic Department
Mr. Khamkhong DETCHANTHACHACK	Deputy Director of National Geographic Department
Mr. Bounkong SOUGNATY	Chief of Survey Division
Mr. Thongchanh MANIXAY	Chief of Planning Section
Mr. Neuang XAIPANGNA	Chief of Cartography Division
Mr. Phouangphane SAYASANE	Deputy Chief of Cartography Division

Japanese side

Mr. Tositomo KANAKUBO	Leader
Mr. Koichi MIKI	Deputy Leader
Mr. Yasuo TANAKA	Mapping Planner
Mr. Fujio ITO	Chief Surveyor
Mr. Hideaki SAKAI	Coordinator
Mr. Yasuo IDE	Technical Management Officer Geographical Survey Institute

PLAN OF OPERATION

TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

- 2nd Year -

SEPTEMBER, 1993

JAPAN INTERNATIONAL COOPERATION AGENCY

ラオス国ボーリカムサイ県
地形図作成調査
THE TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
19°
18°
105°
104°
103°
THAKHEK
地形図作成地域
Mapping zone

PLAN OF OPERATIONS
FOR
THE TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

INTRODUCTION

In June 1991 the government of Lao People's Democratic Republic (referred to as Laos hereinafter) made a request to the government of Japan to provide technical cooperation for the topographic mapping of Bolikhamxai Province (referred to as the Study hereinafter) after recognizing the importance it has as basic survey for planning and implementation of various projects.

In response to the request and acting on behalf of the Japanese government, the Japan International Cooperation Agency (referred to as JICA hereinafter) sent a Preparatory study team to Laos over a period of mid-August to late August 1992 to have talks with the National Geographic Department (referred to as NGD hereinafter), the counterpart agency on behalf of the Laotian government.

After a series of talks and studies the two governments agreed to the Scope of Work on the Topographic Mapping of Bolikhamxai Province (referred to as S/W hereinafter).
The Study as agreed based on the S/W as above involves the topographic mapping of Bolikhamxai Province of Laos talking four years (37 month).JICA dispatched a study team(referred to as the Team hereinafter) for the implementation of the Study for the 2nd year starting December 1992 lasting until February 1993.

CHAPTER 1. SCOPE OF WHOLE STUDY

1-1 OBJECTIVE OF THE STUDY

1.Base Map Preparation

Based on the request from the Laotian government, the topographic maps as specified below are to be produced to serve as basic material for planning of development/conservation projects in Bolikhamxai Province.

Scale : 1:25,000. Neat lines : 5'X 7.5'
A total of 112 maps sheets in 5 colors.

2.Technology Transfer

Technology transfer is to be made of map making technology through the Study to Laotian counterparts.

1-2 SCOPE OF WORK

The scope of work to achieve the captioned objective is stated in a document entitled "Scope of Work for Topographic Mapping of Bolikhamxai Province in Lao People's Democratic Republic" agreed between NGD on 12th August 1992 (hereinafter referred to as "S/W").
It covers:

Aerial Photography, Control Point Survey and Leveling,
Aerial Signalization and Pricking, Field Verification,
Aerial triangulation, Plotting, Compilation, Field Completion,
Cartography, Drafting and Printing.

The volume of the Study and yearly job classification is tabulated as Table 1.

Table 1. Work volume of the Study

	ITEM	VOLUME	REMARK
First Year 1992 ∫ 1993	1.Aerial photography	approx.13,000km²	scale 1/40,000 (approx.920 pcs.)
	2.Ground control survey by GPS	approx.29points	including 3known points
	3.Leveling	approx.580km	
	4Pricking		
	GPS Point	29points	including 3 known points
	Traverse point	7points	
	Established B.M.	approx.143km	
	New leveling line	approx.580km	
	Aerial triangulation	approx.817models	
Second Year 1993 ∫ 1994	Field identification	approx.13,000km²	
	Plotting	approx.3,200km²	scale 1/25,000 (30sheets)
	Compilation	approx.3,200km²	scale 1/25,000 (30sheets)
Third Year 1994 ∫ 1995	Field completion	approx.13,000km²	scale 1/25,000 (92sheets)
	Plotting	approx.9800km²	
	compilation	approx.9800km²	scale 1/25,000 (92sheets)
Forth Year 1995	Drafting	approx.13,000km²	
	Printing	112 sheets	

1-3 STANDARD OF THE STUDY

Principal technical specifications are tabulated as table 2.

Table 2. standard of the Study

Reference ellipsoid	:Everest 1830
Map projection	:U.T.M Zone 48
Datum of height	:Mean sea level of South China sea at Viet Nam
Map scale	:1:25,000
Neat lines	:5'X 7.5'
Contour line	:Intermediate contour 10m Supplementary half contour 5m, subject to topography.
Map smboies and its application rule	:Those adopted by NGD
Ground control point survey	:1/100,000
Leveling	:5cm$\sqrt{S}$ S:km
Number of colors	:5 colors
Map accuracy	
a.Planimetry	:not more than 1.0mm on the map
b.Spot height	:not more than 2/3 of contour interval
c.Contour	:not more than 1/1 of contour interval

1-4 GENERAL UNDERTAKINGS

The Study shall be conducted in close cooperation between the two countries of Laos and Japan. Responsibilities of each side set forth in S/W (as attached) are summarized as follows:

1.Laotian side:
-Necessary arrangements to ensure the entry, exit and stay of the team members as well as personal of an aerial photography company contracted by the team for the Study together with related materials and equipment (collectively referred to as Survey Team) to bring in and out of Laos.
-Assistance to issuance of permits necessary for implementation of the survey work.

2.Japanese side:
-Implementation of the Study in Laos and Japan.
-Technology transfer through the execution of the study.

T.K.

1-5 WORK PLAN

The Study shall be carried out under a four-year program starting from December 1992, and accomplishing in December 1995 as shown in Table 3.

CHAPTER 2. WORK TO BE MADE IN THE FIRST YEAR (PHASE 1)

2-1 VOLUME OF THE WORK

The work to be made the first year is as follows:

Control Point Survey	29points
Minor Order Leveling	approx.615km
Pricking	Holizontal control 29 points
	Vertical control 765km
Aerial triangulation	819 models

CHAPTER 3. WORK TO BE CARRIED OUT IN THE SECOND YEAR (PHASE 2)

3-1 VOLUME OF THE WORK

The work volume in this phase is as follows:

Field Verification	13,000km²
Plotting	3,200km² (Approx.30 sheets)
Compilation	3,200km² (Approx.30 sheets)

3-2 WORKING SCHEDULE

Working schedule is shown in table 6 and should be executing in 2nd year's program.

Field Verification:

From the end of September to the middle of December 1993 organizing 5 parties.

Plotting:

From the first of January to the end of March 1994 in Japan.

Compilation:

From the first of January to the end of March 1994 in Japan.

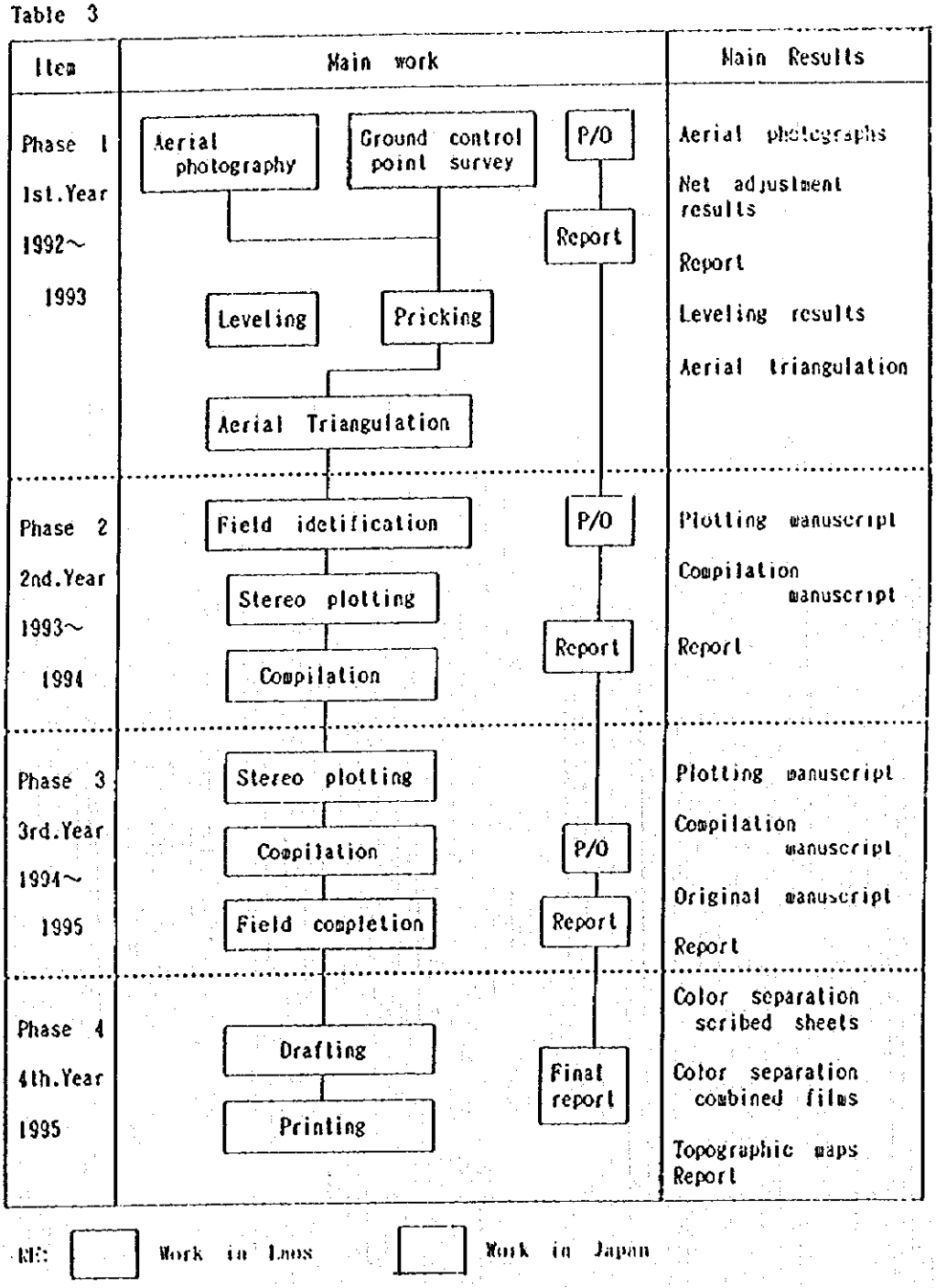
CHAPTER 4. PLAN OF OPERATIONS FOR PHASE 2 (SECOND YEAR,1993)

The study for phase 2 consists of field survey and laboratory works. Laboratory works consist of Plotting and Compilation using the results of field verification.

T.K.

Flowchart for the production of topographic maps

Table 3



4-1 FIELD VERIFICATION

Covering the proposed mapping area, by the use of aerial photographs, the results of preliminary photo-interpretation done in advance shall be identified in the field. The keys for photo-interpretation shall also be prepared.

Based on application rule of the map symbols, necessary items to present on the map shall be collected and verified in the field. The results shall be inscribed on the double enlargement of the aerial photographs and other related materials ready for plotting and compilation. Close cooperation of NGD to the Team is cordially requested in identification of ground features, collection of materials such as toponomy, Administrative boundary, etc.

(1) Planning and preparation

1) Prior to proceeding into the field verification study shall be carried out in Japan to prepare materials which shall be needed for field verification in reference to map symbols and their application rules for 1/25,000 topographic maps and 1/20,000 aerial photographs for use in field identification, which are double enlargements of 1/40,000 photographs taken by JICA, etc.

(2) Items to discussed with NGD

Concerning field identification, technical items to be discussed with NGD and to be confirmed are as follows:

1) Map symbols and their application rule,
2) Administrative names and boundaries,
3) Data to be supplied by NGD
   a. Capacity of bridge
   b. Location of water gauge
   c. Location map of Governmental office
   d. Location map of school
   e. Forest information
   f. Electric power line
4) Name and reference number of each map sheet.
5) Marginal information and legend.

(3) Items of field verification

In compliance with the map symbols and their application rules, following items shall be investigated and/or confirmed in the field:

1) Confirmation of the result of pre-interpretation.
2) Keys for photo-interpretation of topography and ground feature.
3) Items difficult to interpret on the aerial photograph.
4) Items necessary for the application of map symbols, such as roads. railways, buildings, geodetic control points, specified areas, rivers, vegetation, etc.
5) Collection of materials at local administrative offices.
6) Materials in the field concerning various kind of names, including administrative names, and administrative boundaries necessary for annotation on the map,

4-2 LABORATORY WORKS

4-2-1 Stereo Plotting (Restitution)

On the bases of the results of aerial triangulation and field identification, necessary items for representing on the map shall be measured and restituted by stereo plotting machine and plotted manuscript of the topographic map shall be prepared.

1. Method

(1) Materials
For restitution, stable polyester sheet shall be used.

(2) Neat lines
Neat lines shall be 7.5'(longitude)x 5'(latitude)

(3) Planning
Plotting area covers appoximately 13,000km² as shown in Table 5 consisting of 112 sheets. Plotting shall be executed in two phases. Approximatery 3,200 km2 (30 sheets) shall be made in this year. The remaining part of approximately 9,800 km2 (82 sheets) shall be completed in phase 3.

(4) Projection
Projection shall be Universal Transvers Mercator (Gauss-kruger's projection). Study area locates Zone 48.

(5) Plotting
Neat lines, control points, grid lines and ticks shall be plotted on the sheet using automatic coordinategraph. The maximum discrepancy shall not exceed the value specified by the JICA's specifications.

(6) Orientation
1) After the absolute orientation of the photograph, the discrepancy between the plotted points and their model points shall not exceed the value specified by the JICA's specifications.
2) For orientation of height, pricked bench marks shall be used as many as possible for the sake of accuracy of height of the map.

(7) Restitution
1) Restitution shall be executed in accordance with the map symbols and their application rules in the order of linear elements, such as roads, rivers, etc.,buildings, vegetation and contour lines.
2) Ingeneral, buildings shall not be generalized. In agglomeration, however, they can be generalized.
3) If necessary, planimetry and hypsography can be restituted on separate sheets.
4) Care must be taken to get rid of the effect of curvature of the earth's surface while restitution.
5) Intermediate contour line shall be 10m and half interval auxiliary contour lines of 5m shall be supplemented according to the topography. Care must be taken for the representation of micro topography the study area being rich in various types of ground features and topography, like hills, plains, forests, seasonal rivers, cultivated lands, etc.

T.K.

(8) Measurement of spot heights

1) Spot height shall be measured photogrammetrically at conspicuous points like junctions of main roads, distinct knick points of topography, etc.
2) Density of spot heights shall be discussed with NGD, including the distribution of vertical control points (bench mark) to represent on the map.
3) The effect of the curvature of the earth's surface shall be compensated.

(9) Adjustment

Following results and materials obtained shall be adjusted.

1) Plotted manuscript,
2) Control point data sheet,
3) Record of orientation.

4-3. Compilation

On the basis of the plotted manuscripts, compilation shall be carried out using the results of field identification and materials collected and prepare materials necessary for succeeding procedures .

4-3-1 Method

(1) Materials

For compilation work, stable synthesized polyester sheet shall be used and the specifications shall be the same as for the sheet for plotting.

(2) Planning

Compilation also shall be executed in two phases approximately 3,200 Km²(30 sheets) shall be compiled. The rest approx.9,800km2 shall be dealt with in the next phase.

(3) Preparation of compiled manuscript

1) Care shall be taken to keep the density of drawn lines uniform and avoid error or omission during compilation work following the rules for map representation.
2) If any doubtful point arises during compilation, it shall be noted to clarify it at the time of field completion.
3) On the basis of plotted sheet, control point data sheet and materials collected in the field, various kind of data sheets as given in the article (4) shall be prepared.
4) Annotation sheets are prepared in two editions of Latin letter and Lao alphabet. The Lao alphabet edition shall be prepared by NGD in phase 3.

(4) Adjustment

Following results and materials obtained shall be adjusted:

1) Compiled manuscript,
2) Annotation data sheets,
3) Road information sheets,
4) Vegetation data sheet,
5) Water information data sheet,
6) Forest information data sheet,
7) Bridge information data sheet,
8) Marginal information data sheet,

CHAPTER 5. FINAL PRODUCTS AND MATERIALS

Final products and materials of phase 2 are as follows:

(1) Field identification
  1) Photographs with field verified data 1 set
  2) Overlays on the above 1 set
  3) Collected materials 1 set
(2) Stereo plotting
  1) Plotted manuscript 1 set
  2) Control point data sheet 1set
  3) Record of orientation 1 set
(3) Compilation
  1) Compiled original 1 set
  2) Annotation data sheets 1 set
  3) Road data sheet 1 set
  4) Vegetation data sheet 1set
  5) Water system data sheet 1set
  6) Forest information data sheet 1 set
  7) Bridge information data sheet 1 set
  8) Marginal information data sheet 1 set

3-4 ORGANIZATION OF THE STUDY TEAM

The organization of the Team is as follows:

Duty	Number of Team	Number of parties
(Field Identification)		
Leader	1	
Deputy leader	1	
Mapping planner	1	
Mechanic	1	
Chief surveyor	1	
Surveyor	8	5 parties
Counterpart	5	

The survey team involved in this Study is organized as follows:

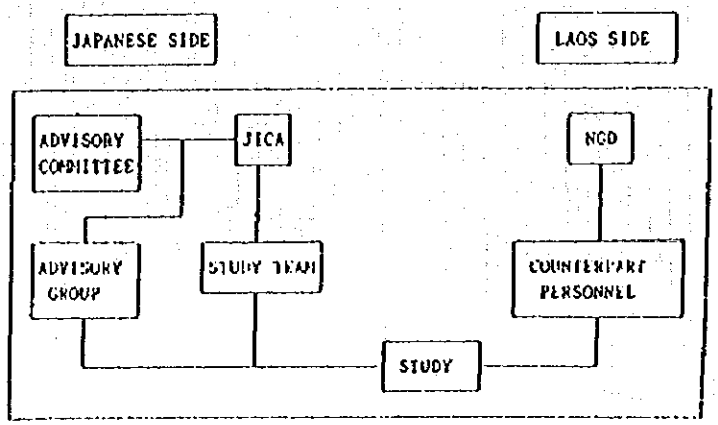


Table 4. MEMBERS OF STUDY TEAM AND THEIR ASSIGNMENT IN THE 2ND YEAR

NAME	ASSIGNMENT	DURATION	CHARGE
Toshitomo KANAKUBO	Team Leader	24/9 -13/10 10/12-22/12	1.Total Management 2.General discussion
Koichi MIKI	Deputy Team Leader	24/9 -22/12	1.Sub Management 2.General Discussion 3.General Supervision
Yasuo TANAKA	Mapping Planner	"	1.Fundamental Map Planning 2.General Coordination 3.Making Report
Fujio ITO	Chief Surveyor	"	1.Planning of Implementation 2.Supervision of Works 3.Coodination of Works 4.Quality checking of Results
Atsusi TANAKA	Mechanical	"	1.Management of Vehicle 2.Maintenance of Vehicle
Minori ONAKA	Surveyor	"	Field Verification
Masaru TERADA	Surveyor	"	Field Verification
Norio GOTO	Surveyor	"	Field Verification
Kiyofumi TAHARI	Surveyor	"	Field Verification
Hideto HOSODA	Surveyor	"	Field Verification

NAME	ASSIGNMENT	DURATION	CHARGE
Yoshiharu SATO	Surveyor	24/9 -22/12	Field Verification
Sadao MATSUMOTO	Surveyor	"	Field Verification
Hideya SAWAKI	Surveyor	"	Field Verification
Hideaki SAKAI	Coordinator	24/9 -3/10 13/12-22/12	

Table 5 INDEX MAP FOR CARTOGRAPHING AND SHEET NUMBER

Table 6 WORKING SCHEDULE

Minutes of Meetings

on

Progres Report of

the Second Year's Work

(December 17, 1993)

MINUTES OF MEETINGS
FOR
THE TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
BETWEEN
JICA STUDY TEAM
AND
NATIONAL GEOGRAPHIC DEPARTMENT

At Vientiane, 17th of December, 1993

T. K.

The JICA Study Team (referred to as the Team hereafter) headed by Mr.Tositomo KANAKUBO visited Lao P.D.R. on the 25th of September, 1993 to carry out the Second Year (Part II) work for technical cooperation of the Topographic Mapping of Bolikhamxai Province in Lao P.D.R.

The meeting was held at the National Geographic Department (referred to as the NGD hereafter) on the 13th-17th of December, 1993. The team submitted a progress report to explain the work of this stage.

NGD accepted the study results including progress report submitted by the Team and appreciated for their effort and technical transfer.

The following items were discussed and mutually agreed upon between the NGD and the Team. The list of the Attendants is shown in Annex.

1. As the future undertakings of Laos side, NGD confirmed that NGD would prepare the annotation data, and the Team expressed the intention to prepare sample maps consisting of the three(3) kinds of two(2) sheets covering town area and mountain area by the next study stage.

2. Concerning the schedule of next study stage, NGD advised that the study should be started from November, but not from September,1994 because of the rainy season.

3. NGD strongly requested that the counterpart training for the succeeding processes should be conducted in Japan, and the Team replied that their request would be conveyed to JICA Headquarters.

4. NGD also requested that members of NGD could participate in the group training course in 1995, and the Team also replied that their request would be conveyed to JICA Headquarters.

At Vientiane, 17th of December, 1993

Mr. Boualay XAIGNASANE	Mr. Tositomo KANAKUBO
For General Director of National	Leader of the JICA Study
Geographic Department	Team

ANNEX: List of the Attendants of the Meeting

Laos side

Mr.Thongpene SOUKLASENG	General Director of National Geographic Department
Mr.Boualay XAIGNASANE	Deputy Director of National Geographic Department
Mr.Khamkhong DETCHANTHACHACK	Deputy Director of National Geographic Department
Mr.Thongchanh MANIXAY	Chief of Planning Section
Mr.Neuang XAIPANGNA	Chief of Cartography Division
Mr.Phouangphane SAYASANE	Deputy Chief of Cartography Division

Japanese side

Mr. Tositomo KANAKUBO	Team Leader
Mr.Koichi MIKI	Deputy Leader
Mr.Yasuo TANAKA	Mapping Planner
Mr.Fujio ITO	Chief Surveyor
Mr.Hideaki SAKAI	Coordinator

Observer

Kenji DOMOTO	Special Assistant, Embassy of Japan

T. K.

PROGRESS REPORT
OF
THE FIELD WORK OF THE SECOND YEAR (PART II)
FOR
TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

DECEMBER, 1993

STUDY TEAM
OF
TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

JAPAN INTERNATIONAL COOPERATION AGENCY

I. Introduction

In response to the request of the Government of the Lao People's Democratic Republic (hereinafter referred to as "Laos"), the Government of Japan (hereinafter referred to as "Japan") decided to conduct the study of the "Topographic-Mapping of BOLIKHAMXAI Province" (hereinafter referred to as the "Study")

The Study started in December 1992 under a four year program of the Japan International Cooperation Agency (hereinafter referred to as the "JICA"). The first year's work was reported in annual report of 1992. Some parts of second year's work (Part I , leveling and pricking) were executed from March to May, 1993 and already reported in the previous progress report of May 1993. After leveling and pricking work, succeeding work aerial triangulation was executed in Japan from June to July '93 using the field data (GPS, leveling and pricking). The result and its accuracy were inspected and accepted by JICA.

For another second year's work (Part II, field identification), the Study Team (hereinafter referred to as the "Team") arrived in Vientiane on 25th September 1993. In advance of the field work, the Plan of Operations (hereinafter referred to as the"P/O") was submitted to National Geographic Department (hereinafter referred to as the "NGD") and discussed between both sides.

The conventional signs and its application rule (specification) for the field identification were also discussed and decided before starting the field survey. The field survey was conducted from the beginning of October to the middle of December. In accomplishing the field survey of the second year (Part II), hereinafter, the summary of the progress is reported.

II. Outline of the Second Year's work

1 Objectives

Objectives of the Study are : (1) To prepare 1/25,000 topographic maps covering the Bolikhamxai Province, (2) To transfer technology to the counterparts of NGD through the implementation of the works,and (3) To establish the friendship between Lao PDR and Japan through the implementation of the Study.

2 Scope of work for the captioned year

2-1 Field survey

2-1-1 Field identification

In compliance with the specification, necessary items to represent on the map shall be collected and identified on the double enlargement copies of aerial photographs in the field. Working area volume is 13,000km^2 on this stage.

2-2 Office work

2-2-1 Stereo plotting and compilation

Stereo plotting shall be carried out by using the diapositives of the aerial photographs in account of the results of aerial triangulation and field identification. (Preparation of plotting manuscript)

Compilation manuscript shall be made by compiling of plotting manuscript using the identified items, the toponomy and annotation data obtained in the field in compliance with the specifications.

The working area of this year work volume for the stereo plotting and compilation is 3,200km^2 only.

The stereo plotting and compilation shall be continued to the third year.

3 Working period

Field identification 24 September, '93 - 22 December, '93

Plotting and Compilation December ,'93 - March, '94

III. Field Survey

1 Formation of the Study Team

Team Leader	Mr. Tositomo KANAKUBO	24 September - 13 October '93
		10 December - 22 December '93
Deputy Leader	Mr. Koichi MIKI	24 September - 22 December '93
Mapping Planner	Mr. Yasuo TANAKA	24 September - 22 December '93
Chief Surveyor	Mr. Fujio ITO	24 September - 22 December '93
Mechanical Engineer	Mr. Atsushi TANAKA	24 September - 22 December '93
Field identification	Mr. Kiyofumi TAMARI	24 September - 22 December '93
"	Mr. Hideya SAWAKI	24 September - 22 December '93
"	Mr. Sadao MATSUMOTO	24 September - 22 December '93
"	Mr. Minori ONAKA	24 September - 22 December '93
"	Mr. Hideto HOSODA	24 September - 22 December '93
"	Mr. Masaru TERADA	24 September - 22 December '93
"	Mr. Norio GOTO	24 September - 22 December '93

"	Mr. Yoshiharu SATO	24 September - 22 December '93
Coordinator	Mr. Hideaki SAKAI	24 September- 3 October '93
		13 September- 22 December '93

2 Working period

Working period for the field identification is

24 September,'93 - 22 December,'93

3 Discussion with NGD

3-1 Map symbols and thier application rules

In advance of the field work, the map symbols and their application rules for field identification were discussed and agreed by both the Team and NGD as shown in Annex 1.

3-2 Other discussions

Other rules for the mapping , were discussed and agreed by both the Team and NGD during field identification.

The discussed items are as shown in Appendix II.

4 Field identification

Field identification was executed by the Team members and NGD counterparts in compliance with the map symbols and their application rules from the beginning of October to the middle of December.

Because of heavy rainfalls, some roads were damaged and difficult to access by vehicles.

The filed work using vehicles were carried out only along trunk roads ,the most parts of the study area were investigatad from air using Helicopter. The working places using helicopter are as shown Fig.1.

The results were indicated on the enlargement of aerial photographs.

Main items identified are;

1) Classification of roads and their attributes

2) Public buildings and structure

3) Linear structures (electric power line, water pipe line,etc.)

4) Key for photo-interpretation of vegetation and topographic features

5) Collection of toponomy and designation of ground features(village,mountain,river,etc.)

6) Other necessary items for map representation in accordance with the map symbols and their application rule

5 Plan and Results

The working plan and their results are as follows:

Item	Original plan	Result	Remarks
Field identification	13000km^2	13000km^2	finished on Dec. '93
Stereo plotting	3200km^2		will be finished March'94
Compilation	3200km^2		will be finished March'94

6 Co-operation of Counterparts of NGD

6-1 Personnel

Headquarters
Mr. Thongpene SOUKLASENG
Mr. Boualay XAIGNASANE
Mr. Khamkhong DETCHANTHACHACK
Mr. Thongchanh MANIXAY
Mr. Neuang XAIPANGNA

Field identification
Mr. Phouangphanh SAYASANE
Mr. Sangkhan THIENGTHAMMAXONG
Mr. Souban LOUANGSAMATAH
Mr.Boungnom
Mr. Phonesavanh

6-2 Undertaking Work of NGD

As the undertaking work of NGD, the following works were carried out:

1) Preparation of annotation list

Based on the collected toponomy and designation of ground features (village, mountain, river,etc.), NGD has prepared an annotation list in Latin and Lao script for the succeeding compilation work.

2) Preparation of materials for the sample marginal information plate

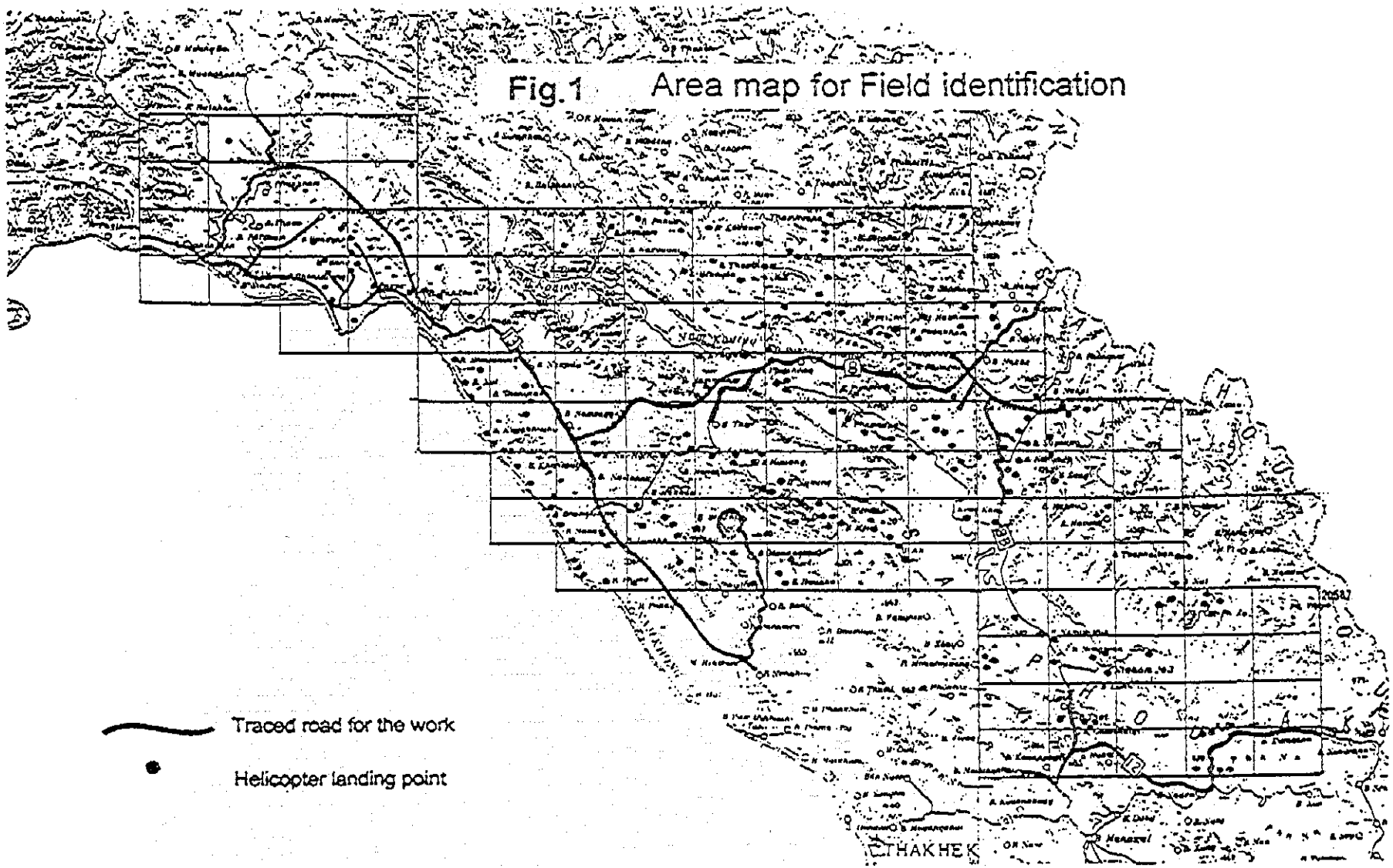
Based on the existing maps (1/25,000), NGD has prepared a draft of design and other materials for the sample marginal information plate.

V. Supervision of the Field Work

During the second year field work(PartII),the following advisor was dispached to Laos by JICA for technical meeting with NGD and supervision of the field work.

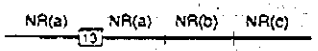
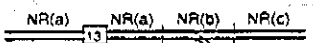
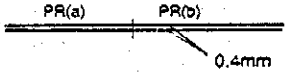
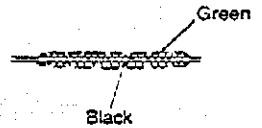
Mr.Yasuo IDE	Technical Management Officer, Topographical Department Geographical Survey Institute, Ministry of Construction
Period of dispaching	24 September '93 -- 3 Oct. '93

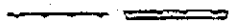
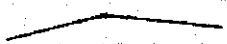
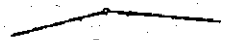
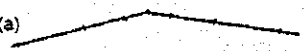
Fig.1 Area map for Field identification

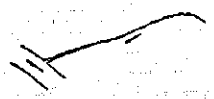
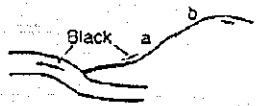
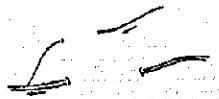
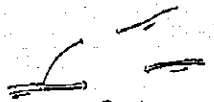
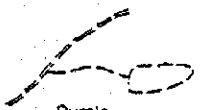
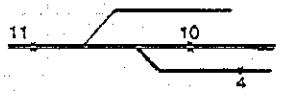
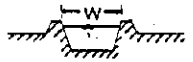
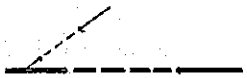
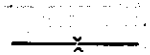
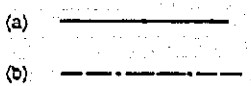
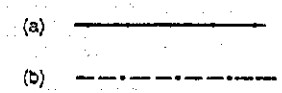
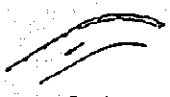


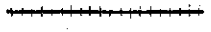
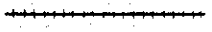
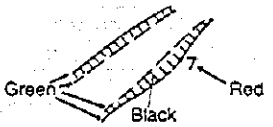
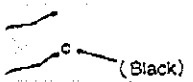
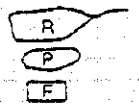
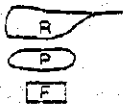
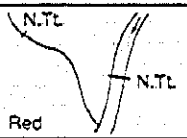
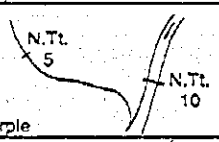
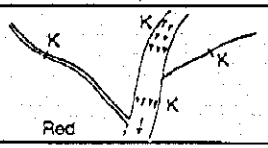
Map symbols and their aprication rule

ANNEX 1

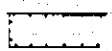
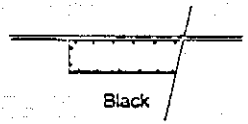
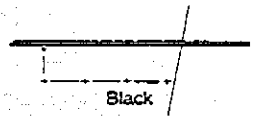
	No.	Designation	Field Identification	Compilation	Specifications
ROAD AND ASSOCIATED FEATURES	1	NATIONAL ROAD	 Red	 Black	• Road route number is indicated on the road line. (a) Paved road. (b) Not paved. Road width ≥5m. (c) Not paved. Road width <5m.
	2	PROVINCIAL ROAD Vehicles passable at all seasons Width: More than 5m	 Red	 Black	(a) Paved road. (b) Not paved. • More than 10m width: Actual width shall be indicated. • Enough condition for 2WD passage.
	3	PROVINCIAL ROAD Vehicles passable at all seasons Width : 2.5m–5m	 Red	Red	
	4	PROVINCIAL ROAD Vehicles passable in dry season	 Red	Red	• Any width.
	5	FOOT PATH Vehicles not passable	 Red	Red	
	6	UNDER CONSTRUCTION ROAD In the provincial road Width: More than 5m	 Red	 Black	• Except national road. • Length: More than 1 cm on the map.
	7	CUTTING	 Red	 Black	• Gradient: More than approx. 45° (1:1). • Length: Longer than 1 cm on the map. • Height difference: More than approx. 3 m.
	8	EMBANKMENT	Red	 Black	• Gradient: More than approx. 30° (1:2). • Length: Longer than 1 cm on the map. • Height difference: More than approx. 2m.

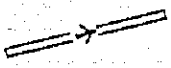
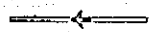
	No.	Designation	Field Identification	Compilation	Specifications
ROAD AND ASSOCIATED FEATURES	9	REVETMENT Concrete, stone etc.,	 Red	 Black	• Length: Longer than 1 cm on the map. • Height difference: More than 2m.
	10	ROAD SIDE TREE, RIVER SIDE TREE	 Green	 Black	• Tree height: More than about 10m. • Length: Longer than 2 cm on the map.
RAIL WAY	12	NATIONAL RAILWAY			• One-Track line. • Double-Track lines.
	13	RAILWAY STATION			
TRANSMISSIONS	14	POWER TRANSMISSION	(a)  (b)  Red	(a)  (b)  Black	• Voltage: More than 20KV. (a) Tower type. (b) Pole type.
	15	TELECOMMUNICATION LINE	 Red	 Black	• More than 20 circuit lines.
	16	POWER STATION	 Red	 Black	

	No.	Designation	Field Identification	Compilation	Specifications
WATER AND ASSOCIATED FEATURES	31	RIVER, STREAM, DIRECTION of FLOW	 Blue	 Purple	• Double line ≥10 m > Single line. • Single line a: 5m~10m. • Single line b: less than 5m.
	32	UNDER GROUND RIVER & STREAM (NATURAL)	 Blue	 Purple	
	33	INTERMITTENT STREAM & POND	 Blue	 Purple	• Double line ≥ 10 m > Single line.
	34	CANAL, DRAINAGE CANAL, DITCH	 Blue	 Purple	 W ≤ 3,4m : Single line. W ≥ 3,5m : annotate width in metre. 3,5 ~ 4,4 = 4m, 10,5 ~ 11,4 = 11m.
	35	UNDERGROUND CANAL/DITCH	 Blue	 Purple	• Double line ≥ 3,5m > Single line.
	36	CULVERT	 Red	 Black	• Including small bridge (length <3m).
	37	WATER - WAY, WATER - PIPELINE	 Blue	 Purple	(a) On the ground. (b) Underground. • Not necessary oil, gas pipe line.
	38	REVETMENT Concrete, stone etc.	 Red	 Black	• Length: Longer than 1 cm on the map. • Height difference: More than 2m.

	No.	Designation	Field Identification	Compilation	Specifications
WATER AND ASSOCIATED FEATURES	39	EMBANKMENT, LEVEE	 Red	 Black	• Height difference: More than 2m. • Length: Longer than 1 cm on the map.
	40	RIVER-SIDE EROSION	 Red		• Height difference: More than 3m, and indicates Δh in metre (To be measured by stereo-plotters at 2-3 km each). • Length: Longer than 1 cm on the map.
	41	SPRING , HOT SPRING	 Blue Hot spring	 Purple Hot spring	• Natural condition: Only symbol. • Permanent revetment: With annotation. • Hot spring: With annotation.
	42	RESERVOIR, POND, FISH POND	 Blue	 Purple	• Reservoir • Pond • Fish pond } Minimum size: 2 x 2 mm on the map, and notes the name if there are.
	43	WATER TANK (TOWER)	•W/T Blue	Black	• Height difference: More than 5m.
	44	WATER POOL, WELL, PUMP (by hand, by dynamo) –Public only –	• WP • P • W Blue	Purple	• Water pool (on the ground and under the ground). • Pump up. • Well (perennial).
	45	WATER FALL	 Red	 Purple	• Height difference: More than 3m. • Note add: height difference & N. Tt. (To be measured by stereo-plotters).
	46	RAPID	 Red	 Purple	

	No.	Designation	Field Identification	Compilation	Specifications
WATER AND ASSOCIATED FEATURES	47	DAM Dam length ≥ 50m	(a) Cm.P. 80-8 (b) F.D. 70-6 Red	(a) Cm.P. 80-8 (b) F.D. 70-6 Black	(a) Vehicles passable . Note. : Concrete dam : Cm. P. Earth, soil dam : F .D. (b) Vehicles not passable. 110-6 ← top (head) width. ↑ dam length in metre.
	48	SMALL DAM Dam length < 50m	Dam Red	Black	
	49	FORD, SHOAL	(a) (b) (c) Red	(a) (b) (c) Red Black	(a) Vehicles passable in dry season. (b) -ditto- (c) Vehicles not passable in dry season.
	50	BRIDGE Length >3m	Cm.P. 130-8/20 Red	Cm.P. 130-8/20 Black	-Vehicles passable. Note, Concrete bridge: Cm. P. Metal bridge: L. Wooden bridge: M. (length) 130-8 (width in metre) 20 (capacity tons)
	51	FOOT BRIDGE	Red	Black	• Vehicles not passable.
	52	FERRY (Vehicular)	Bac Red	Bac Black	
	53	PIER (PORT)	Red	Black	
	54	WATER GAUGING STATION	S.L.N. Red	S.L.N. Black	

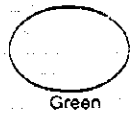
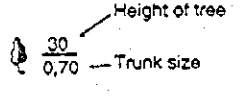
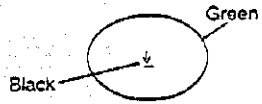
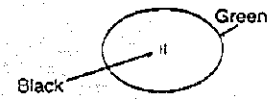
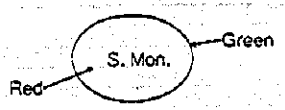
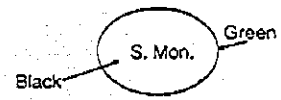
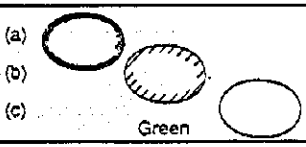
	No.	Designation	Field Identification	Compilation	Specifications
FENCE	61	CONCRETE FENCE , BRICK FENCE, etc.	 Red	 Black	• Length : Longer than 2 cm on the map. • Not necessary along the single line road.
	62	IRON NET FENCE, BAMBOO FENCE, etc. (Not temporary)	 Red	 Black	• Length: Longer than 2 cm on the map. • Not necessary along the road.
BUILDINGS AND STRUCTURES	71	BUILDINGS More than 3 floors	•C Red	Brown  Black	• Note the name if there are.
	72	PROVINCIAL GOVERNMENT OFFICE	•P.G.O. Red	◉ Red (Black)	• Symbolize.
	73	DISTRICT GOVERNMENT OFFICE	•D.G.O. Red	◎ Red (Black)	- ditto -
	74	SCHOOL	Red	Red (Black)	• Primary, Junior high school and high school, universities. • Not necessary kindergarten. • Symbol is indicated on the center of area.
	75	TELEPHONE & TELEGRAM OFFICE	•P.T.T. Red	⚑P.T.T. Red (Black)	• Annotation indicate beside of house symbol.
	76	POST OFFICE	•P.T.T. Red	⚑P.T.T. Red (Black)	-ditto-

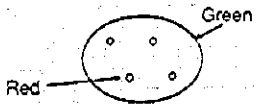
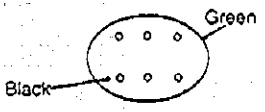
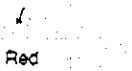
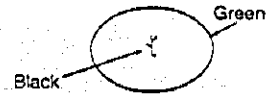
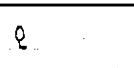
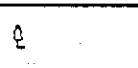
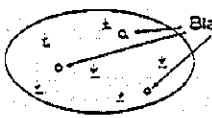
	No.	Designation	Field Identification	Compilation	Specifications
BUILDINGS AND STRUCTURES	77	BIG MARKET	• TI Red	TI Red (Black)	• With annotation. • Not necessary limit.
	78	HOSPITAL	• HSP Red	+ Red	• Not necessary clinic, dispensary.
	79	TEMPLE, PAGODA	 Red	 Red (Black)	
	80	CHRISTIAN CHURCH	 Red	 Red (Black)	
	81	AIR PORT	(a)  (b)  Red	(a)  (b)  Black	(a) With control tower & concrete landing strip. (b) others.
	82	STADIUM, GROUND	Gr Red	Gr Red (Black)	• Including rugby, soccer ground etc.
	83	BIG FACTORY, PLANT	 Red	 Red (Black)	
	84	SAWMILL, MATERIAL YARD	 Red	 Red (Black)	• Not necessary timber yard with small house.

	No.	Designation	Field Identification	Compilation	Specifications
BUILDINGS AND STRUCTURES	85	OIL (GAS) STORAGE PLANT	Red	Red (Black)	• Not necessary limit.
	86	OIL (GAS) STATION	Red	Red (Black)	• Big or marked station for driver.
	87	MONUMENT	Red	Red (Black)	
	88	STATUE, HISTORIC SPOTS	Red	Red (Black)	
	89	GRAVEYARD, CEMETERY	Red / Green	Red / Green	• Small graveyard. • Big cemetery with limit.
	90	BIG CHIMNEY	Red	Black	• More than about 15m height.
	91	TOWER (TV, TELEPHONE etc.)	Red	Black	
	92	CABIN of TRANSFORMER, POWER SUBSTATION	Red	Black	• Main transmission voltage: More than 20kv.

	No.	Designation	Field Identification	Compilation	Specifications
BUILDINGS AND STRUCTURES	93	METEOROLOGICAL STATION	 Red	 Red (Black)	
	94	MINES	 Red	 Red (Black)	• With annotation.
	95	QUARRY SITE	 Red	 Black	
	96	HOUSE	———	 Black	• Minimum size : 0,4 x 0,6 mm on the map. • Special square houses: 0,4x0,4 mm or actual size on the map.

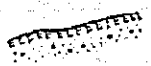
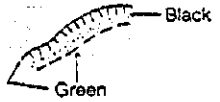
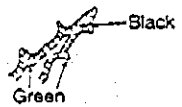
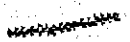
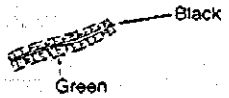
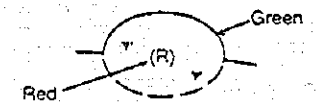
	No.	Designation	Field Identification	Compilation	Specifications
CONTROL POINTS	101	SECONDARY TRAVERSE POINT	△123,4 Red	△123,4 Black	• Not necessary A.M.S. triangulation points.
	102	SECONDARY BENCH MARK	⊗ 123,4 Red	⊗ 123,4 Black	
	103	GPS CONTROL POINT	(a) △123,4 (b) •123,4 Red	(a) △123,4 (b) •123,4 Black	(a) Permanent monument. (b) Others.
	104	TEMPORARY BENCH MARK	•123,4 Red	•123,4 Black	• Temporary marked.
	105	SPOT HEIGHT	——	•123 Black	• To be measured by plotting instruments in metre. • 5-10 points in 100 cm^2 (10 x 10 cm) on the map.
	106	WATER SURFACE ELEVATION	——	∘ 123 Purple	

	No.	Designation	Field Identification	Compilation	Specifications
VEGETATIONS	111	CULTIVATED LAND LIMIT	Mostly symbolize		
	112	DENSE FOREST, JUNGLE			 } Data from NGD.
	113	THIN/SPARSE FOREST			-ditto-
	114	RICE FIELD, PADDY FIELD			Minimum area : approx. 1 ha.
	115	UPLAND RICE FIELD, BURNED FIELD, VEGETABLE FIELD			-ditto-
	116	GRASS , WEEDS LAND			-ditto-
	117	PLANTATIONS			Limitation of area: approx. 1 cm² on the map. S. Mon: mulberry. S. Oy: sugar cane. S. cafe': Coffee. S. N: Pineapple. S.Ys. : Tobacco. S. K: Banana. S.Ng: Kapok.
		- ditto -	——		(a) Tree type plantation. (b) Scrub type plantation. (c) Grass type plantation.

	No.	Designation	Field Identification	Compilation	Specifications
VEGETATIONS	118	ORCHARD			• Minimum area: approx. 1 cm² on the map.
	119	BAMBOO THICKET			• Minimum area: approx. 2 cm² on the map.
	120	SHRUB, BUSH Including thorn tree (broussailles)			- ditto -
	121	DEAD TREE AREA			- ditto -
	122	ISOLATED/PROMINENT TREE	(a) (b) 	(a) (b) 	(a) Broad leaf tree. (b) Conifer tree.
	123	SMALL GROUP TREE	(a) (b) 	(a) (b) 	(a) Small area in the cultivated land. (b) Only one or two tree.
	124	SWAMP TERRAIN (A) Dry season passable			• Minimum area : approx. 1 cm² on the map.
	125	SWAMP TERRAIN (B) Dry season not passable			- ditto -

	No.	Designation	Field Identification	Compilation	Specifications
LANDSCAPE	126	SAND TERRAIN	S.T. Red	Green Black	Minimum area: approx. 1 cm^2 on the map.
	127	GRAVEL TERRAIN	S.S. Red	Green Black	- ditto -
	128	BED ROCK, ROCK OUTCROP	Red	Black	
	129	MONOLITH, SCATTERED ROCKS	Red	Black	
BOUNDARIES	141	NATIONAL BOUNDARY	———	Red	Drawing by NGD.
	142	PROVINCIAL BOUNDARY	———	Red	- ditto -

(1166)

	No.	Designation	Field Identification	Compilation	Specifications
GEOGRAPHY	151	ROCK WALL (CLIFF) & ACCUMULATED STONES	 Red	 Black Green	• Length: Longer than 1 cm on the map.
	152	SOIL CRUMBLING, LANDSLIDE	 Red	 Black Green	-ditto -
	153	EROSION GULLY, RAIN GULLY	 Red	 Black Green	- ditto -
	154	ROCK RANGE, ROCK COLUMN	 Red	 Black Green	- ditto -
	155	ROCKY TERRAIN (BARE)	 Red	 Green (R) Red	• Minimum area: Approx. 1 cm^2 on the map.
	156	ROCKY TERRAIN (THIN FOREST)	 Red	 Green (RT) Red	- ditto -
	157	PENCIL/STICK ROCKS (BARE)	 Red	 Green Red	- ditto -
	158	ISOLATED BIG ROCK in FLAT AREA	 Red	 Green (R) Red	• With contour line & spot height.

	No.	Designation	Field Identification	Compilation	Specifications
GEOGRAPHY	159	ISOLATED STICK ROCK	Red	10 Black	• With height difference in metre (To be measured by stereo-plotters).
	160	SMALL HILLS		Brown	• Symbolize.
	161	DEPRESSION, HOLE	Red	Brown	• Symbolize.
	162	CAVERN	Red	Black	
	163	CONTOUR LINE			• To be continued on the road, house and intermittent river.
	164	SADDLE, HILL			
	165	CONTOUR LINE VALUE		150 200	• Density of contour value: In mountainous area: 4-5 values in 100cm² on the map. In flat area : 2-3 values.

ANNEX 2

The Topographic Mapping of Bolikhamxai province (1/25,000) :ラオス国

Classification for Annotation Codes ：注記コード表

1．City &Village ：集落

Code No.	Designation 区　　分	Style (Latin) 書体（ラテン）	Height(mm) Latin	Style (Lao) 書体（ラオ）	Height(mm) Lao
１００	Metropolis (VIENTIANE) 首都	CENTURY BOLD E01-44　CAP	5.0	Alice_0 Regular	5.8
１０１	Capital of province 県都	CENTURY BOLD E01-44　CAP	4.0	Alice_0 Regular	4.8
１０２	Capital of District 郡都	UNIVERS 57 E102-22　CAP	2.8	Alice_0 Regular	3.2
１０３	Village 集落	Univers 57 E102-22　min	1.8	Alice_0 Regular	2.2
１１１	Abandoned village 廃村	*Century Old Italic* E01-25　min	1.5	*Alice_0* *Italic*	1.8
１１２	Annotation for Buildings 建物注記	Univers 45 E102-14　min	1.5	Alice_0 Regular	1.8
１２１	Island 島、中州	Century Light E01-25　min	1.5	Alice_0 Regular	1.8

2．Regional name (Plain , Plateau , Range etc.) ：地域名（平地、高地、山脈等の通称名）

Code No.	Designation 区　　分	Style (Latin) 書体（ラテン）	Height(mm) Latin	Style (Lao) 書体（ラオ）	Height(mm) Lao
２０１	More than 40km² ４０Ｋｍ²以上	*UNIVERS 56* E102-25　CAP	4.2	*Alice_0* *Italic*	5.0
２０２	20~40km²	*UNIVERS 56* E102-25　CAP	3.5	*Alice_0* *Italic*	4.0
２０３	8~20km²	*UNIVERS 56* E102-25　CAP	2.5	*Alice_0* *Italic*	3.0
２０４	4~8km²	*UNIVERS 56* E102-25　CAP	2.0	*Alice_0* *Italic*	2.5
２０５	Less than 4km² ４Ｋｍ²以下	*UNIVERS 56* E102-25　CAP	1.5	*Alice_0* *Italic*	1.8

3．Mountain ：山名

Code No.	Designation 区　　分	Style (Latin) 書体（ラテン）	Height(mm) Latin	Style (Lao) 書体（ラオ）	Height(mm) Lao
301	More than 1,000m height , Prominent Mt 1000m以上の山及び顕著な山	*Univers 56* E102-25 min	2.5	*Alice 0* *Italic*	3.0
302	More than 500m height 500m以上の山	*Univers 56* E102-25 min	2.2	*Alice 0* *Italic*	2.5
303	Less than 500m height 500m以下の山	*Univers 56* E102-25 min	1.8	*Alice 0* *Italic*	2.0
304	Hill 丘	*Univers 56* E102-25 min	1.5	*Alice 0* *Italic*	1.8

4．River , Lake etc. ：水部関係

Code No	Designation 区　　分		Style (Latin) 書体（ラテン）	Height(mm) Latin	Style (Lao) 書体（ラオ）	Height(mm) Lao
	River ：河川	Lake , pond ：湖沼				
400	Mekong river メコン川		*CENTURY OLD ITALIC* E01-45 CAP	5.0	*Alice 0* *Italic*	5.0
401	More than 10 mm width on the map 図上幅10mm以上	More than 4 km^2 4 K m^2以上	*Century Old Italic* E01-45 min	3.0	*Alice 0* *Italic*	3.0
402	4 mm ～ 10 mm width on the map 図上幅4 mm～10 mm	1 ~ 4 km^2	*Century Old Italic* E01-45 min	2.5	*Alice 0* *Italic*	2.5
403	Less than 4 mm width on the map 図上幅4 mm以下	25 ha ~ 1 km^2	*Century Old Italic* E01-45 min	2.0	*Alice 0* *Italic*	2.0
404	Small river (5 m ~ 10 m) 一般河川（5m～10m）	4 ha ~ 25 ha	*Century Old Italic* E01-45 min	1.8	*Alice 0* *Italic*	1.8
405	Stream (less than 5m width) 一般河川（5m未満）	less than 4 ha 4 h a 未満	*Century Old Italic* E01-45 min	1.5	*Alice 0* *Italic*	1.5
410	Prominent objects 顕著な地物		*Century Old Italic* E01-45 min	1.5	*Alice 0* *Italic*	

5．Control point ：基準点等

Code No	Designation 区　　分	Style (Latin) 書体（ラテン）	Height(mm) Latin	Style (Lao) 書体（ラオ）	Height(mm) Lao
501	・Secondary traverse point ・Monumented GPS control point ２級多角点、ＧＰＳ点（永久点）		2.0		
502	Secondary bench mark ２級水準点		2.0		
503	Unmonumented GPS control point ＧＰＳによる標高点		2.0		
504	Temporary bench mark 仮水準点		1.8		
505	Spot elevation (ground) 独立標高点		1.8		
506	Spot elevation (water surface) 水thiの標高		1.8		
507	Height difference (relative height) 比高、岸高		1.8		
508	Contour line value 高線数値		1.5		

6．Marginal information：その他（整飾も含む）

Code No	Designation 区　　分	Style (Latin) 書体（ラテン）	Height(mm) Latin	Style (Lao) 書体（ラオ）	Height(mm) Lao
601	Thong, Khok, Na 説明注記	*Century Old Italic* E01-25　min	1.5	*Alice_0* *Italic*	1.8
602	Structures bridge, dam etc. 構造物：橋、ダム等	Univers 57 E102-22　min	1.5		
603	Structures (hydro) ford, gauging st. etc. 構造物（水関係）：渡し場、水位観測所等	*Century Old Italic* E01-25　min	1.5		
611	Map title 表題	**CENTURY BOLD** E01-44　CAP	4.0	Alice_3 Regular	5.0
612	Name of map sheet 図葉名	**CENTURY BOLD** E01-44　CAP	3.0	Alice_0 Regular	3.0
613	Destination　annotation 到達注記	Century Light E01-25　min	1.5	Alice_0 Regular	1.8
614	Legend (Title) 凡例（タイトル）	**CENTURY BOLD** E01-44　CAP			

TECHNICAL DISCUSSIONS ANNEX 3

Introduction

JICA Study Team and NGD continued meetings on the interpretation and application of the conventional signs to be used for the new 1/25,000 topographic maps based on the existing 1/25,000 topographic maps.

After discussions, some of them put on the map symbols and their application rules attached Annex 1, other discussed items are summarized as follows:

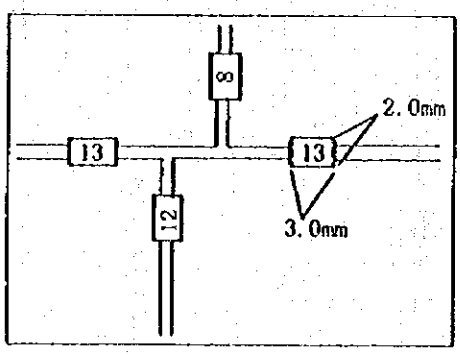
Date : 4th, 5th, 6th, 7th, 20th OCT., 14th, 15th Dec., '93

Attendants: NGD	Mr.Boualay	Japanese side Mr.Kanakubo
	Mr.Khamkhong	Mr.Miki
	Mr.Thongchanh	Mr.Tanaka
	Mr.Neuang	Mr.Ito
	Mr.Phouangphanh	Mr.Onaka
	Mr.Sangkane	Mr.Tamari
		Mr.Matumoto

1. Road

1) Route number boxes shall be put 1 or 2 at appropriate position on each national road.

2) Box shall be same size regardless of number of letter



3) Only followings shall be defined as the National road .

Route 8 (B. Lao --Nam Theun-Lak xao --VTM)

Route 12 (Thahek --VTM)

Route 13

Rout number shall be put on the above-mentioned National road and 8B (Lakxao-B.Gnommalat)

4) Width of road shall be defined from its edge to edge.

5) For the provincial road, all weather and seasonal road shall be classified by the field work.

6) Contour lines in the double line roads shall not be interrupted.

2. Electric power line

Allow sign shall be put on the turning point, junction and around tower sign which located near neat line.

3. Power station

Generator, which can supply electricity for small area, shall not be shown .

4. Water tank

Neighboring plural water tanks shall be represent to typical one.

5. Water pool and well

1) Public use with permanent water only shall be shown.

2) Neighboring plural wells shall be represent to typical one.

3) Fountain in the villages shall be shown as same as pump up well.

6. Bridge

1) Bridge data (length , width and capacity) shall be collected in the field and supplement by the existing data of NGD.

2) In case of no data, annotation shall not be shown.

7. Buildings symbol

1) Symbolized buildings (school , hospital , etc.) shall not be shown buildings themselves, only symbols shall be put in the center of its area.

2) Direction of symbols shall be North.

3) In case there are some obstacles to put symbols, symbols shall be removed to appropriate position.

8. National boundary

Mapping area of Thailand side shall be until water line of Mekhong river.

9. Forest data

Forest data shall not be shown on the new maps.

10. Annotation

1) Neighboring country

Annotation of the neighboring country shall be put into administration box of the marginal information sheet , so that no annotation shall be put out of the National boundary.

2) Abundant village

In case there are some abundant houses, annotation of "B. Hang" shall be put.

In case of no houses, any annotation shall not be put.

3) Village name shall be adopted people using name.

4) Area name shall be confirmed in the field.

5) Sub-village (Khoum) shall not be annotated.

6) Public house (called "Hn.L."in Lao) shall not be annotated.

7) Annotation for the distnation of road shall be shown in Latin.

11. Marginal information and others

For the new map , existing marginal information of 1/25,000 topographic map shall be modified as follows:

1) Legend shall be made by Lao alphabet and English using black color.

2) Zone number(18)of Y coordinate of U.T.M. shall be deleted.

18579 ----------> 579

3) Coordinate of inside of sheet line shall be deleted.

4) 10 second dots of outside of sheet line shall be deleted.

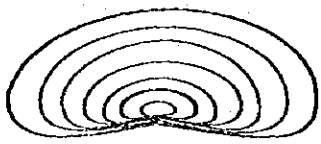
12 Contour line

In the steep slope area, the following rules shall be adopted.

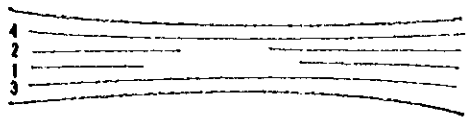
1) Example 1 When the steep slope area continues less than 1 cm on the map and the distance between two contour lines becomes less than 0.2 mm, both contours can be jointed each other.

2) Example 2 When the steep slope area continues more than 1 cm on the map and the distance between two contour lines becomes less than 0.2mm, some contour lines among the two index contours can be omitted. In this case, the contour lines shall be omitted to respect the priority order of 1,2,3, and 4 as shown in the following

Example 1



Example 2



13 Spring

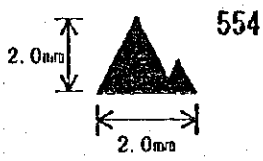
Hot spring shall be annotated as "B.N.H"

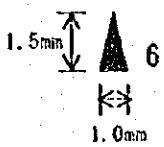
· 13 Isolated stick rock

Isolated stick rock shall be symbolized two styles (small and big size) as follows:

Remarkable big isolated stick rock shall be put spot height, and others shall be put the height difference in meter order near the top of symbol.

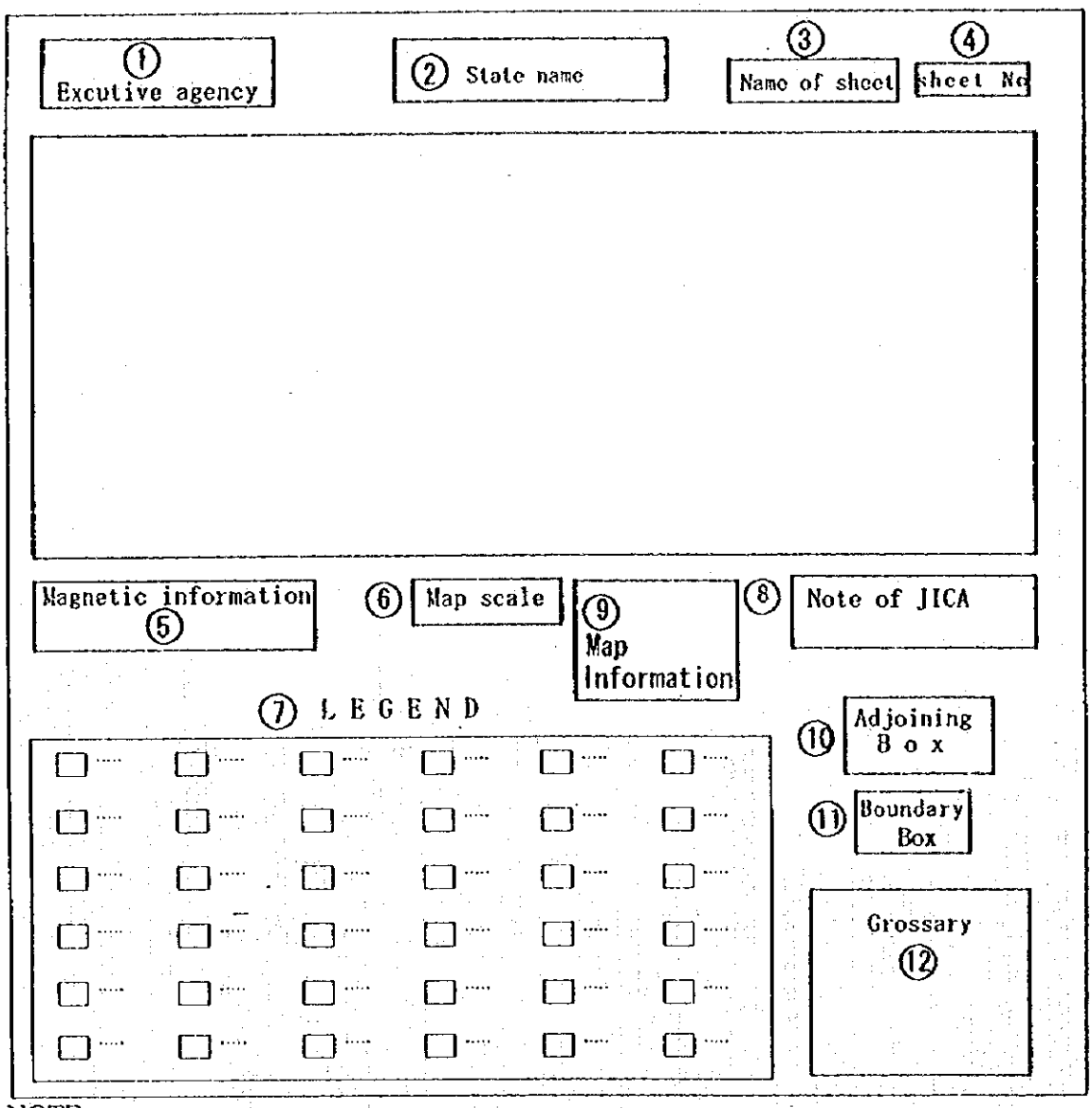
Its spot height shall be counted as one of distributed spot height in compliance with its specifications. (5 to 10 points in 100 square cm)





14 Marginal information

1) Basic design are as shown in next page.



NOTE:

1 English and Lao Alphabet
2 English and Lao Alphabet
3 English and Lao Alphabet
4 English
5 English
6 English
7 English and Lao Alphabet
8 English
9 English
10 English
11 English
12 English

Minutes of Meetings

on

Plan of Operation of

the Third Year's Work

(November 3, 1994)

MINUTES OF MEETINGS
FOR
THE TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
BETWEEN
JICA STUDY TEAM AND NATIONAL GEOGRAPHIC DEPARTMENT

3RD OF NOVEMBER, 1994

MINUTES OF MEETINGS FOR THE TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE IN LAO PEOPLE'S DEMOCRATIC REPUBLIC
BETWEEN
JICA STUDY TEAM AND NATIONAL GEOGRAPHIC DEPARTMENT

The JICA Study Team (referred to as the Team hereafter) headed by Mr.Tositomo KANAKUBO visited Lao P.D.R. on the 20th of October, 1994 to carry out the third year work for technical cooperation of the Topographic Mapping of Bolikhamxai Province in Lao P.D.R.

The meeting was held at the National Geographic Department (referred to as the NGD hereafter) on the 24th of October to the 2nd of November, 1994. The team submitted a study report of the second year and the Plan of Operation for the third year on the 24th of October, 1994.

NGD accepted the study report of the second year and appreciated for the effort of the Team.

The explanation on the Plan of Operation was made by the Team and discussion was carried out between both side for the work of this stage.

The following items were discussed and mutually agreed upon between the NGD and the Team.

1. NGD received twenty (20) copies of the study report of the second year and accepted the Plan of operation.
2. The Team informed that the counterpart training in this year would be started from the end of January or the beginning of February, 1995 in Japan and NGD appreciated it.
3. Concerning the annotation plate for Lao alphabet, the undertakings of Laos side, NGD requested to prepare it to the Team because of the lack of photocomposing machine.
4. The Team understood their hardware problem and requested to NGD to prepare a floppy disk inputted of the data file of annotation in Lao alphabet as a counterpart undertaking.
5. Technical discussion shall be continued for the map symbols and their application rules of the final drawing, using the prepared sample maps consisting of three (3) kinds of different colors for two (2) sheets covering a town area and a mountain area.
6. And also, specification of colors for printing shall be discussed successively using the above sample maps.

T.K.

7. NGD strongly requested to the Team to deliver negative films of aerial photographs taken in the first stage of the work, to Laos as soon as possible, since a lot of urgent restoration projects came out for the project area in this moment because of natural disaster caused by heavy rainfall in this year. The team replied the request would be conveyed to JICA Headquarters.

The list of attendants is shown in Annex.

At Vientiane, 3rd of November, 1994

Mr. Boualay SAIGNASANE
For General Director of
the National Geographic Department

Mr. Tositomo KANAKUBO
Leader of the JICA Study Team

PLAN OF OPERATION

TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

- Third Year -

OCTOBER, 1994

JAPAN INTERNATIONAL COOPERATION AGENCY

I. INTRODUCTION

In June 1991 The Government of Lao People's Democratic Republic (hereinafter referred to as the "the Laos") made a request to the Government of Japan to provide technical cooperation for the Topographic Mapping of Bolikhamxai Province (hereinafter referred to as the "the Study") after recognizing the importance it has as basic survey for planning and implementation of various projects.

In response to the request of the Laotian government, A initial study team was dispatched by Japan International Cooperation Agency, the official agency responsible for the implementation of the technical cooperation programs of the Japanese Government (hereinafter referred to as "JICA") in August 1992 to discuss in detail with National Geographic Department, the official agency of Laos side (hereinafter referred to as "NGD"), and the Scope of Work (hereinafter referred to as "S/W") was agreed between the mission and NGD.
Based on the S/W, the Study is being carried out for the four year period from 1992 through 1995, on 37 months.

II OBJECTIVE

The objectives of the study are :

(1) To prepare base map and aerial photography
Photo scale 1 : 40,000 Aerial photography approx. 13,000km^2
Map scale 1 : 25,000 Topographic mapping approx. 13,000km^2
(112 maps sheets, 5 colors print)
The areas covered were shown on the first page of the report.

(2) Technology transfer
Technology transfer of topographic mapping to Laos NGD through the study.

III SCOPE OF WORK

The scope of work to achieve the captioned objective is stated in a document entitled " Scope of Work for Topographic Mapping of Bolikamxai Province in Lao People's Democratic Republic" agreed between NGD on 12th August 1992 (hereinafter referred to as "S/W").
It covers :

Aerial Photography, Control Point Survey and Levelling Aerial Signalization and Pricking, Field Completion , Cartography, Drafting and Printing.

The volume of the study and yearly job classification is tabulated as Table 1.

Table 1. Work volume of the study

	ITEM	VOLUME	REMARK
First Year 1992 ~ 1993	1.Aerial photography	approx. 13,000Km²	Scale 1/40,000 (approx.920pcs.)
	2.Ground control survey by GPS	approx. 29 points	including 3 known Points
	3.Leveling	approx. 580Km	
	4.Pricking GPS Point	29 point	including 3 known Points
	Traverse point	7 point	
	Established B.M.	approx. 143km	
	New leveling line	approx. 580km	
	Aerial triangulation	approx. 817models	
Second Year 1993 ~ 1994	Field indetification	approx. 13,000km²	
	Plotting	approx. 3,200km²	Scale1/25,000 (32Sheets)
	Compilication	approx. 3,200km²	Scale1/25,000 (32Sheets)
Third Year 1994 ~ 1995	Field completion	approx. 13,000km²	Scale1/25,000 (80Sheets)
	Plotting	approx. 9,800km²	
	Compilation	approx. 9,800km²	Scale1/25,000 (80Sheets)
Forth Year 1995	Drafting	approx. 13,000km²	
	Printing	112 sheets	

IV Standerd of the study

Principal technical specifications are tabulated as table 2.

Table 2. Standard of Study

Reference ellipsoid	:Everest 1830
Map projection	:U.T.M. Zone 48
Datum of hight	:Mean sea level of Hon Dau in Vietnam
Map scale	:1:25,000
Neat lines	:5' X 7.5'
Contour line	:Intermediate contour 5m,subject to topography
Map smboies and its application rule	:Those adopted by NGD
Ground control point survey	:1/100,000
Leveling	:5cm$\sqrt{S}$ S:Km
Number of colors	:5 Colors
Map of accuracy	
a.Planimetry	:not more than 1.0mm on the map
b.Spot height	:not more than 2/3 of contour interval
c.Contour	:not more than 1/1of contour interval

V UNDERTAKING

The study shall be conducted in close cooperation between the two countries of Laos and Japan. Responsibilities of each side set forth in S/W are summarized as follows:

1.Laotian side:
-Necessary arrangements to ensure the entry, exit and stay of the team members as well as personal of an aerial photography company contracted by the team for the study together with related materials and equipment (collectively referred to as Survey Team) to bring in and out of Laos.
-Assistance to issuarance of permits necessary for implementation of the survey work.

2.Japanese side:
-Implementation of the study in Laos and Japan.
-Technology transfer through the execution of the study.

VI PROGRESS OF WORK PLAN

Progress of past 2 years works are shown in the Table 1, work volume of the study.

VII. PLAN OF OPERATIONS FOR THIRD YEAR (1994)

1. Guide Lines of Execution

1) The work period of this phase shall be from 21st July 1994 to 31st March 1995. In this phase, the stereo plotting and the compilation shall be continued from the last phase. The period of the field survey shall be from 19th October 1994 to 26th December 1994. This procedure is important one to accomplish the original manuscript of the map using the results obtained untill now. Consequently, it is particularly necessary to control quality and secure the accuracy of the product by checking the data or materials to utilize and confirming the results of plotting and compilation.

2) Progress of the works shall fully be controlled not to be behind time. Especially, for plotting and compilation, care must be taken not to be delayed for field completion.

3) Plotting and compilation shall be carried out in compliance with the specifications agreed with NGD.

4) In order to effectively execute field completion, preparatory works shall be fully done.

5) As it will be the last occasion to go to Laos and see and talk with NGO, the Team shall discuss not only of the drafting which shall follow the field compilation but also of technical matters of printing scheduled to follow in the next phase at the time of the field cmpletion.

6) In the field completion one must work on a variety of items, such as confirmation of the contents of manuscripts, supplementary surveying, collection and preparation of materials on dministrative boundaries etc. on vast area. Consideration has to be taken especially on the security of the Team members.

7) Taking an increase of the demand on the maps in future into account, it shall be discussed with NGD to make additional prints efficiently by NGD.

2. Planning and Preparations

2-1. Work Volume

The work volume in this phase is as follows:

Stereo plotting	1/25,000	9,800 km² (80 sheets)
Compilation	1/25,000	9,800 km² (80 sheets)
Field completion		13,000 km²

2-2. Planning and Preparations

1) Planning of operations

The engineer in charge of respective item of the Study shall set up the detailed plan of the work in his charge and study the method of execution.

a. Arrangement of data and materials

Arranging the materials in hand and those provided by NGD and survey results obtained in the first year, preparation for planning operations shall be proceeded.

b. Preparation of the Plan of operation (P/O)

In the study for this phase, a field operation is involved and this is the last visit to Laos for the Study. Besides P/O for this phase, a draft of P/O for the next (fourth) phase shall be formulated, which contains drafting and printing process planned to execute, in order to discuss it with NGD (See Annex 2).

2-3. Preparation of equipment and materials

Arrangement for securing materials, duplication of data, checking and adjustment of equipment, etc. shall be executed. In preparation for field survey, materials and equipment to carry with the Team shall be packed and procdures to export them to Laos shall be proceeded.

2-4. Preparation of conventional signs for drafting

At the time of field identification in the 2nd year, the Team discussed with NGO on the conventional signs for stereo plotting and compilation and to an agreement was reachead between them along which the Team has executed the works. For the next year, the discassion for the drafting, succeeding work of the pltting and compilation,the discussion of the conventional sings shall be done between the Team and NGD at the time of field complation . Consequently, a draft of conventional sings for drafting shall be prepared by the Team be for the discussion.

2-S. Preparation of a Trial Map

According to the minut of meeting on 17th of December at last year, In order to go through smoothly the discussion with NGD on drafting and printing, Several Sanple map shall be drafted and printed on trial.

3. Field Survey (Field Completion)

Taking the duplicates of the compilation manuscripts of the map with the Team to the field, they shall be supplemented and corrected in reference to the findings in the field and completed as the original manuscript of the map after returning to Japan. The survey area covers the whole area of the mapping of approximately 13,000 km² (112 sheets). Main items to study are as follows:

a. By reconnoiting the whole field, checking shall be done to find out serious errors, if any.
b. Clarification shall be made on questionable and/or unidentified points extracted while plotting and/or compilation.
c. Supplemental collection, inscription and confirmation of geographical names shall be executed.
d. With the collaboration of NGD, collection, inscription and confirmation of administrative names and boundaries shall be executed.
e. Important ground features not appearing on the aerial photograph, for example, wells, water supply facilities, small mosques, etc. and thosehidden under trees or in the shade of buildings shall be partially surveyed.
f. Secular changes taken place after aerial photographs used for plotting and compilation were taken shall be studied. Important changes shall be surveyed and the compilation manuscript shall be revised.

3-1. Preparations in Japan

1) Detailed planning

Detailed plan for execution of the Study shall be formulated and P/O shall be prepared. As this is the last occation for the Team to be able to make direct contact with NGD, a draft of P/O for the fourth year (Drafting and printing of maps) shall be prepared to discuss it with NGD. To help smooth progress of the meeting, several trial sampl map shall be executed among those of the Study area.

2) Preparation of materials

Compilation manuscripts of the map, annotation sheets, composites of the compilation manuscript and the annotation sheet and various kinds of data sheets shall be duplicated to be ready for the use in the field.

Their kind and quantity are as follows:

Item	Material	Quantity	
Compilation manuscript	Polyester sht.	112shts x 1	
〃	Blue Copy	112 x 5	Pos.
〃	Colour Copy	112 x 2	〃
〃	SSP	112 x 3	〃
Composite of compilation manuscvipt & annotation sheet	Polyester sht.	112 x 1	
〃	SSP	112 x 2	
Annotation sheet	Polyester sht	112shts x 1	
〃	Paper	112 x 1	
Road data sheet	〃	112 x 1	
Vegetation data sheet	〃	112 x 1	
Water System Sheet	〃	112 x 1	

3) Study of work instructions and methodology of survey

a. General items to survey in field completion and peculiar items to the present study shall be arranged.

b. After finishing compilation, the kind and nature of unsettled points and the best way of survey to clarify them shall be studied and appropriate instruction shall be given to the Team members. When surveying is necessary, surveying method shall besettled. For instance,

* An area covered by trees shall be surveyed by plane table,
* Linear objects such as roads constructed after taking aerial photographs shall be surveyed by plane table or, when they are long, by traversing using theodolites or GPS,
* Positioning of point objects which cannot be identified on the aerial photographs, such as wells, water supply facilities, shall be carried out by GPS,
* When the ground height is necessary, leveling shall be executed by usings levels.

4) Study and adjustment of unsettled and/or uncertain points found in the map specifications and risen in the course of compilation

a. Questionable and uncertain points risen while compilation are marked on the SSP of the compilation manuscript with remarks to be taken into consideration. These overlays shall be prepared for the Team to carry them to the field.

b. In referece to the materials, annotations shall be studied and questionable points shall be picked out. At the same time, comparing the apearance of place names with the view of the compilation manuscript, parts where annotations are thought lacking shall also be extracted for field confirmation.

c. Studying the specifications for drafting of OTC, a list of conventional signs for drafting (See annex 1) and questionnaires on uncertain points shall be made.

5) Preparation of shipment of materials and equipment to carry with the Team

a. After checking and adjusting the surveying materials and equipment, they shall be packed for shipment to Tunisia.

b. Invoice for customs clearance shall be prepared.

c. On shipment of materials and equipment and departure of the Team to the field, reporting shall be done to the authorities concerned of Japan.

3-2. Activities in Laos

The Team shall be dispatched to Laos for about two months: from 19th October 1994 to 26th December 1994 for 69 days. The Team is composed of 14 members of the team leader, deputy leader, mapping planner, chief surveyor, mechanic, and 9 engineers.

1) Items to discuss with NGD

a. Items to discuss with NGT

* The Team shall propose P/O for this phase the Team on the basis of which the two parties shall discuss it to settle the works for this phase.
* Based on the duplicates of the compilation manuscripts the Team shall report the progress of stero plotting and compilation.
* Discussion of a part of the conventional signs for drafting which is prepared by the Team shall be made.

b.Discussion on the work of the fourth year

Based on the trial prints of the maps, specifications of printing map shall be discussed.

c .Items to request the undertakings of NGD

(1) Confirmation of the progress and/or result of the items requested through JICA in advance:
* Exemption from taxes, duties and any other charges on equipment and materials brought into Laos for the conduct of the Study,
* Assignment of at least 5 Laotian counterparts to work with the Team in the field (at least one person for each of 5 parties),

(2) Security of the Team members,

(3) Arrangement in getting permission to bring into Laos and/or take out to Japan necessary materials for the execution of the Study.

(4) Arrangement for hiring hellicopter and employing making a application for flight parmissioners and drivers.

(5) Arrangement for issuing the order of mission.

(6) Arrangement for issuing letter of authorization to enter into province.

(7) Facilitation of prompt clearance through customs and other procedures of all materials and equipment brought into Laos for the conduct of the Study.

(8) Announcement to or making connection with public agencies and/or other organizations concerned concerning the Study.

(9) On the duplicates submitted by the Team of compilation manuscripts, annotation sheets and their composites, requests shall be proposed to study and inscribe linear objects such as electric power lines, pipelines and administratve names and boundaries. Confirmation and supplement of geographical and/or proper names shall also be requested.

(10) Other items stated in S/W

(11) Comfirmation for preparation of annotation plate in Laos alphahet by NGD.

2) Preparation for the outset o f the field work

For the preparation against the outset of the field work, following items shall be dealt with chiefly by the Team.

a.Establishment of the field headquarters and subcamps.

b.To receive shipped equipment and materials.

c.To purchase equipment and materials.

d.To hire vehicles and Hellcopter

e.To make connection with public agencies and/or other organizations concerned.

3) Execution of field completion

Taking the duplicates of compilation manuscripts and annotation sheets and their composites with the Team into the field, following studies shall be executed:

a. Studies chiefly executed by the Japanese side

* Checking of the compilation manuscript with the site Reconnaissance study on the whole area shall be executed to check the compilation manuscript with the site to find out the omission, misconception of important items at the time of stereo plotting and/or compilation and examine the quality of compilation.

* Clarification of questionable points at the time of stereo plotting and compilation

Questionable points shall be clarified in the field. When necessary, supplemental surveying shall be executed by using surveying instruments.

* Supplemental survey of uncertain points at the time of stereo plotting and compilation

Confirmation of uncertain points shall be done in the field. When necessary, supplemental surveying shall be executed by using surveying instruments.

* Revision of secular changes

Secular changes after the aerial photography shall not be revised in principle. However, important changes shall be revised after discussing with NGD.

* Small objects not shown on the aerial photograhs shall be surveyed supplementally if they are specified to represent on the map by map specifications.

* For supplemental surveying, the best method shall be applied taking the conditions of the field and the antureof the object into consideration.

For example,

(1) Objects hidden under trees shall be surveyed by plane table.

(2) Newly constructed roads of big size shall be surveyed by traversing using theodolites or positioning using simplified GPS receivers.

(3) Small objects such as wells, water supply system, etc. shall be surveyed by positioning using simplified GPS receivers.

(4) When height is required, leveling shall be executed.

*Checking of annotations in general

Checking of annotations which can not be done at the last year shall be done in the field in cooperation with counterparts.

b. Studies chiefly executed by the Laotian side:

* Studies and inscription of administrative names and boundaries.

* Lao Alphabet.

* Preparation of proper toponym in Latin.

*Collection of supplemental data (electric power lines, pipelines, etc.).

4) Preparation of original manuscript of the map

After returning from the field to Japan, the original manuscript of the map shall be prepared by revising and adjusting the compilation manuscript and various kinds of data sheetsusing the following materials. Materials necessary for drafting and printing shall also be prepared.

a.Field completed compilation manuscript.
b.Results of surveying of secular changes.
c.Data for administrative boundaries
d.Data for annotation (including road classification, road name, destinations, etc.).
e.Materials provided by NGD (electric power lines,etc.).
f.Others.

6) Checking and quality control
Original manuscripts shall be closely examined and a list of quality control shall be prepared.

4. Laboratory Works

4-1. Stereo Plotting
On the basis of the reults of the aerial triangulataion and the ground control survey and the materials obtained in the field identification, the plotting manuscript of the map shall be prepared from aerial photographs by measuring and restituting aerial photographs on the stereo plotting machine. The mapping area covers an area of approximately 13,000 km² and the number of sheets is 112 in the specified size. The proposed area is shown in Fig. 1. The preparation shall be carried out in two phases of Phases second year and third year. In the Phase second year 32 sheets were finished. In this phase the work shall be carried out for the remaining part of 80 sheets (approximately 9,800 km²).

1) Specifications
Specifications for plotting are as follows:

Plotting scale	: 1:25,000
Area covered	: 13,000 km² Phases second year and third year)
Number of sheets	: 112 sheets (ditto)
Contour lines	: Intermediate contour line 10 m Index contour line 50 m Supplementary contour line 5 m (subject to topography)
Projection	: UTM Projection, Zone 48. Along neat lines, grid ticks of every 1 km shall be drawn. Ticks of latitude and longitude shall also be drawn every 1' along neat lines.
Neat lines	: 7.5' x 5' for both longitude and latidude
Allocation of each sheet	: Sheet number and sheet name are each sheet shown in Fig. 1.
Accuracy	: Class "B" of the "Specifications of Geodetic and Photogrammetric Surveying for Overseas ", March, 1983, JICA, shll be applied.

2) Mapterial to be used
Plotting sheet shall be synthesized polyester sheet of small expansion and contraction.

3)Planning and_preparation
Plotting shall be executed for approximately 9,800 km² (80 sheets) excluding an area of approximately 3,200 km² (32 sheets) finished last phase out of the total area of approximately 13,000 km². Prior to the outset of the work, the results of aerial triangulation, field identified aerial photographs, etc. shall be arranged and instructions of execution shalll be prepared to

give necessary instructions to operaters. The flow chart of stereo plotting is shown in Fig. 6.

4)Plotting

a. On three kinds of sheets of planimetry, topography (contour) and control point data sheets, the following items shall be plotted by auto-coordinategraph:

Sheet name	Items to plot
Planimety Sheet & Topography sheet Control point data sheet	Neat line, ticks of UTM grid, ticks of longitude and latitude, control points, pass points and tie points Neat lines

b. As restiltution shalle be carried out on three kinds of different sheets of planimetry sheets, to pography sheets and control point data sheets, registering shaqll be made among these three sheets by punch hole method before plotting.

5)Orientation

a.Relative orientation

For relaative orientation 6 pass points shall be used.

b.Absolute orientation

For absolute orientation the coordinates of pass points and tie points obtained by aerial triangulation, those of geodetic control points and the height of bench marks by leveling shall be used.

c.For height orientation, pricked bench marks shall be used as many as possible for the sake of accuracy of the height of the map.

6)Restitution

a. Resitution shall be executed in accordance with the the map symbols and their application rules in the order of linear elements, such as roads, rivers, etc.,buildings, vegetation and contour lines.

b. Ingeneral, buildings shall not be generalized . In agglomeration, howeever, they can be generalized.

c. If necessary, planimetry and hypsography can be restituted on separte sheets .

d. Care must be taken to get rid of the effect of clurvature of the earth's surface while restitution.

e. Intermediate contour line shall be 10m and half interval auxiliary contour lines of 5m shall be supplemented according to the topography. Care must be taken for the representation of micro topography the study area being rich in various types of ground features and topography, like hills, plans, forests, seasonal rivers, cultivated lands, etc.

f. Contents of these sheets shall be as follows:

*Planimetry and contour line sheet :Roads, rivers,railways, buildings conventional signs, etc.
*Topography sheet :Contour lines
*Control point data sheet :Heightof control points,of bench marks,and ofspot heights

g. Allotment of colors on the manuscript

Ball point pen or pencil shall be used for drawing manuscript. Color allotment on the manuscript is as follows:

Black :Man made objects (double line roads, ways,buildings,other linear objects), conventional signs of vegetation, index contour lines, embankment and cut (rock), etc.
Red :Roads (not paved), foot paths, indication point,enclosures,small objects, revetment, water falls (oblique), garden paths, etc.
Green :Vegetation, aquatic plants, indefinite water shore lines, fences, etc.
Brown :dikes (soil), embankment and cut (soil), etc.
Orange :contour lines (except index contour lines)
Blue :Objects related to water (definite lilmits of water shore lines, rivers, lakes, water falls <vertical>, etc.), fish farms, salt fields, etc.

h.Planimetry and contourline sheet

*In reference to the field identified aerial photographs, planimetry shall be restituted in the order of linear objects such as roads, rivers, railways, etc., buildings, vegetation, etc. in compliance with the specified map style.

*In general, buildings shall not be generalized. In agglomeration, however, they can be generalized to get rid of the congestion of represented lines.

*Water shore lines shall be represented as they appear on the aerial photograph. In special cases, they shall be modified by available data.

*Contour lines shall be drawn with care to keep the height accuracy and not to affect the representation of topogrphic characteristics and ground feataures.

*The interval of the intermediate contour lines being 10 m, it may happen that contour lines are too much congested in mountainous area of steep slope. In such case, contour lines, except index contour lines, can be omitted in accordance with the rule for omitting contours.

i.Tying to adjacent map sheets

A plotted manuscript shall be tied with surrounding map sheets. Measurement shall be made in comparison of the edge area of a map sheet with the corresponding edge area of adjacent map sheetsmeasuring by stereo plotting machine.

j.Measurement of spot heights

*Spot heights shall be measured photogrammetrically at the following conspicuous points:
(1)Principal mountain summits and cols,
(2)Junctions of main roads,
(3)Distinct knick points of topography,
(4)Points representing the area,
(5)Bottons of depressions,
(6)Other points thought necessary to represent the topography.
The density shall be according to the specifications taking the distribution of control points and bench into consideration.

*The measurement shall be made twice and the mean value shall be recorded in meters.

*The effect of the Earth's curvature shall be corrected.

k.Control point data sheet

*Control points and spot heights shall be represented by conventional signs. The name, number and the height shall be inscribed.

*The position of pricked bench marks shall bemeasured using stereo plotting machine and their number and height shall be inscribed.

7) Adjustment

After finishing the restitution work, theplotting manuscripts shall bechecked with field identified aerial photographs and collected materials,as well as the examination of their conformity with the map specifications. The following results and materials shall be adjusted:

(1)Plotting manuscripts,
(2)Control point data sheets,
(3)Records of orientation.

4-2.Compilation

A plotting manuscript prepared by stereo plotting depicts precisely the elements extractable from the aerial photograph. In order to be ready for its publication as a map, it is necessary to symbolize, omit or change the position of the objects depicted on it in accordance with the map specifications and prepare the compilation manuscript. Several kinds of data sheets shall also be prepared for the efficiency of succeeding procedulres of drafting and printing.
The proposed area of mapping covers an area of approximately 13,000 km²(112 sheets). Compilation work is to be carried out in the second year and the third year. In the second year, it covered an area of approximately 3,200km²(32 sheets). Restituted in the last phase and an areaarea of approximately 9,800km²(80 sheets) to be restitutead in this phase, totaling to approximately13,000 km² (112 sheets). The proposed areas for this phase are shown in Fig.
The flow chart of comilation is shown in Fig. .

1)Specifications

Specifications of the compilation work are as follows:

Compilation scale	:1/25,000	
Area covered	:Area resituted in the last phase, approximately 3,200 km²(10 sheets)	
	Area to be restitutd in this phase,approximately 9,800 km²(80 sheets)	
Projection	:UTM Projection, Zone 48.	
Neat lines	:15' x 15' in longitude and latitude.	
Allocation of each	:Sheet number and name are shown in sheet Fig. 5.	
Accuracy	:Class "B" of the "Specifications of Geodetic and Photogrammetric surveying for Overseas", March, 1983, JICA. shall be applied.	
Work volume	:Compilation manuscript	112 sheets,
	Data sheet for annotation	112 sheets,
	Road	112 sheets,
	Vegetation	112 sheets,
	Water system	112 sheets,
	Marginal information	112 sheets.

2)Sheet to be used

Synthesized polyester sheet of small expansion and contraction shall be used.

3)Planning and preparation

On the basis of the map style and its application rule, and taking the work volume into consideration,an operation manual shall be prepared and necessary instructions shall be given to each cartographer. Plotting munuscript, field identified aerial photographs and collected materials shall be adjusted and necessary materials and equipment shall be prepared.

4)Plotting on the sheet

Neat lines shall be plotted on the sheet of compilation manuscipt and of data sheets by an automatic coordinategraph. On the sheeet for compilation manuscript, besides plotting control points, longitude and latitudelines of every 1′ , crosses of UTM grid of every 1 km.

5)Compilation work

Overlay method shall be applied for compilation in principle. On account of the steep topography, if contour lines are too much congested and it is difficlt to redraw them, compilation be executed by putting the topography sheet of the plotting manuscript over the compilation sheet of planimetry and revising the former in reference to the latter.

a.Allotment of colors

Different colors are allotted on the compilation manuscript as follows:

Black	:Roads, spot heights, conventional signs of vegetation, linear objects, index contour lines, contour line values, administrative boundaries, indefinite boundaries of tenporarily inundated areas, small objects, embankments and cuts (rock), etc.
Red	:Foot paths, enclosures, religious buildings, cemetries, etc.
Green	:Vegetation boundaries, parks, aquatic plants, indefinite water bounaries, embankments and cuts (soil), etc.
Brown	:Sandy places, etc.
Orange	:Contour lines (except index contour lines).
Blue	: Surfaces and definite water shores of rivers, lakes, etc., fish farms, salt fields, water pipe-lines, reservoirs, boundaries of temporarily inundated areas, etc.

b.Execution of compilation

Details of execution are as follows:

*Roads broader than the conventional sign on the map shall be represented in real scale.The name and the number of roads, when applicable, shall be inscribed. In agglomeration, roads shall be represented in real scale. However, the minimum breadth shall be 0.25 mm on the map.

*Small buildings or houses representd by conventional sign of spot type and small independent constructions shall be selected so that they may match the view of the topography and villages.

*When buildings are congested, for example in agglomerations, they can be generalized.

*In mountainous areas when contour lines are congested, it is necessary to try to represent the view as much as possible by omitting contour lines in compliance with the application rule of the map style or replacing them with the conventional sign for a cliff.

*Magnetic declination shall be the value at the center of each map sheet computed from the empirical formula "International Geomagnetic Reference Field" with the latest coefficients.

*Preparation of annotation sheet

(1)Geographical names and designtions of ground features shall be inscribed. Administrative names shall be studied in the field at the time of field completion and inscribed later.

(2)Style, size, interval, allocation, etc. of letters shall be in accordance with the designation of NGD.

(3)The annotation of destination shall be determined after discussion with NGD.

(4)Two kinds of annotation sheets for Lao and English editions shall be prepared by NGD.

(5)Items of the marginal informmation common to all sheets shall be prepared for one of the sheets. The items different for each map sheet shall be described for all map sheets. (sheet name, sheet number, index map in reference to neighbouring map sheets, etc.)

*When doubtful points arise while compilation, they shall be recorded on a overlay in order to give instructions to study at the time of field completion.

6)Preparation of various kinds of data sheets

At the time of compilation, several kinds of data sheets shall be prepared showing clearly items to represent on the map classifying item by item in order not to rise questionable points while drafting by cartographers.

a. Road data sheet
Administrative classification (representation of national roads by symbols), breadth and conditions of pavement shall be described.

b. Vegetation data sheet
For the sake of preparation of mask sheets for vegetation in drafting, the range covered and the species shall be shown.

c. Hydrography data sheet
Extracting objects related to hydrography, such as rivers, lakes, etc., their range covered and bradth shall be shown as well as whether they are permanent or temporary. The designation, if any, shall be indicated.

7)Tying
A map sheet shall be tied to neighbouring ones.

8)Checking
After finishing compilaton work, checking shall be made to find out errors or omissions in representation by the comparison of compilation manuscrits with field identified aerial photographs, to confirm conformity of contour lines with spot heights, map specificatons, etc. At the same time, questionable points shall berecorde on overlays to give instructions to confirm in the field at the t ime of field completion.

9)Quality control
The quality control list shall be prepared.

Minutes of Meetings

on

Progress Report of

the Third Year's Work

(December 22, 1994)

MINUTES OF MEETINGS
FOR
THE TOPOGRAPHIC MAPPING
OF
BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
BETWEEN
JICA STUDY TEAM
AND
NATIONAL GEOGRAPHIC DEPARTMENT

At Vientiane, December 22, 1994

1. Introduction

The JICA Study Team (referred to as " Team" hereafter) headed by Mr.Tositomo KANAKUBO visited Lao P.D.R. on the 20th of October, 1994 to carry out the third year work for technical cooperation of the Topographic Mapping of Bolikhamxai Province in Lao P.D.R.

In advance of executing the field survey, the Plan of Operation (referred to as "P/O" hereafter) for the third year work was submitted to the National Geographic Department (referred to as the "NGD" hereafter). After the discussions between NGD and Team, P/O was accepted and the first Minutes of Meeting for the third year work was signed by both sides on the 3rd of November 1994. In the first minutes, NGD strongly requested Team to deliver Laos side the negative films of aerial photographs taken in the first stage of the work as soon as possible, since the many urgent restoration projects in the project area against the natural disasters caused by the heavy rainfall in this year required them. Based upon the request letter on the delivery of the negative films issued by Mr. Kali khanophet , General Director of NGD, Mr. kanakubo, Team leader, through the required official procedures, brought the original negative films and delivered them to NGD in December, 1994.

The field survey started in the end of October and was completed successfully in the middle of December 1994. The final meeting was held from the 13th to 21st of December 1994 in NGD.

During the final meeting, a progress report for the third year work was submitted and explained by Team, and NGD accepted it and appreciated for Team's effort and technical transfer.

A draft of P/O for the fourth year work was also proposed by Team to NGD. The technical discussions between Team and NGD were made to specify the final drawings of conventional signs, Specifications and coloring for printing.

The following items were discussed and mutually agreed upon between NGD and Team.

2. Agreed items :

1. NGD accepted the progress report of the third year work.
2. NGD and Team agreed on the specification of final drawings of conventional signs which are attached in the draft of P/O for the fourth year work and as shown in the Appendix 1 to 3.1
3. In response of the special request of NGD, JICA accepted to delivery the original negative films of the aerial photography to NGD before the completion of the Study. NGD received the original negative films of six (6) rolls of the aerial photography and appreciated the consideration and cooperation of Japanese side very much.

T. K.

4. Team informed that one or two counterpart trainees would be arranged by JICA for the next year, 1995 work.
5. NGD strongly requested to donate the five (5) unit of four-wheel driving cars which were used for the field survey and Team has no plan to use them any more because this stage is the final field work stage. The Team expressed to convey NGD's request to JICA headquarters.
6. NGD also requested to Team to hold a technical seminar on the processes and results, and on exhibition of the newest printed maps of the Topographic Mapping Project of Bolikhamxai Province after completing the process of printing. Team took note the request and expressed to convey NGD's request to JICA headquarters.

3. Attendants

NGD side

Mr.Kali KHANOPHET	General Director of NGD
Mr.Boualay XAIGNASANE	Deputy Director of NGD
Mr.Khamkhong DETCHANTHACHACK	Deputy Director of NGD
Mr.Thongchanh MANIXAY	Chief of Planning Section
Mr.Neuang XAIPANGNA	Chief of Cartography Division
Mr.Phouangphane SAYASANE	Deputy Chief of Cartography Division

Mapping Team side

Mr.Tositomo KAKUBO	Team Leader
Mr.Koichi MIKI	Deputy Leader
Mr.Yasuo TANAKA	Mapping Planner
Mr.Fujio ITO	Chief Surveyor
Mr.Hideaki SAKAI	Coordinator

Observer

Kenji DOMOTO	Special Assistant, Embassy of Japan

At Vientiane, 22nd of December, 1994

Mr. Boualay SAIGNASANE
For General Director of NGD

Mr. Tositomo KANAKUBO
Leader of the JICA Study Team

ANNEX: List of Attendants of the Meeting

LAOS SIDE:

Mr.Kali KHANOPHET	General Director of National Geographic Department
Mr.Boualay SAIGNASANE	Deputy Director of National Geographic Department
Mr.Khamkhong DETCHANTHACHACK	Deputy Director of National Geographic Department
Mr.Thongchanh MANIXAY	Chief of Planning Section
Mr.Neuang XAIPANGNA	Chief of Cartography Division
Mr.Phouangphanh SAYASANE	Deputy Chief of Cartography Division
Mr.Sangkhan THIENGTHAMMAVONG	Engineer of Cartography Division

JAPANESE SIDE:

Mr.Tositomo KANAKUBO	Team Leader
Mr.Koichi MIKI	Deputy Leader
Mr.Yasuo TANAKA	Mapping Planner
Mr.Fujio ITO	Chief Surveyor
Mr.Minori ONAKA	Surveyor
Mr.Takashi SHIMONO	Surveyor
Mr.Hideaki SAKAI	Coordinator

T. K.

PROGRESS REPORT
OF
THE WORK OF THE THIRD YEAR

TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

DECEMBER, 20, 1994

STUDY TEAM
OF
TOPOGRAPHIC MAPPING OF BOLIKHAMXAI PROVINCE

JAPAN INTERNATIONAL COOPERATION AGENCY

T K

1. Introduction

In response to the request of the Government of the Lao People's Democratic Republic (hereinafter referred to as "Laos"), the Government of Japan (hereinafter referred to as "Japan") decided to conduct the study of the "Topographic Mapping of BOLIKHAMXAI Province" (hereinafter referred to as the "Study").

The Study started in December 1992 under a four years program of the Japan International Cooperation Agency (hereinafter referred to as the "JICA"). The aerial photography and ground control survey were executed from December 1992 to February 1993 (phase I of the first year), the leveling and pricking were executed from March to May, 1993 (phase II of the first year). After leveling and pricking work, aerial triangulation was executed from June to July 1993 (phase III of the first year). Those results and accuracy of the first year work were inspected and accepted by JICA.

The field identification for 13,000 km^2 and plotting and compilation for 3,200 km^2 were carried out from September 1993 to March 1994 in the second year work. Plotting work was performed by plotting machine using the result of aerial triangulation, field identification and other field data.

The detail of phase I of the first year was mentioned in annual report of 1992. Also, the detail of phase II & III of the first year and the second year work were mentioned in annual report of 1993.

The third vear work contained plotting and compilation for 9,800 km^2 and field completion for 13,000 km^2. The plotting and compilation work were continuously carried out for remaining parts of the second year work. After the finishing the plotting and compilation for 13,000 km^2, the Study Team (hereinafter referred to as the "Team") arrived in Vientiane for carrying out the field completion on 20th October 1994. In advance of the field work, the Plan of Operations for the third year work (hereinafter referred to as the"P/O") was submitted and explained by the Team to National Geographic Department (hereinafter referred to as the "NGD") and NGD accepted it.

The field completion was executed to respect the conventional signs and their application rule (specification) which were agreed in the last year. The surveying was conducted from the end of October to the middle of December and finished successfully and safely. In accomplishing the field survey of the third year, hereinafter, the summary of the progress is reported.

2. Outline of the Third Year work

2-1 Objectives

Objectives of the Study are :

(1) to prepare 1/25,000 topographic maps covering the Bolikhamxai Province,

(2) to transfer technology to the counterparts through the implementation of the works, and

(3) to establish the friendship between Lao PDR and Japan through the implementation of the Study.

2-2 Scope of work for the captioned year

Scope of work for the captioned year is as follows:

Plotting	9,800 km^2 (Preparation of plotting manuscript : 80 sheets)
Compilation	9,800 km^2 (Preparation of compilation manuscript : 80 sheets)
Field completion	13,000 km^2
Preparation of original manuscript	13,000 km^2 (Preparation of original manuscript :112 sheets)

3. Progress of works

3-1 Plotting and compilation

Plotting was carried out for 9,800 km^2, remaining area of the second year work, by using the diapositives of the aerial photographs in account of the results of aerial triangulation and field identification.

Compilation manuscript was made by compiling of plotting manuscript using the identified items, the toponym and annotation data obtained in the field in compliance with the specification. Its volume was same as plotting area 9,800km^2.

The stereo plotting and compilation were completed in September 1994 and several duplicate copies were prepared for the field completion.

3-2 Field completion

3-2-1 Field work

In compliance with the specification, necessary items to represent on the map re-collected and corrected on the copies of compilation manuscript in the field. Five field parties were deployed in the field to stay at Pakxan, Lak 20 and Thakhek. The field works were performed using four-wheel driving cars and helicopter. Some area were very difficult to access even though using four-wheel driving cars because of bad condition of road caused

by heavy rainfall in this year. Helicopter was very useful to survey for such areas as well as for mountainous area. Approximately two hundred villages were landed by helicopter.

Main activities carried out in the field were as follows :

1) by reconnoitering the whole area, checking of the compilation manuscripts was carried out to compare with the site for finding out the omission and/or misconception of important items at the time of stereo plotting.
2) questionable points at the time of stereo plotting and compilation were clarified.
3) newly constructed ground features after photographing such as electric power line, new roads and etc. were studied and supplemented.
4) both classification of roads and their connection were verified.
5) small ground features necessary to represent on maps such as well, water tank, etc. were verified by using hand carried GPS receivers.
6) supplemental collection and arrangement of toponym were mainly executed by hearing of NGD counterparts with local residents.

3-2-2 Office work

Japanese side:

1) Colored copies of the compilation manuscripts were employed for the field work. After field work, all of data obtained in the field were transferred on blue copies of the compilation manuscripts using a drawing pen to prepare the records of the field completion.

NGD side :

1) In accordance with the Minutes of Meeting dated 3rd of November 1994, all of toponyms of Lao and Latin alphabet were input into a floppy disk instead of preparation of annotation plates.
2) Arrangement and/or execution of inscription of national boundaries and administrative boundaries were carried out on blue copies of the compilation manuscripts.
3) Collection of bridge data to be annotated on maps was carried out.

4. Discussion with NGD on technical matters

During the field completion, some technical matters including drafting and printing were discussed and agreed by both side. Those are summarized as shown in appendix I.

5. Succeeding works in Japan (preparation of original manuscripts)

After the field completion, all of data obtained and corrected shall be corrected and modified to compilation manuscripts to prepare original manuscripts. Original manuscripts and all of results surveyed in the field shall be inspected technically and authorized by Japan Surveyor's Association entrusted by JICA.

6. Working period

Plotting and Compilation	July 1994 - September 1994
Field completion	19 September 1994 - 26 December 1994
Preparation of original manuscripts	January 1995 - March 1995

7. Working plan and results

Working plan and results are as follows:

Item	Original plan	Result	Remarks
Stereo plotting	9800km^2 (80 sheets)	9800km^2 (80 sheets)	finished in September '94
Compilation	9800km^2 (80 sheets)	9800km^2 (80 sheets)	finished in September'94
Field completion	13000km^2 (112 sheets)	13000km^2 (112 sheets)	finished in December '94
Preparation of original manuscripts	13000km^2 (112 sheets)	13000km^2 (112 sheets)	will be finished in March 1995

8 Formation of the Study Team and its assignment

Team Leader	Mr. Tositomo KANAKUBO	19 October	- 05 November '94
		12 December	- 26 December '94
Deputy Leader	Mr. Koichi MIKI	19 October	- 26 December '94
Planner	Mr. Yasuo TANAKA	19 October	- 26 December '94
Chief Surveyor	Mr. Fujio ITO	19 October	- 26 December '94
Mechanic	Mr. Atsushi TANAKA	19 October	- 26 December '94
Field member	Mr. Kiyofumi TAMARI	19 October	- 26 December '94
"	Mr. Hideya SAWAKI	19 October	- 26 December '94
"	Mr. Sadao MATSUMOTO	19 October	- 26 December '94
"	Mr. Minori ONAKA	19 October	- 26 December '94

"	Mr. Hideto HOSODA	19 October	- 26 December '94
"	Mr. Masaru TERADA	19 October	- 26 December '94
"	Mr. Takashi SHIMONO	19 October	- 26 December '94
"	Mr. Yoshiharu SATO	19 October	- 26 December '94
Coordinator	Mr. Hideaki SAKAI	19 October	- 26 October '94
		17 December	- 26 December '94

9. Co-operation by Counterparts of NGD

9-1 Personnel

Headquarters

Mr. Kali KHANOPHET	General Director
Mr. Boualay XAIGNASANE	Deputy Director
Mr. Khamkhong DETCHANTHACHACK	Deputy Director
Mr. Thongchanh MANIXAY	Chief of planning section
Mr. Neuang XAIPANGNA	Chief of Cartography Division

Field identification

Mr. Phouangphanh SAYASANE	Deputy Chief of Cartography
Mr. Sangkhan THIENGTHAMMAXONG	Cartographer
Mr. Souban LOUANGSAMATAH	Cartographer
Mr.Boungnom	Cartographer
Mr. Phonesavanh	Cartographer

9-2 Undertaking Work of NGD

Undertaking work of NGD was already mentioned at 3-2 Field completion in this paper.

10. Acknowledgment

The team would like to express its sincere thankfulness to the staff of NGD for their administrative support and management and preparation of the study as well as to NGD counterparts who has joined the Team in participating and executing the Study throughout all periods of field survey. All of their efforts in cooperating with the Team reached to the successful results of the Study.

APPENDIX

TECHNICAL DISCUSSIONS

1 Introduction

JICA Study Team and NGD continued the meetings to discuss uncertain and questionable matter obtained in the field survey and the final drawing map symbols and their application rules and besides the colorings for printing . The uncertain and questionable matters were reported by the field parties to NGD and discussed and agreed mutually. The final drawing map symbols and their application rules and the colorings for printing were also discussed based on the sample maps which were prepared by the Team. Sample maps were very useful for the discussion on the map symbols and colorings.

After the discussions, the final drawing map symbols and application rules was attached to "Draft of Plan of Operation for Drafting and Printing". This is as shown in Annex I. The other discussed items are summarized as follows:

2 Date of the meeting

25th October 1994	1st November 1994	14th December 1994
26th October 1994	3rd November 1994	15th December 1994
27th October 1994	8th November 1994	
31st October 1994	14th November 1994	
	15th November 1994	
	29th November 1994	
	30th November 1994	

Attendants: NGD side	Team side
Mr.Boualay	Mr.Kanakubo
Mr.Khamkhong	Mr.Miki
Mr.Thongchanh	Mr.Tanaka
Mr.Neuang	Mr.Ito
Mr.Phouangphanh	Mr.Onaka
Mr.Sangkane	Mr.Tamari
Mr.Boungnom	Mr.Matumoto
Mr.Souban	Mr.Shimono
Mr.Phonesavanh	Mr.Tereda

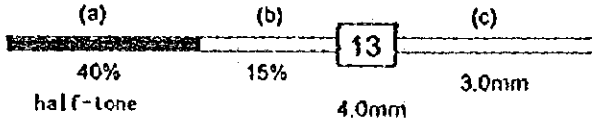
Discussed items

1. National road (reference map symbol NO.1)

   (a) Paved road .....shall be Red color with 40% half-tone

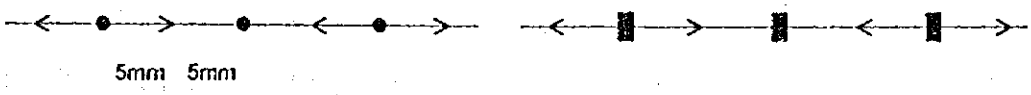
   (b) Unpaved road with more than 5 m width.....shall be Red color with 15% half-tone

   (c) Unpaved road with less than 5 m width..... shall be no color



2. Power transmission line (reference map symbol NO.14)

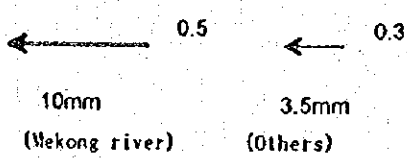
   Arrow sign shall be put between all tower sign.



3. Power station shall be annotated. (reference map symbol NO.16)

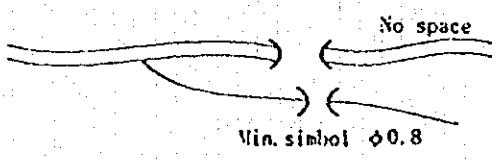
4. Water direction of flow (reference map symbol NO.21)

   The size of arrow signs of Mekong river and others shall be different as follows ;



5. Underground river (reference map symbol NO.22)

   Underground river shall not be indicated but its entrance and exit shall be put a symbol as folloes :



6. Spring (reference map symbol NO.31)

   Hot spring shall be annotated as follows :

7. Reservoir, pond, fish pond (reference map symbol NO.32)

Reservoir, pond and fish pond shall be indicated with same symbol and be annotated a name if any.

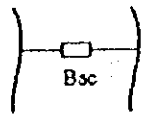
8. Bridge (reference map symbol NO.40)

If capacity data is not available it shall be blank as follows :

Cm. p. $\frac{80 - 8}{80}$ Cm. p. $\frac{80 - 8}{(\ )}$

9. Ferry (reference map symbol NO.42)

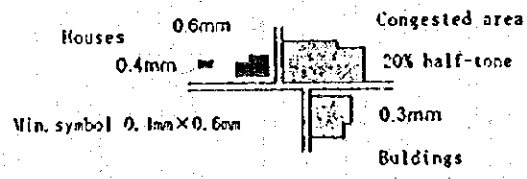
Position of annotation shall be located in the appropriate position.



10. Houses (reference map symbol NO.61, 62, 63)

A expression of fireproof and unfireproof shall not be indicated on a map.

House, Congested area and Buildings shall be indicated as follows :



11. Traverse point (reference map symbol NO.91)

Astronomical point shall not be indicated on a map.

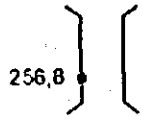
12. GPS control point (reference map symbol NO.93)

Only permanent monument shall be indicated with symbol and if it has leveling data it shall be indicated to round off in a decimal and the others be in meter.

Not monumented GPS point shall be indicated same as spot height.

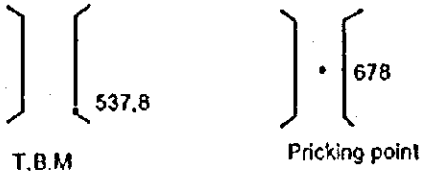
13. Secondary bench mark (reference map symbol NO.92)

Only Secondary bench mark which were established by USSR shall be shown with symbol.



14. Temporary bench mark (reference map symbol NO.94)

Temporary bench marks which were monumented temporarily shall be indicated to round off in a decimal and other pricking points be in meter same as spot height.



15. Vegetation boundary (reference map symbol NO.101)

Symbol of Vegetation boundary shall be changed from dots line to solid line in green.

16. Dense forest and Thin forest (reference map symbol NO.102,103)

Forest data, height and round, shall not be indicated on a map.

The boundary of dense and thin forest shall not be indicated.

17. Mixture of vegetation symbols (reference map symbol NO.109,110)

Mixed area of bamboo and bush shall be indicated by mixing of both symbol with 20% half-tone in green.

18. Rock range shall not be shown in legend.

19. Sharp karst topography (reference map symbol NO.127)

Only remarkable thony karst topography shall be indicated with symbol pattern (zip-a-torn) and its boundary shall not be drawn.

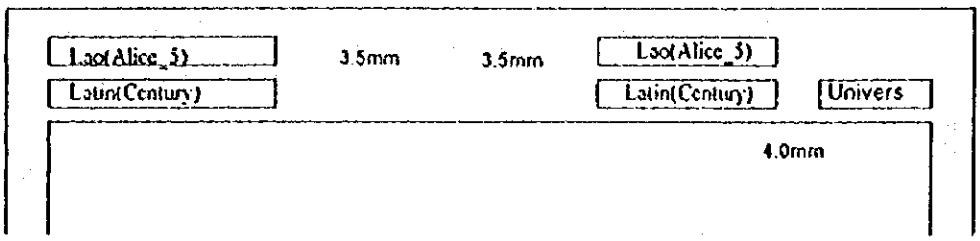
20. Contour line (reference map symbol NO.132)

Contour line shall be expressed in legend as follows.

Index contour	50m
Principal contour	10m
Intermediate contour	5m

21. Marginal information

21-1 Style and size of letters for the title of marginal information shall be described as follows :



21-2 Magnetic declination

a. Magnetic declination shall be the value at the center of each sheet computed from the empirical formula "International Geomagnetic Reference Field" with the latest coefficients. The following explanation shall be annotated with diagram.

"A value of magnetic declination was computed from the International Geomagnetic Reference Field 1990"

And also, In the area with observed magnetic anomaly, the following note shall be added to the above-mentioned explanation.

"NOTE : Magnetic anomaly was observed at some points located in this sheet"

b. Diagram shall be same as the one in the existing 1/25 000 topographic map.

21-3 Administration box

International and provincial boundaries shall be shown in the box and indicated a number of administrative name.

21-4 A frame of vegetation symbol in legend shall be changed from black color to green color.

21-5 Scale-Bar

A figure of Scale-Bar shall be indicated as follows :

1:25_000 → put space

1000m → no space

21-6 Annotation of destination

Annotation of destination shall be same as the one in existing map 1/25,000

21-7 Legend

Legend is as shonwn in appendix 3.

22. · Map symbols shall be indicated vertically against the bottom of neat line.

23. Removal of map symbols

Ground control point shall be not removed on a map.

If a symbol would disturb a linear feature, a symbol shall be removed to the appropriate position.

24. Coloring for printing

Following color shall be adopted for each color.

Black	N-2	(The Number shall be referred to Muncell color chart)
Red	5 R 4/14	(-ditto-)
Blue	10B 5/10	(-ditto-)
Green	10GY 5/10	(-ditto-)
Brown	7.5 YR 5/8	(-ditto-)

25. Letter font

Title of map and legend, sheet name and annotation shall be adopted "Alice 5".

Items of legend shall be adopted "Alice_0".

26. Annotation

26-1 Annotation of water part shall be blue in Latin and Lao alphabet.

26-2 District name shall be indicated in the place located the district office.

26-3 Decimal for annotation shall be adopted to comma (,).

26-4 Annotation of the dam located at PAKXAN north-west shall be no annotation.

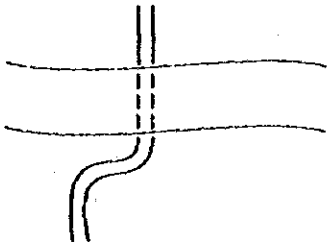
27. Road (reference map symbol NO. ; 1)

27-1 National road route 13 shall be indicated as a paved road because it is expected to complete in 1995.

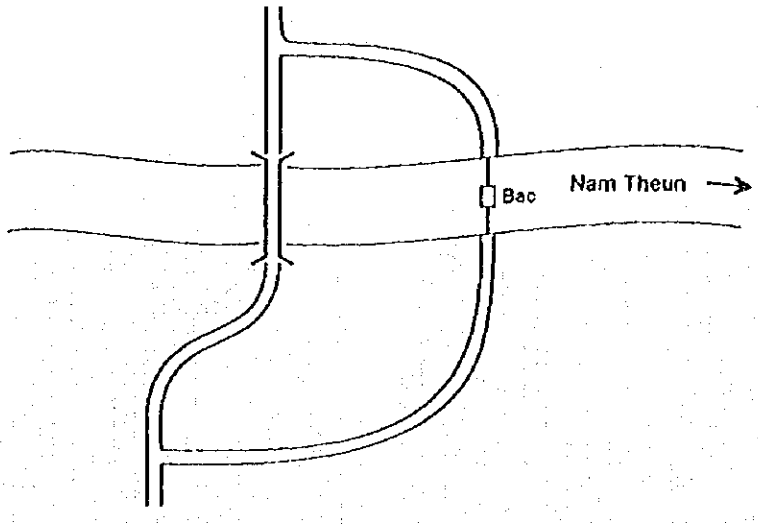
27-2 Annotated data of bridges on the route 13 shall be changed to new data because it is expected to complete in 1996 though they are still under construction and planning.

27-3 Provincial road route 8 B shall be expressed as a double line road (width 0.4 mm on a map) with route box.

27-4 The Bridge crossing the Nam Theun located in B.Thalang shall be indicated as a ford.



27-5 The Bridge crossing the Nam Theun located at Ferry(BAC) shall be putted symbol at the under construction position and planing road also shall be drawn by solid line based on the collected data.



28. Power line in Lak20 area

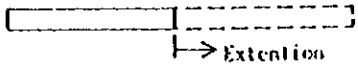
Under construction power line (22Kv) in Lak 20 area shall be indicated on a map.

29. Customs office located B. Nape shall be indicated as a normal house. No need to annotated.

30. Airport in PAKXAN and Lak20 shall be indicated as a airfield.

31. Airfield in Lak20

Paved runway shall be drawn by solid line and planning runway shall be extended by a broken line. Total length shall be 1800m.



32. Expected new provincial office in PAKXAN shall be indicated building symbol only. Provincial office shall be indicated at present place.

33. Drawing of boundaries

Boundaries shall be drawn continuously but shall be cut at the annotation and water direction flow.

In the no space part to put the boundaries such as single line river, it shall be indicated mutually every 4 cm with blank space on a map.

34. Final cutting map size shall be as follows: