

Appendix 10-1
Aerial Photo of
Battambang – Sri Sophorn Section,
National Road No. 5



MINISTRY OF PUBLIC WORKS
AND TRANSPORT

JAPAN INTERNATIONAL COOPERATION AGENCY
KATAHIRA & ENGINEERS INTERNATIONAL

PREPARATORY SURVEY FOR
NATIONAL ROAD NO.5 REHABILITATION PROJECT
IN THE KINGDOM OF CAMBODIA

TITLE:
PLAN NO.01
NATIONAL ROAD NO.5

Drawing No.	PL-01
SCALE	1 / 5,000
DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: PLAN NO.02 NATIONAL ROAD NO.5	Drawing No.	PL-02
				SCALE	1 / 5,000
				DATE	APR. 2012



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					SCALE	1 / 5,000
					DATE	APR. 2012



KP308

MINISTRY OF PUBLIC WORKS
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JAPAN INTERNATIONAL COOPERATION AGENCY
KATAHIRA & ENGINEERS INTERNATIONAL

PREPARATORY SURVEY FOR
NATIONAL ROAD NO.5 REHABILITATION PROJECT
IN THE KINGDOM OF CAMBODIA

TITLE:

PLAN NO.04
NATIONAL ROAD NO.5

Drawing No.

PL-04

SCALE

1 / 5,000

DATE

APR. 2012



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			PLAN NO.05 NATIONAL ROAD NO.5			
			SCALE	DATE		
						1 / 5,000 APR. 2012



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				SCALE	1 / 5,000
				DATE	APR. 2012



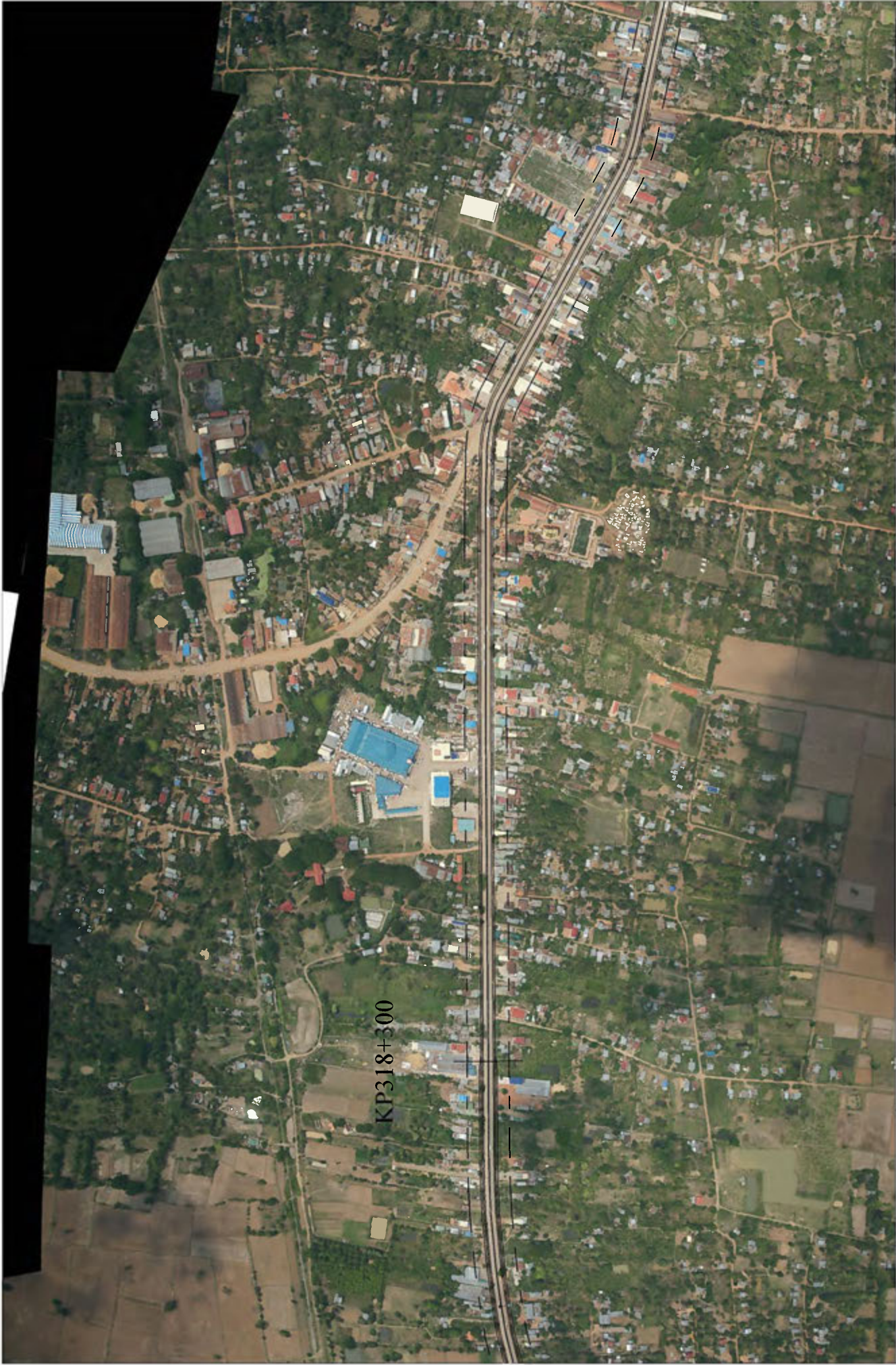
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: PLAN NO.07 NATIONAL ROAD NO.5	Drawing No.	PL-07
				SCALE	1 / 5,000
				DATE	APR. 2012



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				DATE	APR. 2012



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						SCALE	1 / 5,000
						DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		Drawing No.	PL-10
					SCALE	1 / 5,000
					DATE	APR. 2012



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			Drawing No.	PL-11
			SCALE	1 / 5,000
			DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		Drawing No.	PL-12
					SCALE	1 / 5,000
					DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		PLAN NO.13 NATIONAL ROAD NO.5
			Drawing No.		
			SCALE		
			DATE		
				PL-13	
				1 / 5,000	
				APR. 2012	



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						SCALE	1 / 5,000
						DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		PLAN NO.15 NATIONAL ROAD NO.5
			Drawing No.		
			SCALE		
			DATE		
					PL-15
					1 / 5,000
					APR. 2012

PL-15

1 / 5,000

APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: PLAN NO.16 NATIONAL ROAD NO.5	Drawing No.	PL-16
				SCALE	1 / 5,000
				DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		PLAN NO.17 NATIONAL ROAD NO.5		Drawing No.	PL-17
							SCALE	1 / 5,000
							DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	PLAN NO.18 NATIONAL ROAD NO.5	Drawing No.	PL-18
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					DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		Drawing No.	PL-19
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					DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO 5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	PLAN NO 20 NATIONAL ROAD NO.5	Drawing No.	PL-20
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					DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	
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			DATE	APR. 2012



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						DATE	APR. 2012



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					SCALE	1 / 5,000
					DATE	APR. 2012



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PREPARATORY SURVEY FOR
NATIONAL ROAD NO.5 REHABILITATION PROJECT
IN THE KINGDOM OF CAMBODIA

TITLE:
PLAN NO.24
NATIONAL ROAD NO.5

Drawing No.	PL-24
SCALE	1 / 5,000
DATE	APR. 2012



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			PLAN NO.25 NATIONAL ROAD NO.5	
			Drawing No.	PL-25
			SCALE	1 / 5,000
			DATE	APR. 2012



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PREPARATORY SURVEY FOR
NATIONAL ROAD NO.5 REHABILITATION PROJECT
IN THE KINGDOM OF CAMBODIA

TITLE:

PLAN NO.26
NATIONAL ROAD NO.5

Drawing No.

PL-26

SCALE

1 / 5,000

DATE

APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		Drawing No.	PL-27
					SCALE	1 / 5,000
					DATE	APR. 2012



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					NATIONAL ROAD NO 5	SCALE	1 / 5,000
						DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		Drawing No.	PL-29
					SCALE	1 / 5,000
					DATE	APR. 2012



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			PLAN NO.30 NATIONAL ROAD NO.5		
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			SCALE	1 / 5,000	
			DATE	APR. 2012	



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PREPARATORY SURVEY FOR
NATIONAL ROAD NO.5 REHABILITATION PROJECT
IN THE KINGDOM OF CAMBODIA

TITLE:
PLAN NO.31
NATIONAL ROAD NO.5

Drawing No.	PL-31
SCALE	1 / 5,000
DATE	APR. 2012



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KATAHIRA & ENGINEERS INTERNATIONAL

PREPARATORY SURVEY FOR
NATIONAL ROAD NO.5 REHABILITATION PROJECT
IN THE KINGDOM OF CAMBODIA

TITLE:

PLAN NO.32
NATIONAL ROAD NO.5

Drawing No.

PL-32

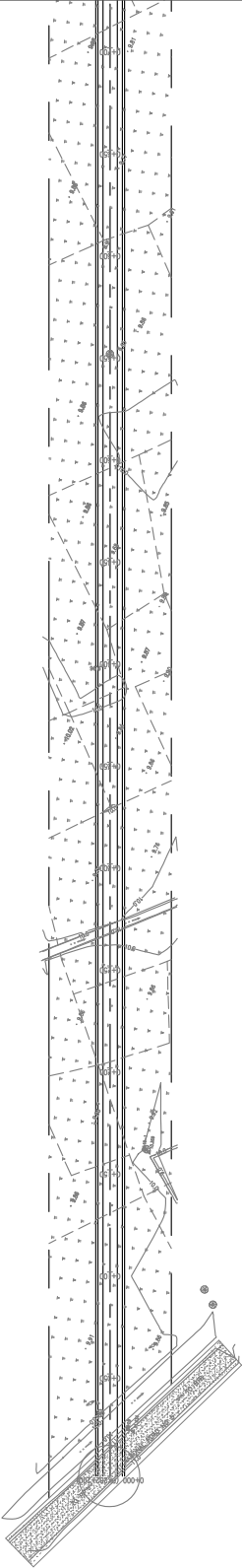
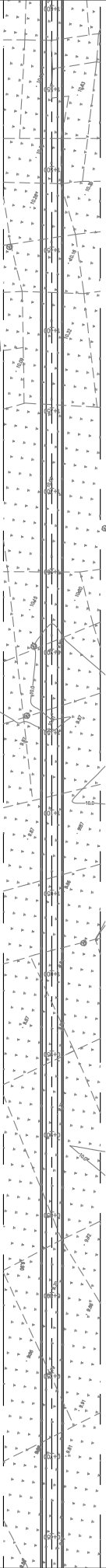
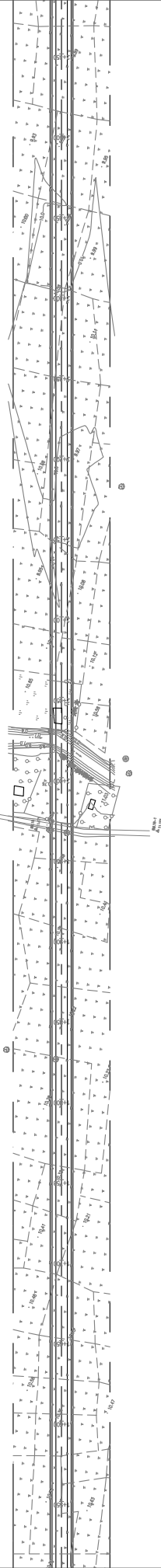
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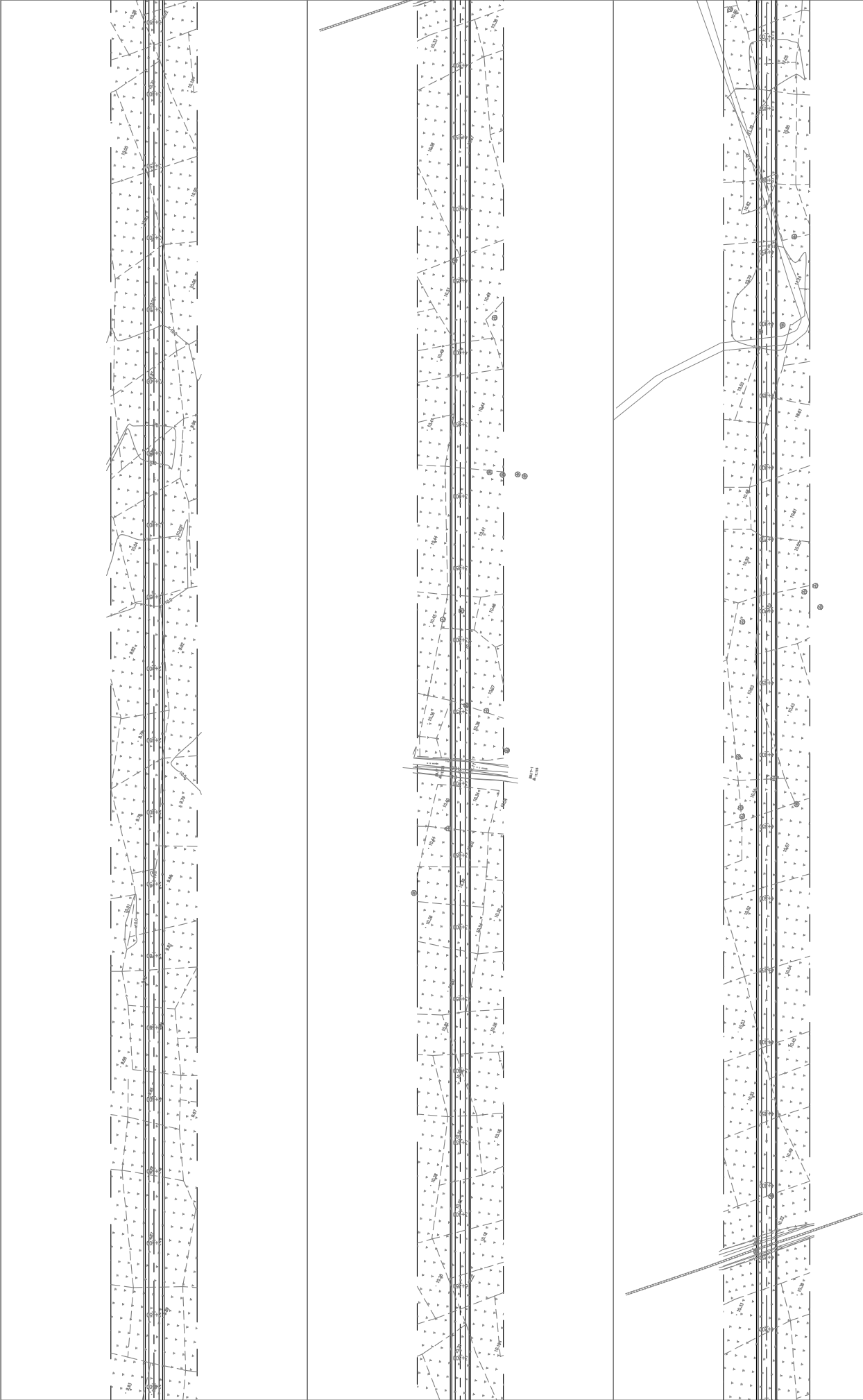
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DATE

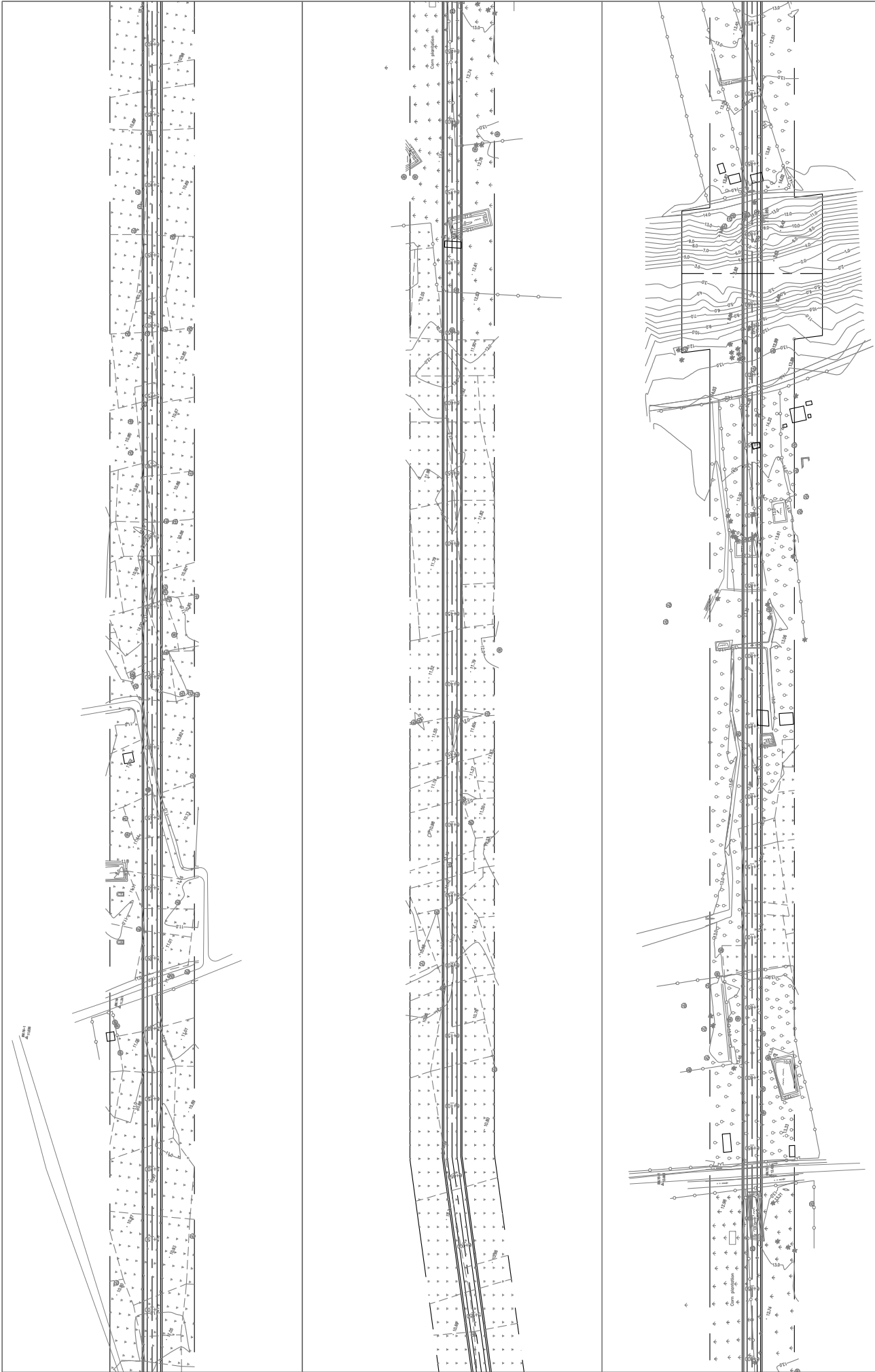
APR. 2012

Appendix 10-2
Plan of
Battambang – Sri Sophorn Section, National
Road No. 5

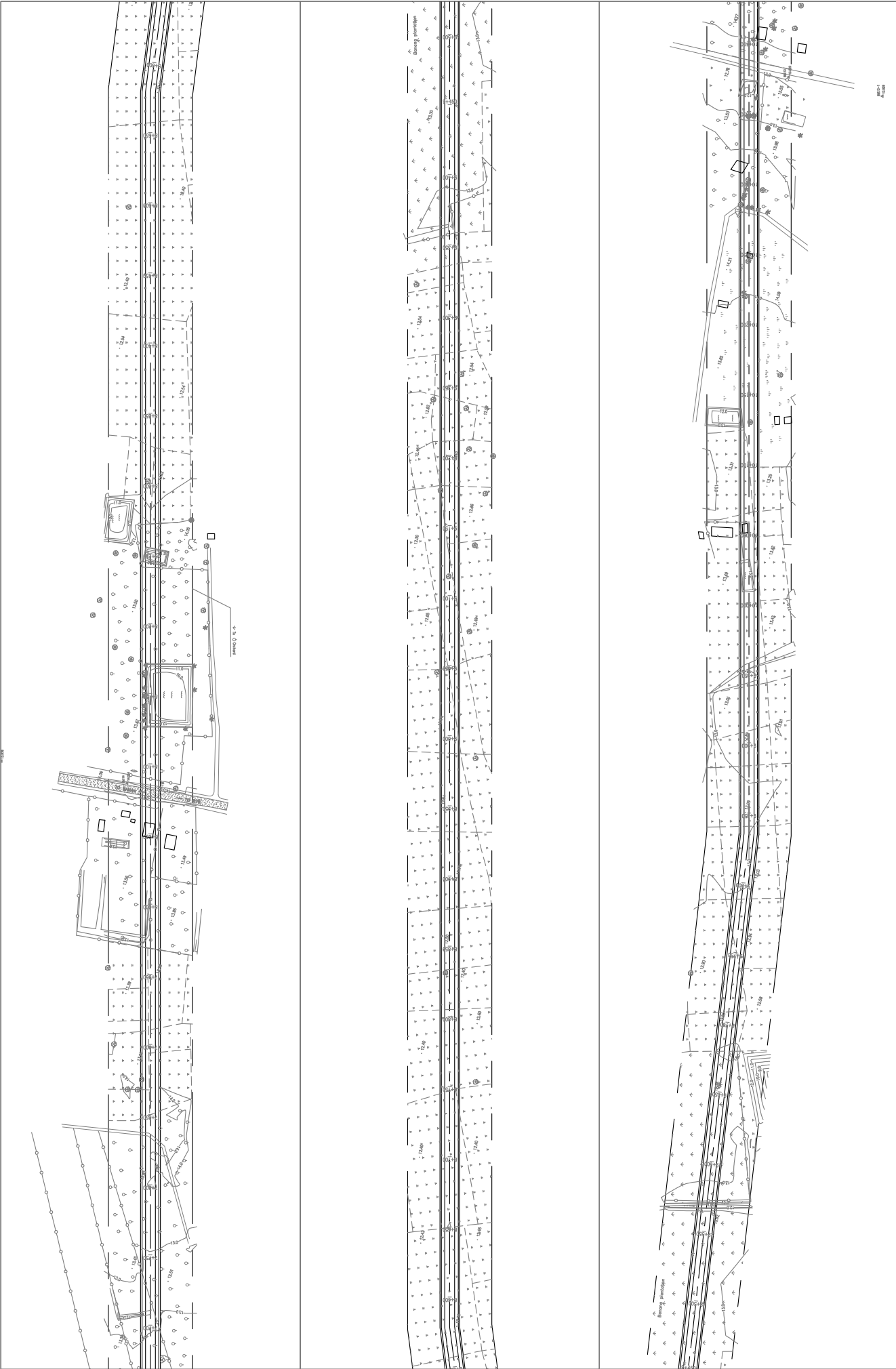
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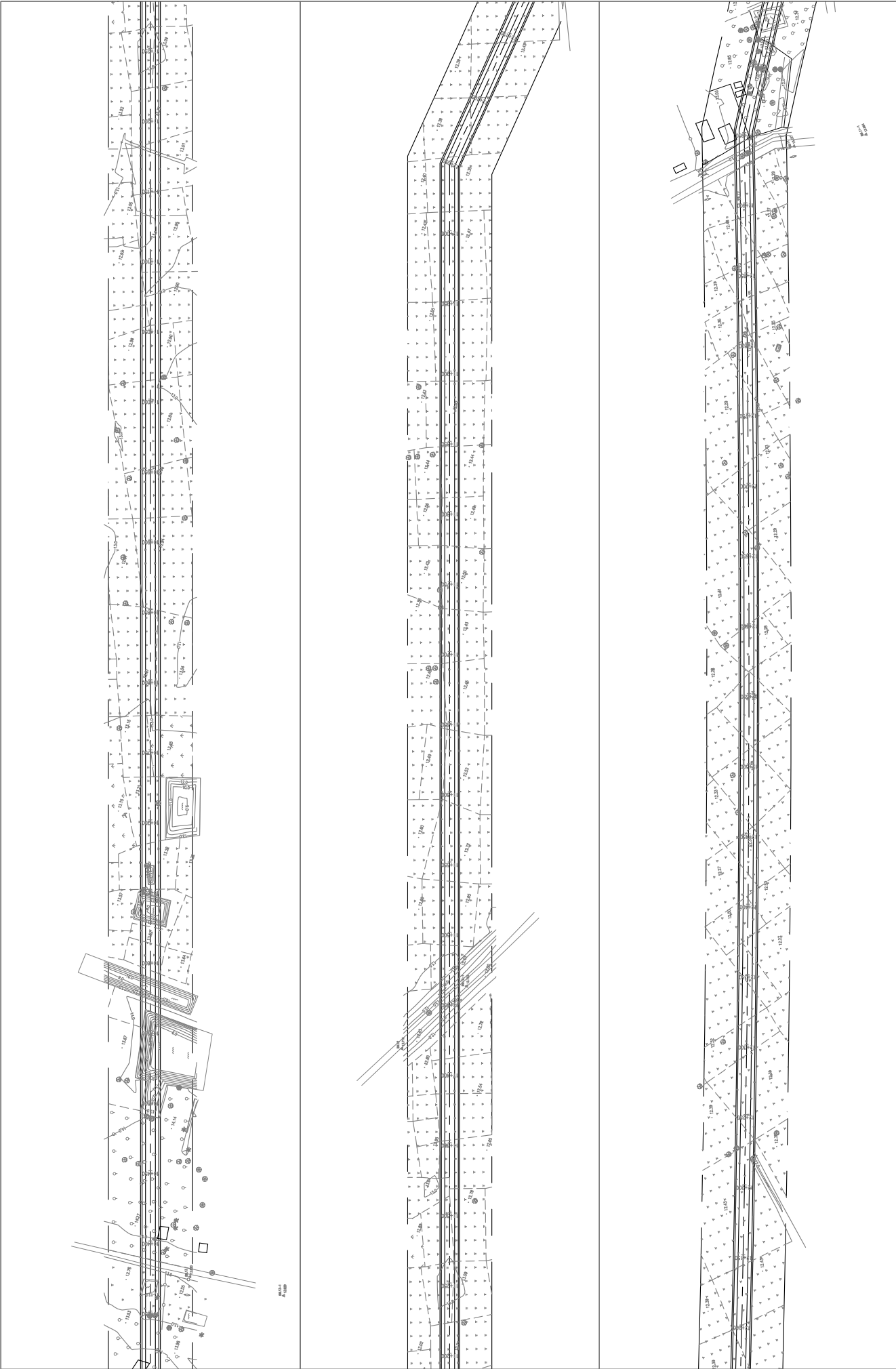
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: NATIONAL ROAD NO.5 BATTAMBANG BYPASS PLAN	Drawing No.	PL-02B
				SCALE	1 / 2,500
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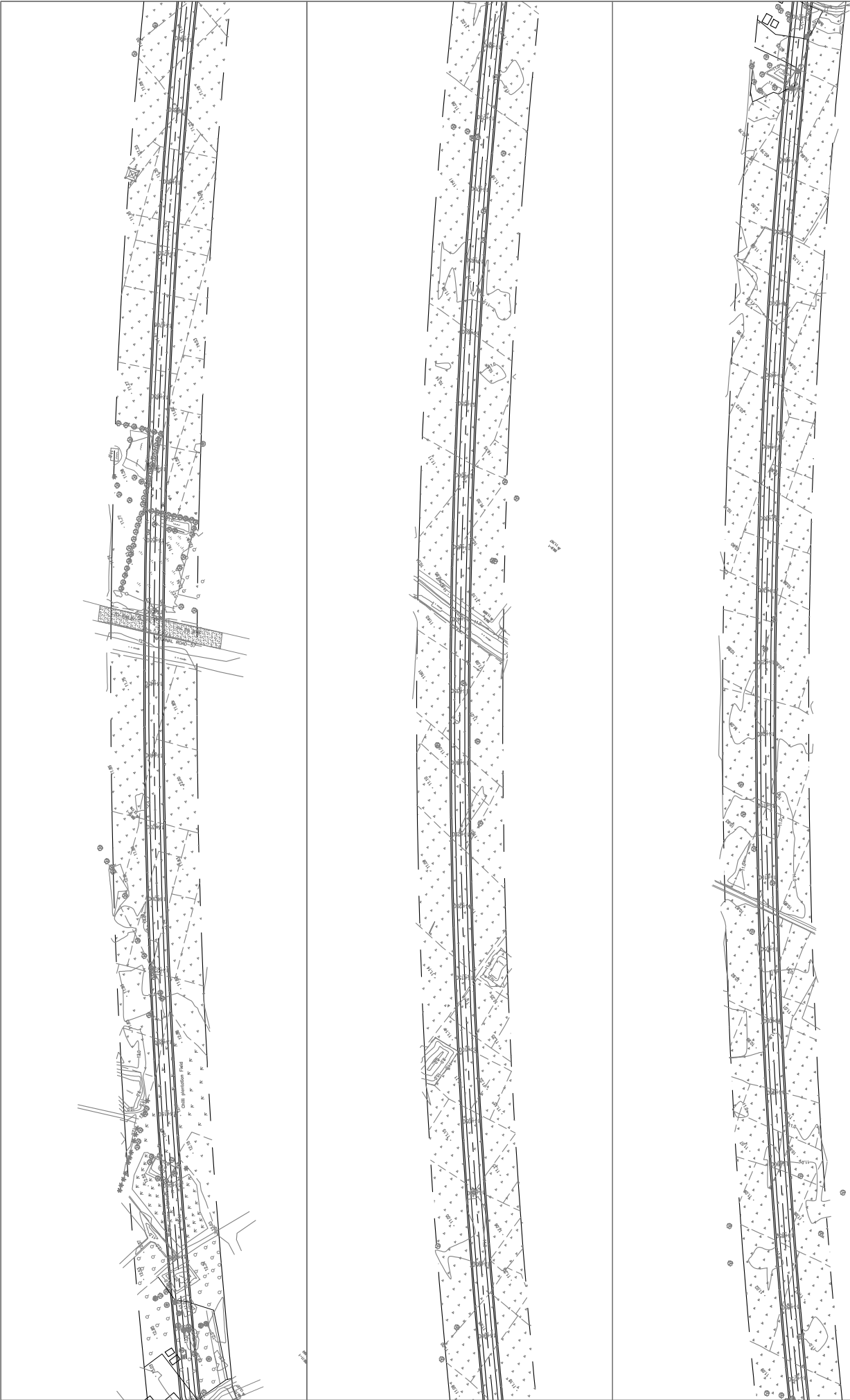
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	
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			SCALE	1 / 2,500
			DATE	APR. 2012



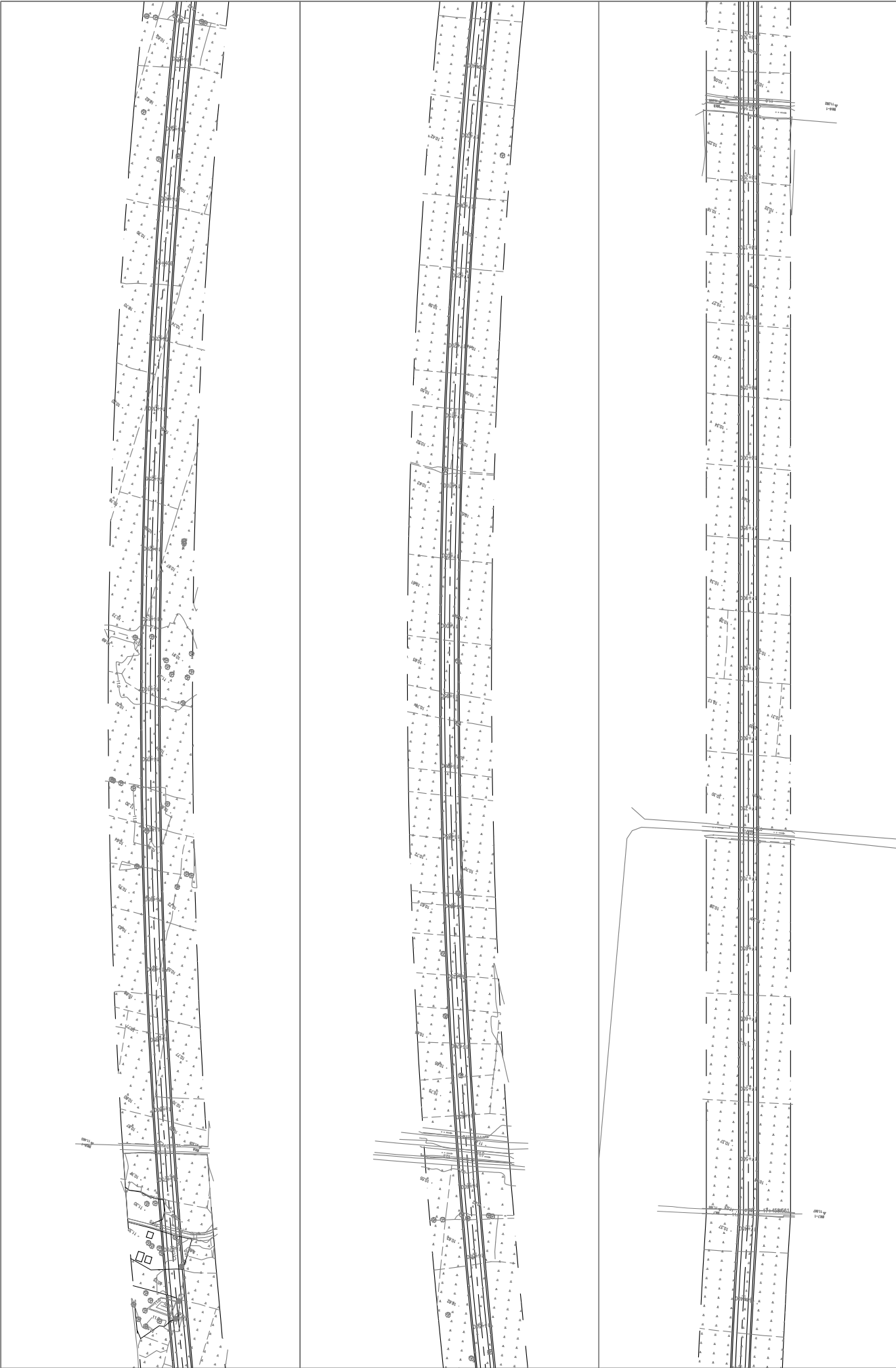
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: NATIONAL ROAD NO.5 BATTAMBANG BYPASS PLAN	Drawing No.	PL-04B
				SCALE	1 / 2,500
				DATE	APR. 2012



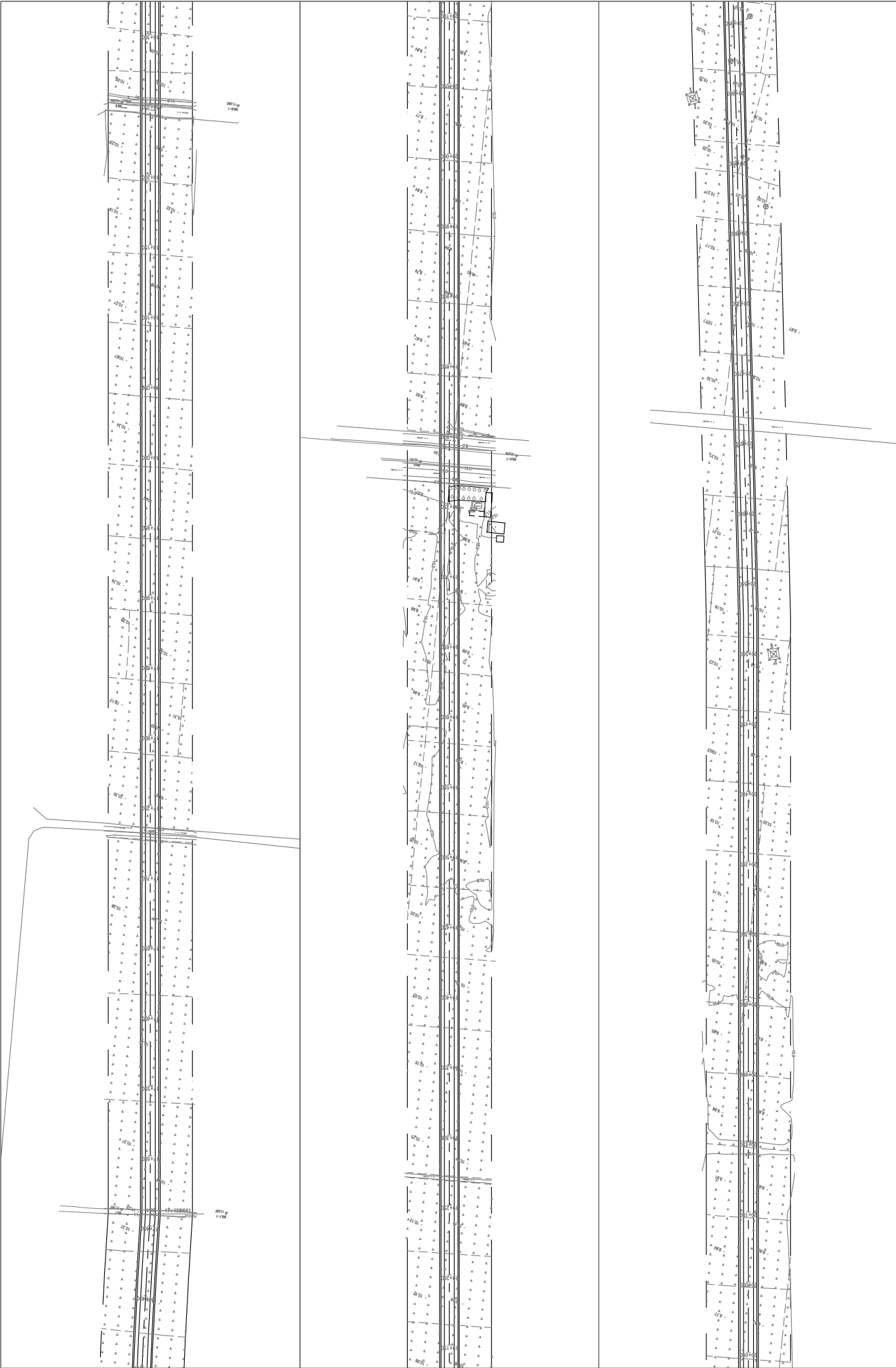
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	
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			Drawing No.	PL-05B
			SCALE	1 / 2,500
			DATE	APR. 2012



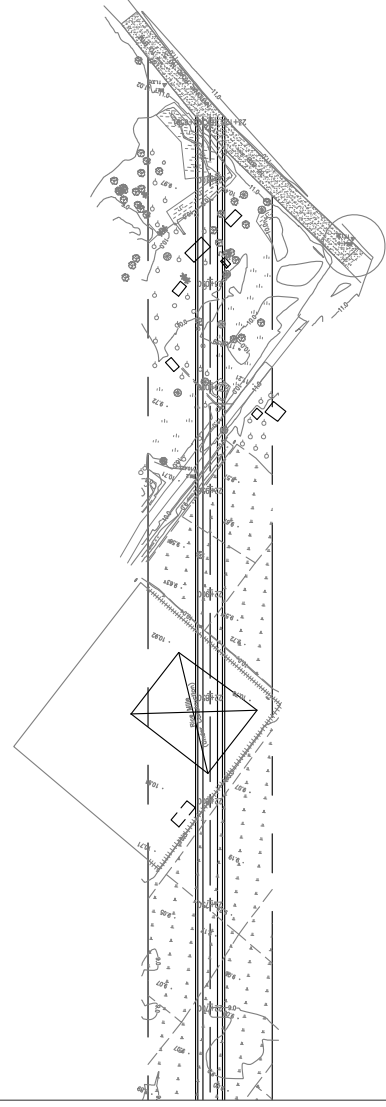
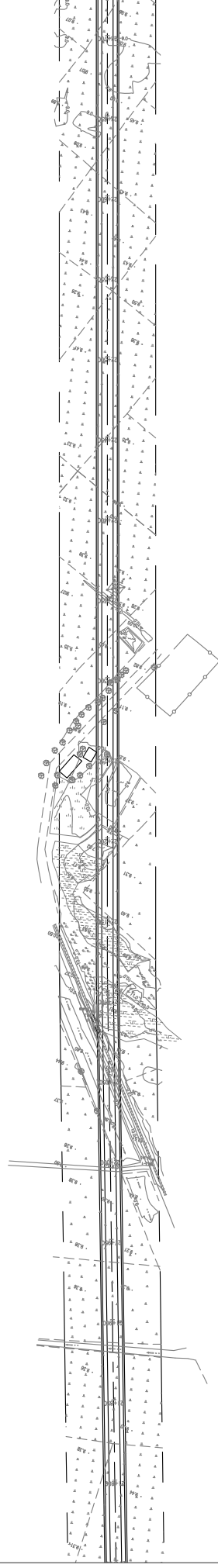
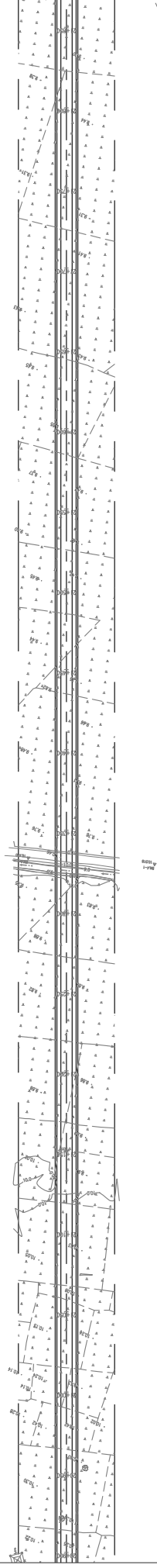
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	
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			Drawing No.	PL-06B
			SCALE	1 / 2,500
			DATE	APR. 2012



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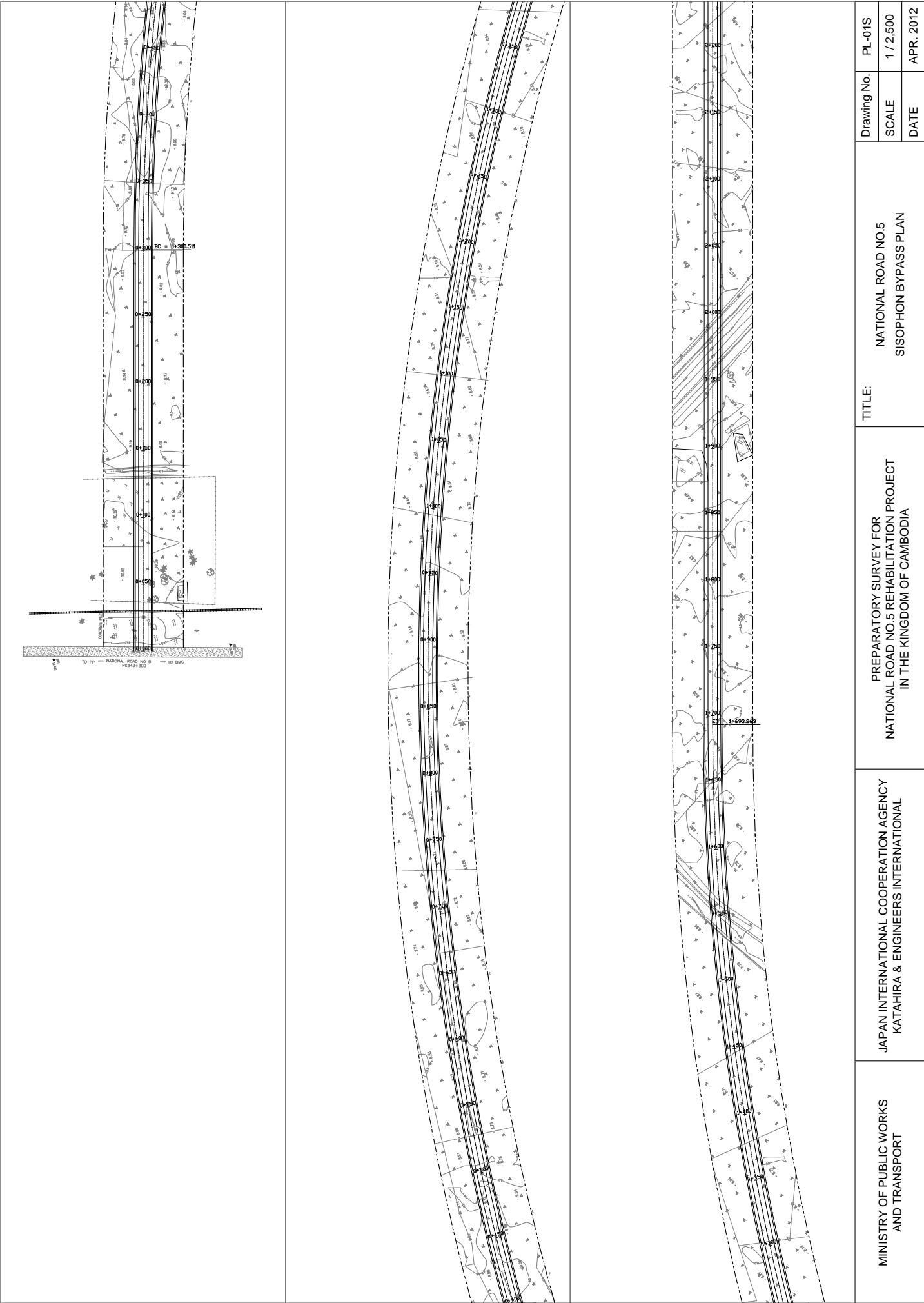


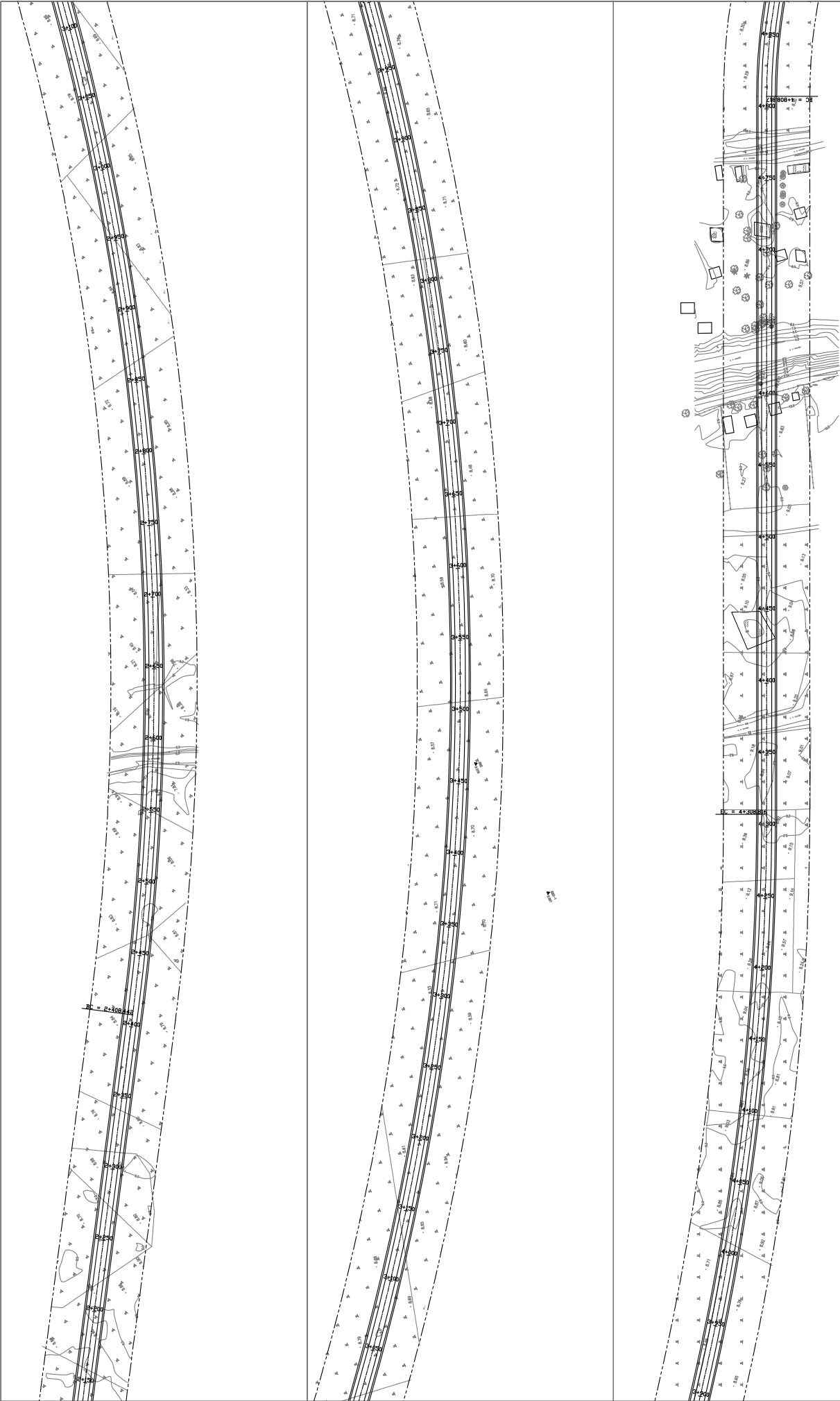
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		
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			Drawing No.	PL-08B	
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			DATE	APR. 2012	



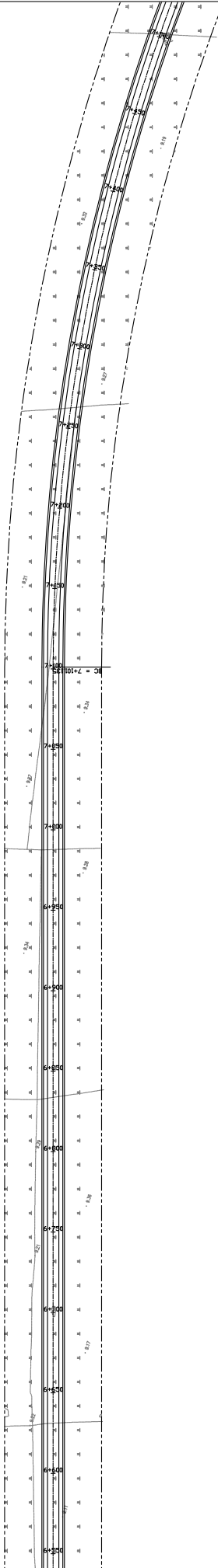
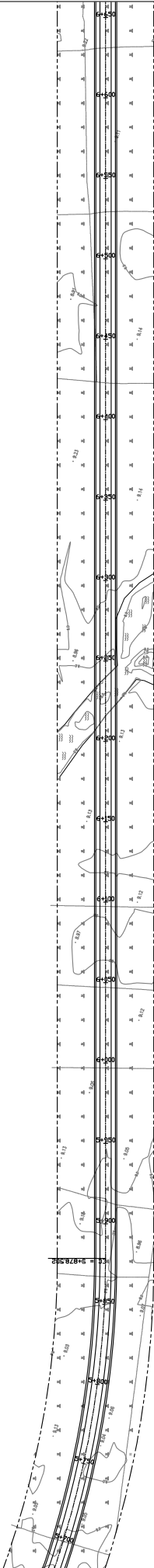
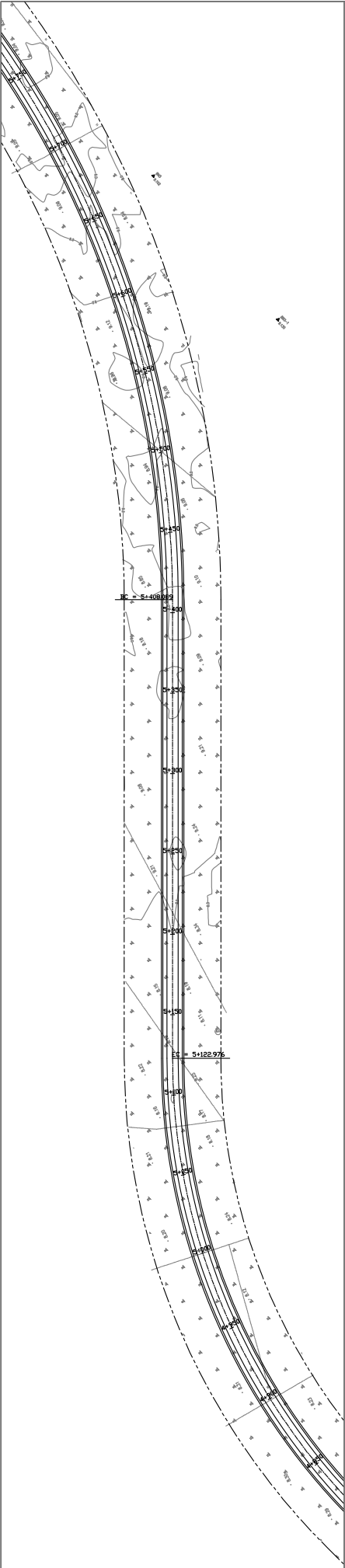
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	NATIONAL ROAD NO.5 BATTAMBANG BYPASS PLAN	Drawing No.	PL-09B
					SCALE	1 / 2,500
					DATE	APR. 2012

Appendix 10-3
Sri Sophorn Bypass

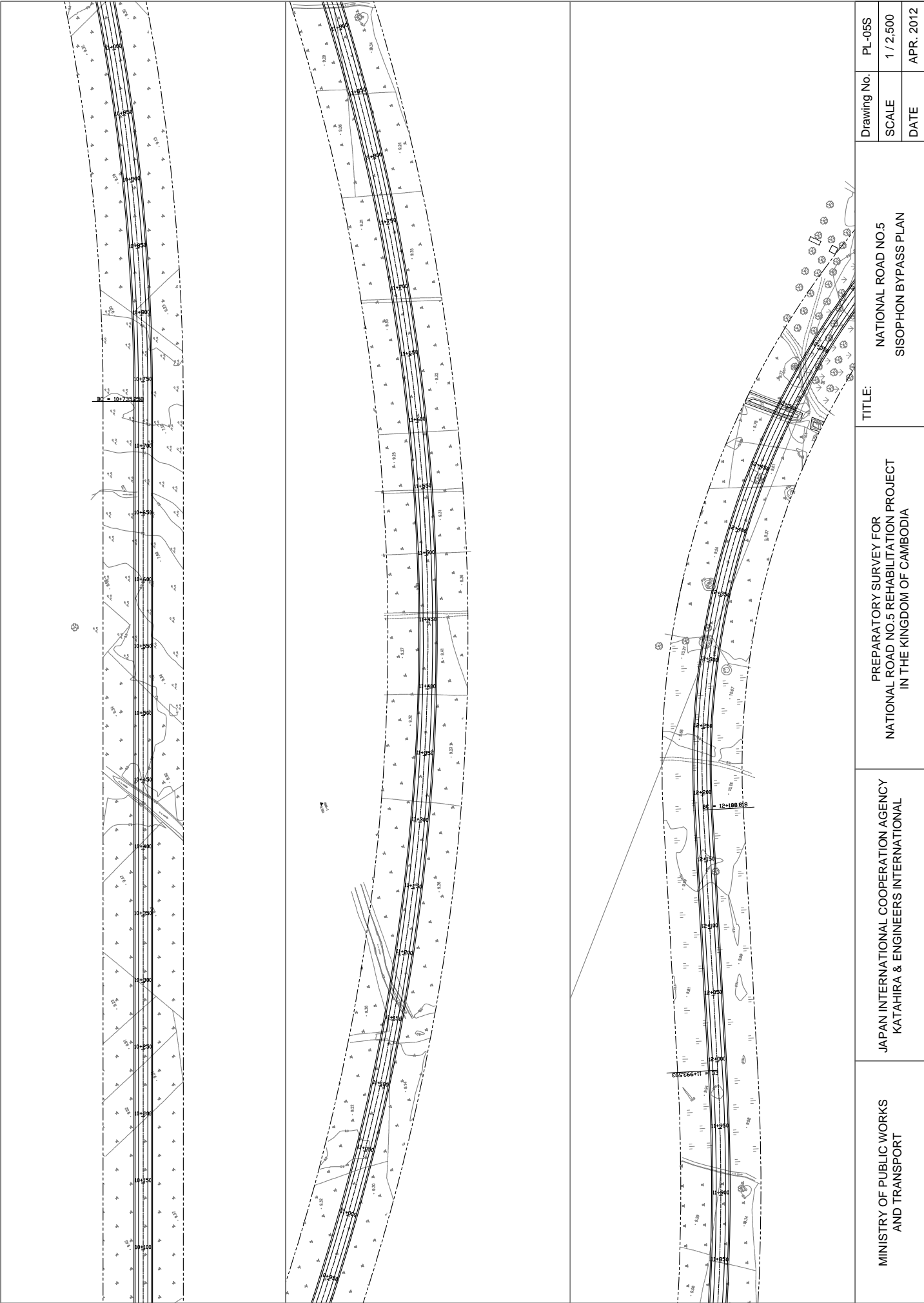




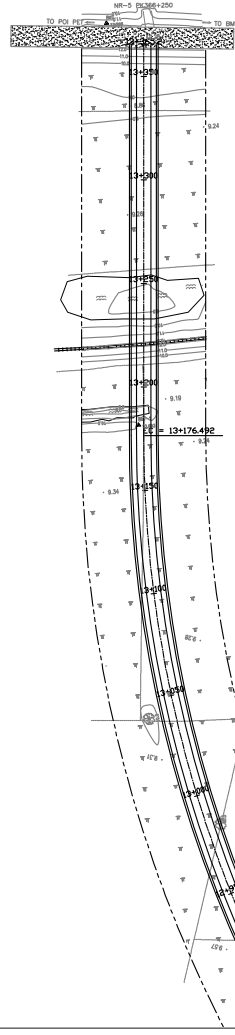
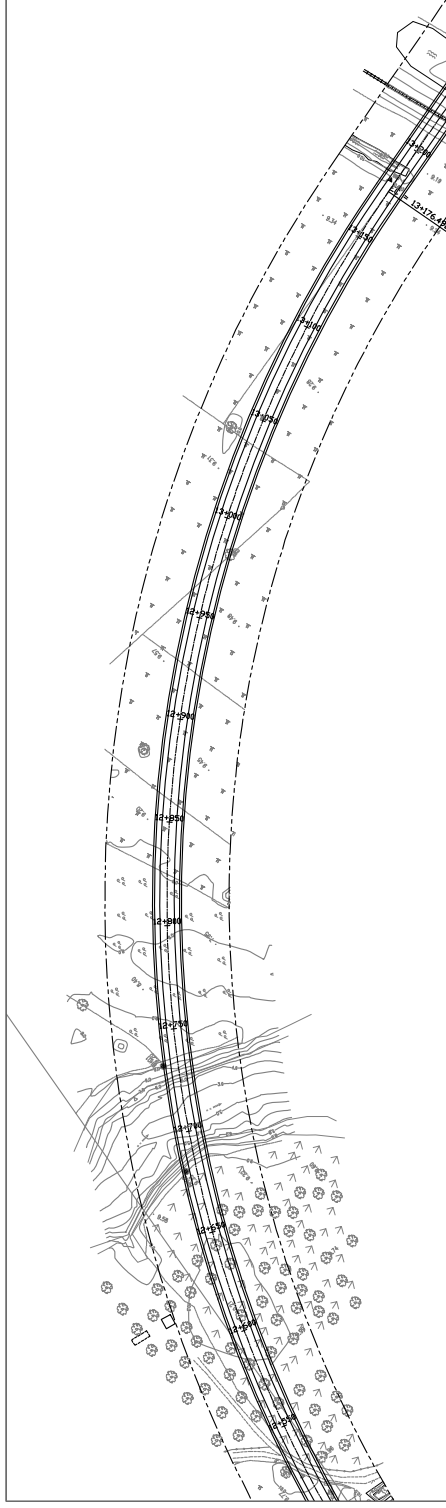
MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: NATIONAL ROAD NO.5 SISOPHON BYPASS PLAN	Drawing No.	PL-025
				SCALE	1 / 2,500
				DATE	APR. 2012



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:		
			Drawing No.	NATIONAL ROAD NO.5 SISOPHON BYPASS PLAN	
			SCALE	1 / 2,500	
			DATE	APR. 2012	



MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE: NATIONAL ROAD NO.5 SISOPHON BYPASS PLAN		Drawing No.	PL-055
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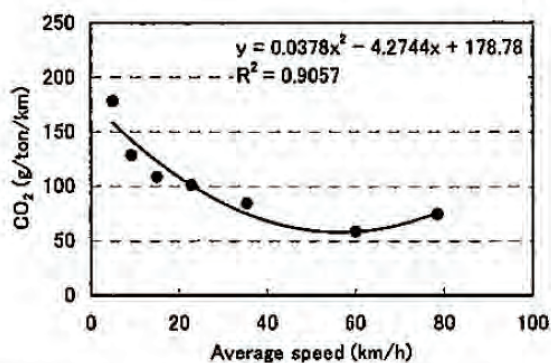
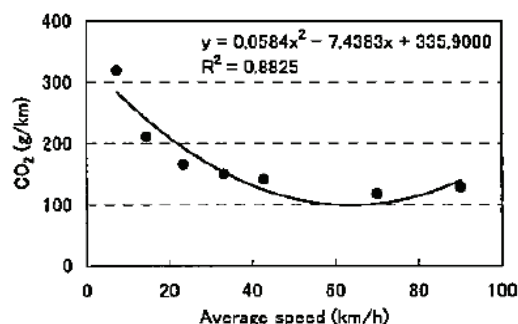
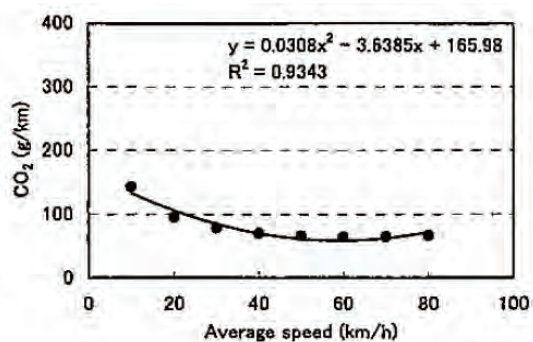


MINISTRY OF PUBLIC WORKS AND TRANSPORT	JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL	PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 REHABILITATION PROJECT IN THE KINGDOM OF CAMBODIA	TITLE:	NATIONAL ROAD NO.5 SISOPHON BYPASS PLAN	Drawing No.	PL-06S
					SCALE	1 / 2,500
					DATE	APR. 2012

Appendix 17-1
Calculation of Total CO₂ Emission

1. Unit Emission Rate

Gross amounts of emission of CO² for 'With Project' and 'Without Project' cases were calculated using JICA STRADA. Unit emission rates of Motorcycles, Light Vehicles and Heavy Vehicles were quoted from the report of 'the Project of Support to Clean Development Mechanism for Mitigating Global Environmental Problems, 2003'. The unit emission rate for each vehicle type is shown below:



2. Result of Calculation

The result of calculation is as shown below:

(1) Motorcycle

Year	Vehicle-Kms		Speed (km/hour)		Co2 (g/km)		Co2 (g/km)		Co2 (ton/km)			Total Reduction (ton)	
	Without	With	Without	With	Without	With	Without	With	Without	With	% Reduction	Per Day	Per Year
					Per Vehicle		North Section		North Section				
2016	442,330	442,330	49.1	60.0	61.582	58.55	27,239,566	25,898,422	27.2	25.9	4.9%	1.3	489.5
2018	535,440	535,440	48.0	60.0	62.295	58.55	33,355,235	31,350,012	33.4	31.4	6.0%	2.0	731.9
2021	722,607	723,027	44.0	60.0	65,514	58.55	47,340,853	42,333,211	47.3	42.3	10.6%	5.0	1,827.8
2030	1,129,170	1,130,757	32.9	58.9	79.611	58.524	89,894,353	66,176,403	89.9	66.2	26.4%	23.7	8,657.1

(2) Light Vehicle

Year	Vehicle-Kms		Speed (km/hour)		Co2 (g/km)		Co2 (g/km)		Co2 (ton/km)			Total Reduction (ton)	
	Without	With	Without	With	Without	With	Without	With	Without	With	% Reduction	Per Day	Per Year
					Per Vehicle		North Section		North Section				
2016	173,570	174,062	49.2	60.0	111.301	99.842	19,318,470	17,378,658	19.3	17.4	10.0%	1.9	708.0
2018	194,066	194,558	48.1	60.0	113.232	99.842	21,974,527	19,425,100	22.0	19.4	11.6%	2.5	930.5
2021	249,120	249,686	44.3	60.0	120.992	99.842	30,141,527	24,929,110	30.1	24.9	17.3%	5.2	1,902.5
2030	370,242	370,866	33.5	59.1	152.256	100.276	56,371,627	37,188,999	56.4	37.2	34.0%	19.2	7,001.7

(3) Heavy Vehicle

Year	Vehicle-Kms		Speed (km/hour)		Co2 (g/km)		Co2 (g/km)		Co2 (ton/km)			Total Reduction (ton)	
	Without	With	Without	With	Without	With	Without	With	Without	With	% Reduction	Per Day	Per Year
					Per Vehicle		North Section		North Section				
2016	76,317	76,317	49.4	60.0	59.87	58.396	4,569,079	4,456,588	4.6	4.5	2.5%	0.1	41.1
2018	84,204	84,204	48.5	60.0	60.386	58.396	5,084,723	4,917,157	5.1	4.9	3.3%	0.2	61.2
2021	105,248	105,248	45.3	60.0	62.718	58.396	6,600,965	6,146,082	6.6	6.1	6.9%	0.5	166.0
2030	140,499	140,499	34.9	59.4	75.644	58.252	10,627,881	8,184,328	10.6	8.2	23.0%	2.4	891.9

Note: Only the traffic volume and vehicle-kilometerage of Light Vehicles are estimated to increase due to diversion from other roads, such as NR 6 after NR 5 is improved. Some Light Vehicles are supposed to use NR 6 in the future as congestion of NR 5 will become severe. Motorcycles are not estimated to divert from other roads because their trip lengths are short and not affected by improvement of NR 5. Heavy Vehicles are not estimated from other road, probably because there will be little difference in travel speeds on NR 5 and NR 6.

(4) Total Reduction

Year	Total Reduction (ton)	
	Per Day	Per Year
2016	3.4	1,238.6
2018	4.7	1,723.6
2021	10.7	3,896.4
2030	45.3	16,550.6

Appendix 17-2

**Method and Assumptions Adopted in
Estimation of Noise and Gas Emission**

1. Estimation of Noise

(i) Model for estimation

The model adopted to estimate traffic noise is the model developed by the Acoustic Society of Japan. This model has been widely used in Japan for estimation of road traffic noise.

This model is expressed as follows:

(a) Basic model: Basic model is as follows.

$$L_{Aeq} = 10 \log_{10} \left(10^{L_{AE}/10} \frac{N}{3600} \right) = L_{AE} + 10 \log_{10} N - 35.6$$

Where,

L_{Aeq} : Equivalent noise level [dB]
 N : Traffic volume [veh/h]

And,

$$L_{AE} = 10 \log_{10} \left\{ \frac{1}{T_0} \left(\sum_i 10^{L_{Ai}/10} \cdot \Delta t_i \right) \right\}$$

Where,

L_{Ai} : Time fluctuation of noise level at A-characteristics, $\Delta t_i = \Delta l_i / V_i$ [s]
 T_0 : Unit time [s]
 Δl_i : Length of i th section of the road [m]
 V_i : Average travel speed of vehicles on i th section of the road [m/s]

(b) Propagation Model: Propagation is calculated by the following formula.

$$L_{A,i} = L_{WA,i} - 8 - 20 \log_{10} r_i + \Delta_{cor,j}$$

Where,

$L_{A,i}$: Noise level from i th point propagated to the point of measurement at A characteristics [dB]
 $L_{WA,i}$: Noise power level of the vehicle at i th point at A characteristics [dB]
 r_i : Distance between i th point and the point of measurement [m]
 $\Delta_{cor,i}$: Correction factors dependent on conditions of propagation [dB]

(c) Power Level of Vehicles Noise : Power level of vehicle noise is calculated by the following formula.

$$L_{WA} = a + b \log_{10} V + C$$

Where,

- L_{WA} : Average travel speed of vehicles [km/h]
a : Coefficient dependent on the type of vehicle (See table below)
b : Coefficient dependent on vehicle speed; 30 for deceleration and constant speed, 10 for acceleration and unstable speed
C : Coefficient for other conditions, such as type of pavement surface

Table of coefficient a:

Type of Vehicle	Constant Speed (40 – 140 km/h)	Unstable Speed
Small Vehicle	46.7	82.3
Large Vehicle	53.2	88.8

(ii) Assumptions

Following conditions are assumed:

- Point of calculation of noise level
- Distance from the road: 20m from the centerline of the road
- Height: 1.2m from ground surface
- Traffic volume: Traffic volume estimated at Station No. 7

Year		Year 2021			Year 2030		
Vehicle Type		MC	LV	HV	MC	LV	HV
Station 5		3,693	3,672	18,90	5,623	5,106	2,610
Station 6		34,713	5,554	2,756	54,063	7,612	3,700
Station 7		24,647	6,492	1,527	38,560	9,253	2,110
Station 8		12,700	4,827	2,774	19,807	7,245	3,687

MC: Motorcycle LV: Passenger car, Small truck etc HV: Large truck, Large bus etc

2. Estimation of Gas Emission from Traffic and Its Diffusion (NOx and SPM)

(i) The models adopted in the estimation of emission gas are those widely used in Japan.

(a) Windy Condition: Under the condition with wind velocity of 1.0m/sec or larger, so-called 'Plume Model' is adopted.

$$C(x, y, z) = \frac{Q}{2\pi \cdot u \cdot \sigma_y \cdot \sigma_z} \exp\left(-\frac{y^2}{2\sigma_y^2}\right) \left[\exp\left\{-\frac{(z-H)^2}{2\sigma_z^2}\right\} + \exp\left\{-\frac{(z+H)^2}{2\sigma_z^2}\right\} \right]$$

Where,

- $C(x, y, z)$: Concentration of NOx at point (x,y,z) (ppm)
 (or concentration of SPM(mg/m³))
 Q : Emission of NOx from the source (ml/s)
 (For SPM mg/s)
 u : Average wind velocity (m/s)
 H : Height of source of emission (m)
 σ_y, σ_z : Width of diffusion in horizontal direction (y), and vertical direction (z) (m)
 x : Distance from the source of emission in the direction of wind(m)
 y : Horizontal distance in the direction of x axis (m)
 z : Vertical distance perpendicular to x axis (m)

(b) Calm Air Condition: Under calm air condition with wind speed of 1.0 m/sec or less, so-called 'Puff Model' is adopted.

$$C(x, y, z) = \frac{Q}{(2\pi)^{3/2} \cdot \alpha^2 \cdot \gamma} \left\{ \frac{1 - \exp\left(\frac{-\ell}{t_0^2}\right)}{2\ell} + \frac{1 - \exp\left(\frac{-m}{t_0^2}\right)}{2m} \right\}$$

Where,

$$\ell = \frac{1}{2} \cdot \left\{ \frac{x^2 + y^2}{\alpha^2} + \frac{(z - H)^2}{\gamma^2} \right\} \quad m = \frac{1}{2} \cdot \left\{ \frac{x^2 + y^2}{\alpha^2} + \frac{(z + H)^2}{\gamma^2} \right\}$$

- t_0 : Time corresponding to initial diffusion (s)
 α, γ : Coefficient on width of diffusion
 x : Distance measured in the direction of wind direction (m)
 y : Horizontal distance measured perpendicular to x axis (m)
 z : Vertical distance measured perpendicular to x axis(m)

$$t_0 = \frac{W}{2\alpha}, \quad W = \text{carriageway width}$$

And $\alpha = 0.3, \gamma = 0.18$ (day time), 0.09 (night time)

(ii) Assumption

Assumed conditions are as follows:

(a) Wind speed and direction

Since there are no data of average wind speed and average wind direction, average of the

maximum wind speed as shown below:

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Direction	NE	SW	S	S	NW	SW	SW	E	SW	NE	N	NE
	Speed	5	5	4	5	14	7	10	8	6	5	5	5
2011	Direction	NW	NW	N	SE	S	W	W	SW				
	Speed	6	5	5	7	12	8	10	12				

Gust factor of 2.5 was adopted to estimate average wind speed from maximum wind speed.

(b) Point of estimation of concentration

- Distance from road: 20m from centerline of the road
- Height: 1.5m from ground surface

Appendix 18-1
IOL/SES Questionnaire Form

INVENTORY OF LOSS AND SOCIO-ECONOMIC QUESTIONNAIRE

QID:

Date of interview:...../...../ 2011

Starting time:.....

Interviewer's name:.....

Ending time:.....

Supervisor's name:.....

Village Headman:

I. LOCATION

PK: (Road direction is from Phnom Penh to Banteay Mean Chey).

Left ☐

Right ☐

☐ NR#5

☐ Bypass

House No:

Village:

Commune:

District:

Province:

Distance from centerline of road to people's landmeters;

Distance from centerline of road to people's house.....meters (first column or wall).

II. PROFILE OF HOUSEHOLD HEAD

Ask for head of household (if not present ask spouse or other adult, but over 18 years old)

2.1 H/H Name:

Call Name:

2.2 Age:

Sex: Male ☐

Female ☐

2.3 Occupation:

2.4 Ethnic group:

Code:

1=Khmer

2=Chinese

3=Cham

4= Vietnamese

5=Other (specify).....

2.5 The respondent is the household head? ☐ Yes (If yes go to 2.8) ☐ No

2.6 If no, what is the relationship with the household head?

Name of the respondent:

2.7 Age:

Sex: Male ☐

Female ☐

2.8 Fill H/H head status in the box below (**multi answers**)

1= Aged (From 60 years old and older)

2=Widow

3=Disabled

4=Landless

5= Income<20\$/month/person (National Poverty Line for Urban Area-2007)

III. SOCIOECONOMIC PROFILE OF AFFECTED HOUSEHOLD

3.1 How many members are in the household?

3.2 If there is more than one family, who are living in this house, give all.

No.	Relationship to H/H (code)	Age	Sex 1=M 2=F	Marital status (code)	Literate 1=No 2=Yes	School attending 1=No, 2=Yes	# Years of graded completed education	Working Activities (code)		
								1 st	2 nd	3 rd
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1										

No.	Relationship to H/H (code)	Age	Sex 1=M 2=F	Marital status (code)	Literate 1=No 2=Yes	School attending 1=No, 2=Yes	# Years of graded completed education	Working Activities (code)		
								1 st	2 nd	3 rd
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

Code B: 1=Self, 2=Spouse, 3=Son/Daughter, 4=Parent,
5=Brother/Sister, 6=Relative, 7=Other (specify).....

Code E: 1=Single, 2=Married, 3=Divorced/separate 4= Widowed 5 = Other.....

Code J, K and L:

00 None or Unable to work	09 Battery charging	18 Government officer
01 Small business	10 Construction Worker	19 Manufacturer/Craftsman
02 Food processing for sale*	11 Garment factory worker	20 Farmer (on own farm)
03 Hotel/tourism/restaurant	12 Company staff	21 Fishman
04 Hair cut/dresser/Beauty shop	13 Credit provider/ Money exchange	22 Livestock Raising
05 Wedding host	14 Motor transporter	23 NGO staff
06 Merchant/Market trader	15 Taxi driver	24 Migration out for job
07 Machinery/Vehicle mechanic	16 Agricultural laborer/Worker	25 Pupil/Student
08 Electrician	17 Non agricultural laborer/Worker	26 Other (specify)

3.3 Household Assets

3.3.1 Agricultural equipments:

Equipment types	Number	Total Cost/R	Equipment types	Number	Total Cost/R
Oxcart			Tractor		
Plow			Hand tractor		
Harrow			Rice mill machine		
Water pump			Other.....		

3.3.2 Other Assets:

Equipment types	Number	Total Cost/R	Equipment types	Number	Total Cost/R
Bicycle			TV/VCR/VCP		
Motorbike			Sewing machine		
Bamboo rail			Air conditioner		
Car/ Pickup/Minivan			Washing machine		
Truck			Refrigerator		

Boat without engine			Telephone		
Boat with engine			Generator		
Radio/Cassette Player			Other (specify)		

3.3.3 Livestock:

Type of livestock	Total Number		Sales of Livestock in 2010	
	Qty	Value in Riels	Qty	Value in Riels
Oxen				
Buffalo				
Pigs				
Horses				
Chickens				
Ducks				
Other (spec.).....				

3.3.4 Main Trees:

Code of Trees

1=Bamboo	2=Banana	3=Coconut	4=Tamarind	5=Chan Kiri
6=Sapodilla	7=Deum Chan	8=Kamping Reach	9=Kantuot	10=Khvet
11=Jack Fruit	12=Korki	13=Kor	14=Krasang	15=Mkak
16=Longan	17=Pring	18=Jujube	19=Sdau	20= Orange
21=Soda	22=Grapefruit	23=Custard apple	24=Sour sop	25=Guava
26=Teuk Dos Kou	27=Acacia/Eucalyptus	28=Lemon	29=Mango	30=Papaya
31= Sugar Palm	32=Cashew	33=Other.....		

No	Tree types	Unit	Total Qty	Income in 2010 (Riel)	Number of affected trees
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Total Income (Riel)					

3.3.5 Land and Agricultural products:

A. What is your affected land in ROW? (The question "A" is not for bypass)

Land Category	Total of using, m ²	Affected Area		
		Length, m	Width, m	Size, m ²
Rice field (Sre)				

Orchard (Chamkar)				
Flooded Area				
Commercial				
House Plot / Home Garden				
Other (specify).....				

B. What is your affected land outside ROW?

Land Category	Total Owning, m ²	Affected Area		
		Length, m	Width, m	Size, m ²
Rice field (Sre)				
Orchard (Chamkar)				
Flooded Area				
Commercial				
House Plot / Home Garden				
Other (specify).....				

C. Agricultural production (all land):

Crop	Area grown, m ²	Harvested Amount, Kg	Unit price Riel/Kg	Production cost, Riel	Farming Expend Riel	Gross Return, Riel
Dry rice						
Wet rice						
Vegetable						
Other crop						
Total (Riel)						

3.3.6 House and other Structures:

Structure Type Code:

1=House 2=House/Shop 3=Kitchen 4=Bathroom
5= Grange/Storage 6=Shop/Restaurant 7=Craft / Workshop 8= Stall / Market stall
9= Animal table/pigsty 10=Other (specify).....

Floor Code:

1st=One floor 2nd=Two floors 3=Khmer Style 4= Other

Construction Material Code:

1- Temporary Material 2- Thatch 3- Tin / Fibro/ Plastic Sheet
4- Wood 5- Bamboo 6- Roofing Tile 7- Floor Tile
8- Mortar 9- Concrete 10- Earth 11-Metal
12- Brick 13-Others (spec.):

Material	Structure: ...	Structure: ...	Structure: ...	Structure: ...
Roof				
Wall				

Material	Structure: ...	Structure: ...	Structure: ...	Structure: ...
Floor				
Column				
Story				
Total floor area, m2				
Affected area, m2				

- How many years have you been living here? year(s)

- If you rent the affected structure, how much do you pay per month? Riels

- Where will you relocate to resettle? Shifting back, to same village, other village

3.3.7 Other fixed assets:

No.	TYPE OF ASSETS	UNIT	Affected Qty.	Other
1.	Concrete Well	set		
2.	Pump Well	set		
3.	Timber post with wire	Meter long		
4.	Concrete post with wire	Meter long		
5.	Brick Wall, 100mm	Meter long		
6.	Brick Wall, 200mm	Meter long		
7.	Water supply system	m		
8.	Mortar	m ²		
9.	Vehicle washing place			
10.	Toilet			
11.	Other (spec.):			

3.4 Incomes

3.4.1 What are the main sources of total income in your household?

1st

2nd

3rd

4th

1. Wages or salary

2. Farming hired labor,

3. Business or trade

4. Agricultural production

5. Livestock

6. Fishing

7. Equipment making

8. Equipment renting

9. Transportation

10. House/land renting

11. Remittance

12. Other (spec.).....

3.4.2 How much the total income (cash and kind) from these activities in **Last Year**:

1st Riels

2nd Riels

3rd Riels

4th (others)..... Riels

Total in Riels (convert to US\$)

3.5 Expenses

Annual expenseRiel converts to USD:

3.5.1 Daily expense (recently expense):

Item	Unit	Price per unit/Riel	Total price/Riel
Rice			
Food (fish, meat, vegetable, and spices).			
Snack			
Wood/charcoal/fuel/gas			
Other (spec.).....			
Total:			
Annual total (365 days)			

3.5.2 Monthly expense:

Item	Unit	Price per unit/Riel	Total price/Riel
Cosmetics (perfume, powder, and soap).			
Health (drug, treatment fee).			
Water			
Electricity power			
Other service			
Gasoline			
Other (spec.).....			
Total:			
Annual total (12 months)			

3.5.3 Yearly expense:

Item	Unit	Price per unit/Riel	Total price/Riel
Clothes			
Education (material, tutoring, and meals at school).			
Furniture			
House repairing			
Ceremonies/marriages			
Entertainment/travel			
Other (spec.).....			
Annual total:			

3.6 Health

3.6.1 Where do you and your household members often go for? (Please tick)

Facility	Health Treatment	Serious Illness	Birth Delivery	How far? Km
Traditional Midwife				
Traditional Healer				
Drug shop				
Private Pharmacy				
Health Center				

Provincial Hospital				
Private Clinic				
Private Hospital				
Other:				

3.6.2 What are the three most important problems with the public health services for the people in this village?

- 1 = Lack of beds/Equipment 2 = Not enough medicine 3 = No physician medical
4 = Poor quality of service 5 = No midwife 6 = High price
7 = Long distance 8 = Unsanitary 9 = Unhelpful staff
10 = Other (Describe).....

1. Most important
2. Second important
3. Third important

3.7 Education

3.7.1 How many children in household is primary school age (6-11)?

3.7.2 How many children in household attend primary school?

3.7.3 If children of primary school age, not attending school, main reason for non attendance?

- 1 = Can not afford school costs 2 = Have to help in business
3 = Takes too long to get to school 4 = other (describe).....

3.7.4 How many children in household is lower secondary school age (12-14)?

3.7.5 How many children in household attend lower secondary school?

3.7.6 If children of lower secondary school age, not attending school, main reason for non attendance?

- 1 = Can not afford school costs 2 = Have to help in business
3 = Takes too long to get to school 4 = other (describe).....

3.8 Credit:

3.8.1 Have you taken any loan? ☐ No (skip to Q. 3.8.4) ☐ Yes

3.8.2 If yes, please fill the table below:

When did you borrow money? Month/year	Credit Amt. (Riel)	From Whom (Code)	Interest rate %

Code: 1 = Govt. /Bank 2 = NGOs / Society 3 = Landlord / traders
4 = Credit provider 5 = Relative 6 = other (specify).....

3.8.3 What did you use this money for (multi answers)?

- 1 = Food consumption 2 = Health care 3 = Schooling costs
4 = Building/Repairing house 5 = Ceremony/Wedding 6 = Farming

7 = Business improving 8 = Supporting to family members
 9 = To meet cost caused by the Project 10 = other (specify).....

3.9 Living condition

A. Water source:

- 3.9.1** Drinking/cooking: Washing/bathing.....
- 1= Stream/river 2= Lake/pond 3= Protected well 4 = Unprotected wel
 5= Rain water 6= Buying 7= Waterworks 8 = other (specify).....
- 3.9.2** If buying from vendor, how much it cost per day? Riels
- 3.9.3** If you collect by yourself, how much time you spend to do so? minutes
- 3.9.4** Is the drinking water filter? ☐ Yes ☐ No
- 3.9.5** Is the drinking water boiled? ☐ Yes, always ☐ Yes, some times ☐ No
- 3.9.6** Is the drinking water filtered? ☐ Yes ☐ No

B. Sanitation:

3.9.7 Do you have a pit latrine? ☐ Yes ☐ No

3.9.8 Is there any drainage system near your house? ☐ Yes ☐ No

3.9.9 If yes, please tick in box as follow:

- Proper rain water drainage ☐
- Waste water drainage ☐
- An open drain ☐

C. Energy source:

3.9.10 Lighting:

Cooking:

1 = None

4 = State Electricity

7 = Gas / Kerosene

2 = Fire wood

5= Battery

8 = Torch/Rubber

3 = Private generator

6 = Charcoal

9 = Other (specify).....

3.10 Accessibility to other facility service

Please indicate the distance of following facility service:

Facilities	Average Distance (Km)
Nearest School	
Market	
Religious centre (Pagoda)	
Drug shop	
Health Centre/ Referral(or District) hospital	
Provincial/Municipality hospital	
Police Administrative Post	
Commune Centre	
District Centre	
Other Urban	

IV. Perception on the project

4.1 What do you think about the project?

0 = No answer 1 = Bad 2 = Good & Bad 3 = Good 4 = Very good

4.2 If good/very good, rank the 3 following statements in the boxes:

<input type="text"/>	Improve cargo transportation	<input type="text"/>	Improve environment
<input type="text"/>	Decrease of congestion/accident	<input type="text"/>	Create more direct/indirect job
<input type="text"/>	Improve travel of tourist	<input type="text"/>	Reduced daily expenditures
<input type="text"/>	Attract more investment	<input type="text"/>	Flood prevent
<input type="text"/>	Increase land price	<input type="text"/>	Big push to outskirts area (Bypass)
<input type="text"/>	Improve access other facilities	<input type="text"/>	Improve local product marketing
		<input type="text"/>	Others (spec.)

4.3 If you think there are some bad things about the project, rank 3 following statement in the boxes:

<input type="text"/>	Increase daily expenditures	<input type="text"/>	Worsen environmental impact
<input type="text"/>	Loss of good trading site	<input type="text"/>	Decrease household income
<input type="text"/>	Increase accident	<input type="text"/>	Affected on public facilities
<input type="text"/>	Disturbs families and community	<input type="text"/>	Loss occupation
<input type="text"/>	Loss house / shop	<input type="text"/>	Worsen people health condition
<input type="text"/>	Loss of land use in ROW	<input type="text"/>	Makes people migrate away
<input type="text"/>	Worsen access to school	<input type="text"/>	other (spec.)

4.4 Will you agree to move your affected properties from PRW?

0 = No answer

1 = Not agree

2 = Agree with assistant

3=Voluntary to move

SIGNATURE

Household Head

Village Headman

Interviewer

Sketch map of the affected house



Appendix 18-2

Public Information Booklet (PIB) for the Resettlement Action Plan

PUBLIC INFORMATION BOOKLET (PIB)

For

The Resettlement Action Plan

National Road No. 5 Rehabilitation Project



1. QUESTION: What is the National Road No.5 Rehabilitation Project?

ANSWER: National Road No.5 (NR5) is the trunk road reaching Bangkok through the border between Cambodia and Thailand. It is also designated as Asian Highway A-1 or Southern Economic Corridor of GMS. The Survey Roads was damaged by the flood in 2000, and the section between Prek Kdam and Thlea ma'Am and the section between Battambang and Sisophon have been temporarily repaired. Therefore, Royal Government of Cambodia requested Japanese loan for rehabilitating 2 sections of NR 5, Prek Kdam – Thlea ma'Am and Battambang – Sisophon, and construction of 3 bypasses around Banteay Mean Chey, Battambang and Kampong Chhnang.

2. QUESTION: Who is responsible for the Project?

ANSWER: The Royal Government of Cambodia represented by IRC (Inter-ministerial Resettlement Committee) will supervise the resettlement plan implementation. MPWT (Ministry of Public Works and Transport) implements and monitors Resettlement Plan for affected houses, land and other properties on the roads.

3. QUESTION: Is the improvement of the road intended to benefit us?

ANSWER: Yes. The improved road will allow the transportation of goods and people to be quicker, more efficient and cheaper between towns and villages and also from Thailand to all parts of Cambodia. It will help everybody to market their products, get supplies, reduces poverty and to reach public services.

4. QUESTION: If there will be road improvements along our road, will we be affected?

ANSWER: The design and improvement of the highway will lead to the use of land, trees and some houses, trading stalls and gardens and entrances in the government owned right of way. During detailed design, these potential effects may be avoided or minimized since actual alignments of the improved road will be determined through consultation with you and the rest of the local communities.

In case the effects on land, trees, house and structures cannot be avoided, affected households (AHs) will be properly compensated in cash or in kind for their land use, houses, structures, crops and trees and even communal properties in order for them to restore their lost assets, resource or income. Rehabilitation assistance will also be provided to APs who will be required to relocate in another location.

5. QUESTION: What if my private land will be affected by the Project?

ANSWER: For affected land, compensation can be in the form of replacement land or cash at current market value. If land has been the agreed form of compensation between AHs and the Project, the replacement land should be of equal or better productive capacity of the lost land and satisfactory to AHs.

6. QUESTION: Do we need to have a land title in order to be compensated?

ANSWER: No. Lack of formal legal rights to land does not prevent any AHs from receiving compensation and rehabilitation assistance. Refer to Cambodia Land Law there is no compensation for the public state land (ROW).

7. QUESTION: Does compensation apply to my affected houses or structures?

ANSWER: Yes. Houses and structures that will be affected by the Project shall be compensated at replacement cost without deduction for depreciation or salvageable materials. You will be able to build a replacement structure out of ROW or shift back in remained ROW.

8. QUESTION: What about my crops and trees?

ANSWER: For annual crops, AHs will be given 3 month notice that the land on which their crops are planted will be used by the Project and that they must harvest their crops in time. If standing crops are ripening and cannot be harvested, eligible AHs can be compensated for the loss of the un-harvested crops at the current market value.

For perennial crops, AHs will be compensated for the loss of fruit and timber trees located within the project area. This will compensate for lost income until the newly planted seedlings bear fruit. AHs will be awarded the full value of any lost crops where the plants are near or ready to harvest.

9. QUESTION: What about our common property resources like school building, pagoda, fence of pagoda and school, irrigation, well and ponds?

ANSWER: For common property resources, the affected land will be replaced in areas identified in consultation with affected communities and relevant organizations. Affected building and structures will be restored to original and better condition. If income loss is expected (e.g. irrigation, community forest, income from fishpond), the affected village will be entitled to compensation for the total production loss (over 3 years). This compensation should be used collectively for income restoration measures and/or new infrastructures.

10. QUESTION: If in case there will be relocation of houses or businesses involved, how can the Project help me rebuild my house during relocation?

ANSWER: Houses or other property, which have to be relocated or demolished, will be paid for at the cost of labor force and rebuilding with new materials. Apart from the compensation for loss of private land and other assets at replacement costs, the Project will ensure that the standard of living of AHs are maintained or better improved after the Project. Therefore, the Project will provide mitigation and subsistence allowance to relocating AHs and will ensure that any movement of houses, shops or stalls will be within only a short distance of the existing structures. Shops and stalls market will be relocated in consultation with the owners and with community representatives to permit the creation of good market access from the road, where possible in small market and residential sites for which the project will provide funding:

Allowances

- Disruption allowances will be provided to all severely affected household, relocating AHs, and AHs losing more than 20% of their total productive landholding. The allowance is from \$US 35 to 200 depend on the characteristic of AHs to assist in restoration of income during the transition period.
- Assistance for training and employment will be provided to all severely affected farmers and to households that lose more than 20% of their total productive landholding, relocate and vulnerable AHs. Advice and support of the Provincial and local authorities in obtaining training and employment for household members.
- Transport allowance will be provided in cash sufficient to be able to transport possessions. The allowance is ranking from US\$ 20 to 70, depend on type of affected structures and location will be relocate to.
- Vulnerable allowances will be paid \$100 to all vulnerable AHs.
- Tenants' allowance will be paid to AHs relocate due to loss of house and/or shop that AHs rent.
- Tax will be exempted for AHs. The Government will pay the tax imposed on AHs.

11. QUESTION: When will the detailed measurement survey be conducted?

ANSWER: The activity will be carried out after the actual alignment has been identified. The DMS survey team will be composed of:

- Representative of IRC;
- Team of Working Group MPWT;
- Provincial Sub-Committee, also Involved representative District, Commune and Village authority; and
- External Monitoring Organization.

The activity will only carried out in the presence of the AHs. The AHs and the local authorities will be informed a few days prior to the activity.

12. QUESTION: If there will be disagreements or problems that arise during project implementation such as compensation, technical and general project-related disputes, do I have the right to voice my complaint?

ANSWER: Yes. If the AH is not clear about satisfied with the compensation package offered or, if for any reason, the compensation does not materialize according to the agreed schedule, the AH has the right to lodge a complaint.

The AHs may present their complaints to the concerned local administrative officials and grievance committees and may be helped to do this by a NGO. The complaint can be elevated to the Project Management Unit of MPWT in writing. Attempts will be made to settle the issues at the commune level through community consultation, involvement of social and resettlement experts as required, NGOs and mediators and facilitators if required.

The concerned resettlement committees will properly document all complaints and

resolutions. AHs will be exempted from all taxes, administrative and legal fees.

13. QUESTION: How will you know if these undertakings are kept and the objectives of this Project are met?

ANSWER: All project activities will be monitored by the IRC, Provincial Sub-Committee, Ministry of Public Works and Transport, and the external monitor. Quarterly reports will be prepared and submitted to IRC and JICA. A post- resettlement impact evaluation will also be undertaken to assess whether impacts of the Project have been mitigated adequately and the pre-project standard of living of AHs have been restored as a result of the resettlement and project. The JICA will also monitor these activities in its regular supervision missions during the period of project implementation.

If you have further queries and suggestions, please contact us at:

Banteay Mean Chey and Battambang Province, also Provincial Department of Public Works: Banteay Mean Chey and Battambang.

Appendix 18-3
Terms of Reference for Training and Income
Restoration

Terms of Reference for Training and Income Restoration

I. Background Information

1. A Training and Income Restoration Program is part of the compensation package provided to all households severely affected by works and land acquisition for the National Road No.5 Rehabilitation Project. Severely affected households are those which lose more than 20% of their total use of land, or whose houses, shops and stalls and employment are lost or severely damaged or/and vulnerable AHs.

2. An NGO/Consulting firm will undertake overall management of the Training and Income Restoration Program, and will be appointed for that purpose by the IRC/MEF. The Program will be supervised by the Ministry of Economic and Finance.

3. The NGO/Consulting firm will directly administer the off-farm training and income restoration program and will for that purpose manage a Training Fund, a Credit Fund and an Apprenticeship Program for household heads, their wives, sons and daughters. It will provide management support for the Agricultural Relocation and Extension Program and will provide a training of trainers program for the Provincial and District agencies taking part.

4. National Road No.5 (NR5) is the trunk road reaching Bangkok through the border between Cambodia and Thailand. It is also designated as Asian Highway A-1 or Southern Economic Corridor of GMS. The Survey Roads was damaged by the flood in 2000, and the section between Prek Kdam and Thlea ma'Am and the section between Battambang and Sisophon have been temporarily repaired. Therefore, Royal Government of Cambodia requested Japanese loan for rehabilitating 2 sections of NR 5, Prek Kdam – Thlea ma'Am and Battambang – Sisophon, and construction of 3 bypasses around Banteay Mean Chey, Battambang and Kampong Chhnang.

5. Since August 2011, a Resettlement Plan (RP) has been prepared based on census and IOL, baseline socioeconomic survey and SHM. In addition, in February 2012, the RP was updated due to another bypass in Banteay Mean Chey has to be included in the Project. Refer to the IOL results, there are 2,265 households will be affected by the Project. Among them, there are 656 AHs will be lost their private land. A total of 1,556,605.71 m² of private land in the two bypasses will be acquired for the Project. Of these, 86.32% (1,343,597.54 m²) is used for growing rice. 704 AHs, along NR #5 and the two bypasses, that their main structures (house, house-shop and/or shop/restaurant) will be affected by the project, comprising 681 AHs along NR #5 and 23 AHs along the two bypasses. With regard to fruit and timber trees, a total of 38,363 trees of various species and age in NR #5 and the two bypasses have been counted during the IOL.

II. Appointment of NGO/Consulting firm

6. For that purpose the IRC proposes to enlist the services of suitably qualified Consulting Firm or Non-Government Organization (NGO) to develop and implement the Project's Income Restoration Program (IRP). The Consulting organization or NGO should have the following qualifications:

- i. Must have good track records in designing and implementing IRP and Gender Development Program within Cambodia;

- ii. Must have the necessary community development and gender orientation and experience to appropriately deal with the poor and vulnerable AHs;
- iii. Must be familiar with the use of Participatory Rapid Appraisal tools; and
- iv. An inclusion of Gender Specialist in the Team.

III. Objectives of Training and Income Restoration Program

7. The NGO/Consultant firm shall undertake overall management of the Training and Income Restoration Program, and will be appointed for that purpose by the MEF. The Program will be supervised by the Resettlement Unit (RU) in the Ministry of Economy and Finance.

3.1 General objective

8. The general objective or goal of the program is to minimize the impact of the project on the livelihoods of AHs, to restore their income and to reduce poverty and social exclusion in the project area.

3.2 Specific project purposes

9. The specific project purposes are:

- (i) to improve the vocational skills of severely and vulnerable AHs by other means to restore and improve their livelihoods and incomes from off-farm (non-agricultural) employment; and
- (ii) to provide land and opportunities for production and marketing of crops for 176 households severely affected by losses of land, by means of the provision of appropriate and sustainable income restoration programs.

IV. Activities

10. To prepare the training and income restoration program, the NGO/Consultant will carry out the following tasks:

a) Carry out Situational and Needs Analysis

- Analyze existing sources of income of severely and vulnerable AHs. To establish a baseline to gauge the success of income restoration program, estimate current actual income of the AHs;
- Conduct consultations, needs, aptitude, and preference surveys among the AHs;
- Determine whether poor/vulnerable AHs have special needs different to other households;
- Identify the major socio-economic situations and problems of the AHs and it must be understood in the context of the basic profile and culture of the affected communities and the concrete descriptions of their way of life and livelihoods.

b) Identify existing or planned programs of the Government, NGOs, and other agencies within the project area to design appropriate strategies to link up with or expand such programs.

c) Prepare a gender strategy to include enhancement of opportunities for women's participation, and to provide women increased opportunities to learn new skills and participate in the decision-making process, and take advantage of new employment and income-generating opportunities.

11. Based on the results of the activities above, the NGO/Consultant will design the appropriate training and sustainable income restoration programs based on the **proposed number** below. The number of target participants **is about 1,486 AHs (about 2,962 participants, two participants per an AH)**, comprising 956 relocated AHs, 176 SAHs and 349 Vulnerable AHs.

4.1 Off farm training

12. The NGO/Consultant will conduct a training needs survey during the first month of the program, making use of data from existing project socio-economic surveys. On this basis the NGO/Consultant will provide 6 months vocational or pre-vocational training to not more than two members of each severely affected household, including household heads, spouses, sons and daughters.

13. Training will be mainly in skills for which there is an established employment demand, but may include basic literacy and numeracy. Skills for which training has provisionally been proposed include crafts production, building trades, motor repair, languages, computer, hairdressing and tailoring.

14. Training will be at a minimum of four centers accessible in each of the four sections of the road works and will be conducted in Khmer (2 centers for each province).

4.2 Job creation

15. Job creation will be undertaken by the NGO/Consultant as 6 month apprenticeships with established enterprises, primarily in Banteay Mean Chey and Battambang province aimed at providing on-the-job training and employment for sons and daughters of severely affected households.

16. The NGO/Consultant will also facilitate hiring of AHs on a priority basis on ongoing project construction activities in order for AHs to benefit directly from the Project.

4.3 Small agricultural and agro-industrial credit

17. The NGO/Consultant will facilitate access to existing credit program such as small agricultural production or agro-industrial loans. Loans will be for plant materials, livestock, on-farm irrigation, agricultural tools and equipment, and for small agricultural or food processing equipment, depending on the outcome of review of current socio-economic situation and AHs' preferences.

4.4 Agricultural extension and training

18. The NGO/Consultant will provide training of trainers and management support for an agricultural extension program to be carried out by the concerned Provincial Departments in

each of the two provinces. Agricultural extension and farmer training will be specifically for land use and production development such as livestock, cash crop, home garden and etc. The NGO/Consultant will also provide training for women in agricultural and food processing and marketing.

4.5 Access to small enterprise credit

19. The Consultant will facilitate access to existing credit programs to enable AHs to obtain small enterprise loans. Loans will be for crafts production equipment, tools for construction or repair work, and for shop and stall equipment and stock.

V. Indicators

20. Depending on the trainings and sustainable income restoration programs selected in consultation with AHs, the following indicators may be used.

5.1 Off farm training

21. By estimating about 800 members of severely and vulnerable affected households will be trained sufficiently to undertake employment or will become literate under a literacy and numeracy program: 400 in Program Year 1 (PY1) and 400 in PY2.

5.2 Job creation

22. By estimate about 400 sons or/and daughters of severely and vulnerable affected households will obtain employment through apprenticeships in established enterprises: 200 in PY1 and 200 in PY2.

5.3 Small agricultural and agro-industrial credit

23. Affected households will establish agricultural production and post-harvest or small agro-industrial enterprises. Some women will receive credit for small scale agricultural and food processing.

24. For this purpose credit will be provided as small agricultural production or agro-industrial loans under the management of the NGO/Consultant from existing credit programs.

5.4 Agricultural extension and training

25. Training of trainers will be provided to 10 Agricultural staff in each of two Provinces and in all Districts for an agricultural extension program to be carried out by the concerned Provincial and District Departments.

26. Agricultural extension and farmer training will be conducted for about 352 farmers, including women farmers, for land and water use and production development in the project area: 176 in PY1 and 176 in PY2.

27. The NGO will provide training for 160 women in agricultural and food processing and marketing: 80 in PY1 and 80 in PY2.

5.5 Access to Small enterprise credit

28. Severely and vulnerable AHs will restore or increase their incomes through provision of credit to use in the development and operation of small enterprises funded through existing credit programs.

VI. Staffing and Other inputs

29. The NGO/Consultant will provide training personnel in accordance with the following requirements. Durations given below are indicative and subject to variation, during the currency of the services, by agreement with MEF, and estimated on the following basis.

- (i) It is assumed that the training and income restoration will be completed within 24 months;
- (ii) Person -month of personnel has been considered only the period stayed on the site or relevant institution, organizations or factories for training purpose. Time spent in other place such as Home office of Phnom Penh shall not be included in the person-month.

Personnel Inputs of Consulting Services

Position	Number	Person-month
Team Leader	1	12
Vocational Trainer	4	24
Credit Coordinator	2	8
Apprenticeship Trainer 1	2	12
Agricultural Trainer 1	2	14
Agricultural Trainer 2	2	12
Total	13	82

VII. Requirement for report and Reporting

7.1 Requirement for report

30. The Training and Income Restoration Program must include concrete actions for income restoration, including budget, timetables, responsibility for implementation, economic assumptions and risks and contingency arrangements. The Reports will include, but not limited, to the following:

31. Inception report

- A review of current socioeconomic conditions of the AH including income baseline, if existing data is not sufficient, carry out supplementary socio-economic survey;
- A summary of AHs' preferences for training and income restoration (indicating description of methods used to elicit AHs' views);
- A summary of potential training and income restoration programs (based on identified economic activities and opportunities prevalent in the area) and options available to AHs and of the process of matching AHs to particular programs or activities;
- A gender strategy.

32. Training and income restoration program plan

- Detailed feasibility studies of the technical, economic, financial and institutional viability of the proposed income restoration programs¹, including realistic estimation of incomes to be received by participating AHs and the number of AHs that can participate in each activity;
- A time-bound plan on specific programs for AHs who have lost their productivity means;
- A time-bound plan for development of human capital (appropriate trainings which have an established employment demand);
- A time-bound plan on job creation and provision of access to capital for small enterprise, small agricultural, and agro-industrial credit;
- Arrangements and indicators for monitoring the effectiveness of training and income restoration programs and for modifying plans found to be ineffective;
- Budget and Implementation Schedule.

33. Progress reports (Quarterly)

- The content will include progress based on arrangements and monitoring indicators as set out in the income restoration plan report. It will also include satisfaction of AHs, problems encountered and strategies or resolutions agreed on.

34. Completion report

- It will include concise history of the program, evaluation of the implementation, including financial audit statements.

7.2 Reporting

35. The selected NGO/Consultant will submit the following to IRC-MEF:

- Inception Report, one month after mobilization
- Training and Income Restoration Plan, within two months after submission of Inception report (contents as indicated in section VI above),
- Quarterly progress reports
- Completion Report

VIII. Estimated Budget and Schedule

8.1 Estimated budget

36. The estimated budget allocated for the Program is about \$102,00.00 NGO/Consulting firm proposing to undertake the program are required to provide a detailed budget for the program, which can include up to one third of the fund to cover the cost of their administration, overheads, training personnel and field costs and transportation.

8.2 Schedule

¹ Can be existing or planned programs of the Government, NGOs, and other agencies within the project area with appropriate strategies to link up with or expand such programs.

37. The selected consulting firm for the IRP program will be hired for two and a half years. The firm will be engaged full-time for the first two years while in the third last year, the consulting firm will provide back-stop support to the participating AHs, as needed. Post-IRP evaluation will be carried at the end of year 3 or completion of the program.

Appendix 18-4

**Terms of Reference for External Monitoring
Agency (EMA)**

Resettlement Plan Implementation

Terms of Reference

For

External Monitoring Agency (EMA)

Resettlement Plan Implementation

The National Road No.5 Rehabilitation Project

I. Background

1. In the Kingdom of Cambodia ("Cambodia"), the road transport accounts for around 65% of the passenger transport, for 70% of the freight transport, and play the most important role in the domestic transport. However the most of the roads were severely deteriorated during the civil war in the 70's to 80's. Since the early 90's, Royal Government of Cambodia (RGC) has been exerting strenuous effort on rehabilitation of the road network with the assistance of Japan, the United States, Australia, Asian Development Bank ("ADB") and World Bank.

2. National Road No.5 (NR5) is the trunk road reaching Bangkok through the border between Cambodia and Thailand. It is also designated as Asian Highway A-1 or Southern Economic Corridor of GMS. The Survey Roads was damaged by the flood in 2000, and the section between Prek Kdam and Thlea ma'Am and the section between Battambang and Sisophon have been temporarily repaired. Therefore, Royal Government of Cambodia requested Japanese loan for rehabilitating 2 sections of NR 5, Prek Kdam – Thlea ma'Am and Battambang – Sisophon, and construction of 3 bypasses around Banteay Mean Chey, Battambang and Kampong Chhnang.

3. The resettlement plan (RP) contains the measures to be carried out by MPWT and the Inter-ministerial Resettlement Committee (IRC) to avoid and/or minimize impacts on the affected households (AHs), particularly on their sources of livelihood, and for the purpose of improving or at least restoring their standards of living to pre-project level consistent with WB's *Operational Policy (OP 4.12)* (December 2001).

4. The purpose of the (RP) is to identify the impact on the local population of upgrading and rehabilitation the road; and to provide measures for compensation where the population is negatively affected by the work, primarily through the acquisition of farmland and encroachment on to residential and commercial sites.

5. AHs are grouped into three broad categories, viz. Individual, Household and Communities and within each group other sub-groups are defined. In particular within the household category there are vulnerable groups defined as those that are socially or economically disadvantaged and who will suffer more, economically and socially, from relocation and improvement than the general population. AHs falling into one or more of the following categories are defined as vulnerable groups;

- (i) female headed households;
- (ii) landless households that have no other residential land holdings;
- (iii) disabled households heads;
- (iv) households below the Cambodia poverty line defined as <US\$20.00/cap. per month;

- (v) Aged household heads with no household member within the active labor force.

6. Since August 2011, a Resettlement Plan (RP) has been prepared based on census and IOL, baseline socioeconomic survey and SHM. In addition, in February 2012, the RP was updated due to another bypass in Banteay Mean Chey has to be included in the Project. The RP has been prepared by JICA study team based on i) census and inventory of all affected households; ii) baseline socio-economic survey; and iii) replacement cost study for affected land, structure and trees.

7. Centre of the resettlement policy is that the affected people will be compensated for their lost assets at replacement cost and provided with rehabilitation assistance to ensure improvement, or at least maintaining their living standards and income to level they would have without the project. The cut-off-date is the date of the first day of IOL, for NR#5 and Battambang bypass is on **1st August 2011** and for Banteay Mean Chey bypass is on **6th February 2012**.

8. Refer to the IOL results, there are 2,265 households will be affected by the Project. Among them, there are 656 AHs will be lost their private land. A total of 1,556,605.71 m² of private land in the two bypasses will be acquired for the Project. Of these, 86.32% (1,343,597.54 m²) is used for growing rice. 704 AHs, along NR #5 and the two bypasses, that their main structures (house, house-shop and/or shop/restaurant) will be affected by the project, comprising 681 AHs along NR #5 and 23 AHs along the two bypasses. With regard to fruit trees and timber trees, a total of 38,363 trees of various species and age in NR #5 and the two bypasses have been counted during the IOL. Except some trees in Battambang bypass, most trees are not commercially grown, meaning, they are sporadically planted inside the ROW.

II. Management and Monitoring

9. The Resettlement plan requires that the external agency contracted to provide external monitoring of the Implementation of the RP. The external monitor will indicate any corrective measures necessary to the RP during its implementation and on the overall effects that resettlement in having on the AHs and on their socioeconomic status.

10. A particular responsibility of the external monitor will be to monitor and evaluate the effectiveness of measures to replace any loss and livelihoods of AHs and of measures to utilize resettlement planning and implementation to maximize the benefits to the immediately adjacent and wider populations of the road improvement and of its integration with social, economic and infrastructural development in the road corridor and the wider region.

III. Requirement for external monitoring

3.1 Monitoring and Evaluation

11. The monitoring and evaluation agency will address specific issues as the following:

- (i) Payment of compensation and allowances as per approved Update RP (URP). Identify whether all AHs are covered under the URP and confirm that they are all eligible for compensation, resettlement and rehabilitation assistance, irrespective of tenure status, social or economic standing, and any such factors that may discriminate against achieving the project objectives. Timing of disbursement of payment and documentation DMS and payments;
- (ii) Public consultation and awareness of resettlement entitlements;

- (iii) Coordination of resettlement activities with construction schedule;
- (iv) Land acquisition and transfer produces;
- (v) Construction of replacement house and structures;
- (vi) Level of satisfaction of AHs with the provision and implementation of the URP;
- (vii) Grievance redress mechanism;
- (viii) Capacity of AHs to restore /re-establish livelihoods and living standard. Special attention will be given to severely affected AHs and vulnerable AHs;
- (ix) Trends in living standards. Throughout the RP implementation process, the EMA will observe and conduct surveys to monitor the progress AHs are making to restore living standards. Special attention will be paid to any differences based on gender and ethnicity. Any potential problems in the restoration of living standards will be reported;
- (x) Resettlement impacts caused during construction activities; and
- (xi) Receive complaints from AHs if any and explain to the aggrieved AHs the eligibility for compensation and livelihood restoration set out in the approved URP.

3.2 Post evaluation

12. Post-evacuation activities will also be carried out one (1) year after the completion of all relocation activities.

IV. Specific Purpose of External Monitoring

13. The Project requires the services of a domestic monitoring and evaluation team to conduct an independent assessment of the extent to which resettlement and rehabilitation objectives are being met. Specifically, the objectives of the monitoring program are:

- (i) to ensure that the standard of living of AHs are restored or improved;
- (ii) to monitor whether the overall project and resettlement objectives are being met in accordance with the Resettlement Plan, and if not to suggest corrective measures;
- (iii) to assess if rehabilitation measures and compensation are sufficient and comply with WB's *Operational Policy (OP 4.12)* (December 2001);
- (iv) to identify problems or potential problems; and
- (v) to identify methods of responding immediately to mitigate and resolve problems.

V. Methodology of Monitoring and Evaluation

14. The methods for external monitoring and evaluation include:

- (i) Review of RP approved by both Government and JICA including Loan Agreement.

- (ii) Review of detailed measurement survey documents to be able to establish a baseline for monitoring and evaluating project benefits. The EMA will check on a random basis the DMS process with AHs from identification to agreement on DMS results.
- (iii) Review of SES baseline prepared during RP preparation (Feasibility Study) and RP updating (following detailed design). If land acquisition (i.e., RP implementation) does not occur for at least two years, EMA will carry out another SES. A post resettlement survey will be carried out one year following completion of resettlement activities. Sampling will include 20% of severely affected AHs as well as at least 10% of all other AHs. The same AHs interviewed during RP updating will be interviewed.
- (iv) Participatory rapid appraisals (PRA): Consultation with AHs and various stakeholders such as resettlement committee, PMU, community leaders; key informant interviews; community public meetings; focus group discussions; direct field observations; and in-depth case studies of good practices and problems identified by internal or external monitoring and required special efforts to resolve.
- (v) Verification of Replacement cost survey: The EMA will verify whether compensation paid was at replacement cost. A special market study to validate whether the rates used in compensating for land and other non-land assets were at replacement costs will be undertaken.
- (vii) The EMA will carry out random checks of payments disbursed to AHs during monitoring. The EMA will submit a resettlement audit report per project upon completion of compensation payment to AHs.

VI. Team Composition, Timing, and Submission of Reports

15. The domestic EMA will be composed of one team leader with extensive experience in monitoring and evaluation of resettlement activities in Cambodia and with strong ability in preparing resettlement compliance/monitoring reports. He/she should demonstrate good communication skill and have at least a bachelor degree in a relevant field. The team leader will be assisted by two (2) social enumerators. All reports will be submitted to IRC.

16. The monitoring work will be consisted in period of two years and post evaluation will be conducted one after completion of RP implementation. The monitoring reports will be included one inception report, 8 quarterly monitoring reports, one audit report annex to the 8th quarterly monitoring report, one base line survey report (six months after MEA assignment) and one post evaluation report.

17. Duration of Field visits and report preparation will be as follows:

No.	Position	Working Day	Number	Total Input
	Monitoring Work			
1	Team Leader	178	1	178
2	Social Enumerator	119	2	238
	Base Line Survey			
1	Team Leader	50	1	50
2	Social Enumerator	30	2	60
	Post Evaluation			
1	Team Leader	50	1	50
2	Social Enumerator	30	2	60
			Total	636

18. Submission of inception and quarterly report will be within two weeks (14 days) after monitoring activities while submission of post-evaluation report will be within one month after post-evaluation activities.

19. The quarterly report will summarize the findings of the EMA, including (a) progress of RP implementation, including any deviations from the provisions of the RP; (b) identification of problem issues and recommended solutions to inform implementing agencies and resolve issues in a timely manner; (c) identification of specific gender and ethnic minorities issues, as relevant; and (d) report on progress of the follow –up of issues and problems identified in the previous reports.

VII. Expression of Interest

20. Please prepare an estimation of the time and finances required to undertake this work. Should you be awarded the contract, a price would be negotiated to undertake and initial consultation and investigation with the community, after which a fixed amount contract would be set and agreed.

Expressions of interest should be addressed to:

[INSERT name, office, address]

Expressions of interest should be received no late than [time, date]

Inquiries may be directed to: [INSERT name, position, phone number]