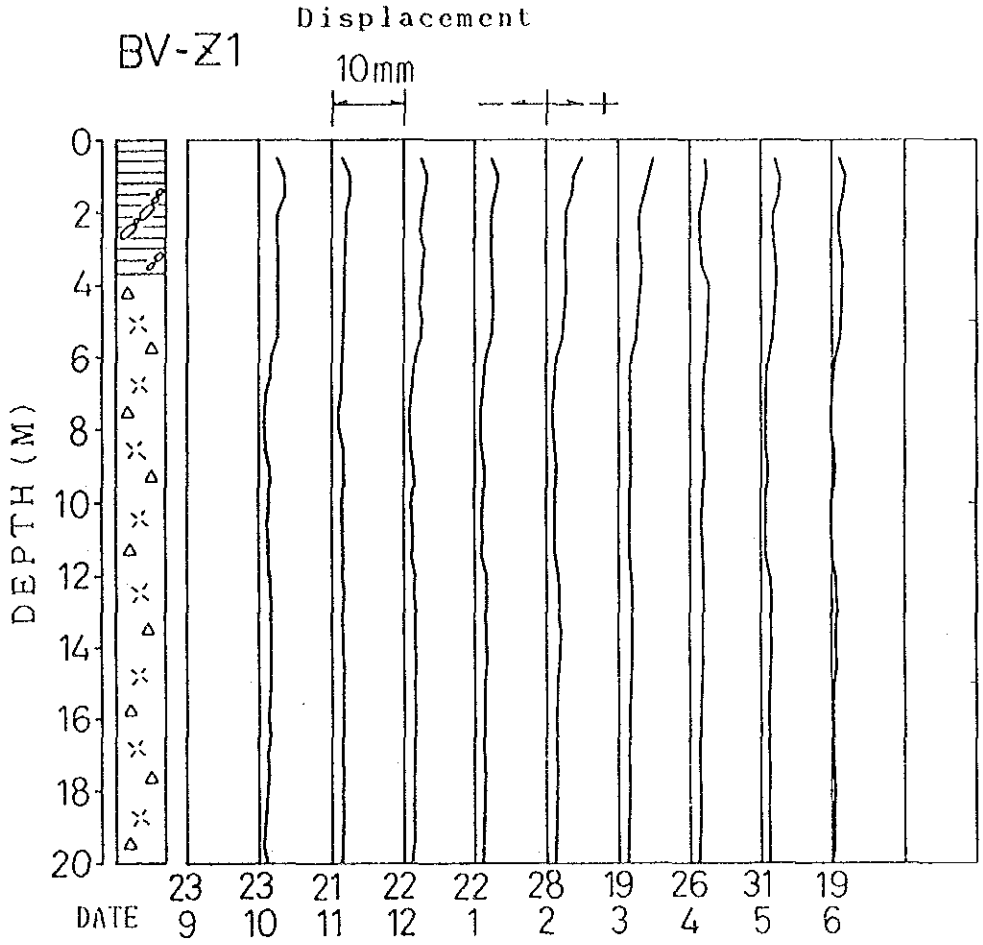
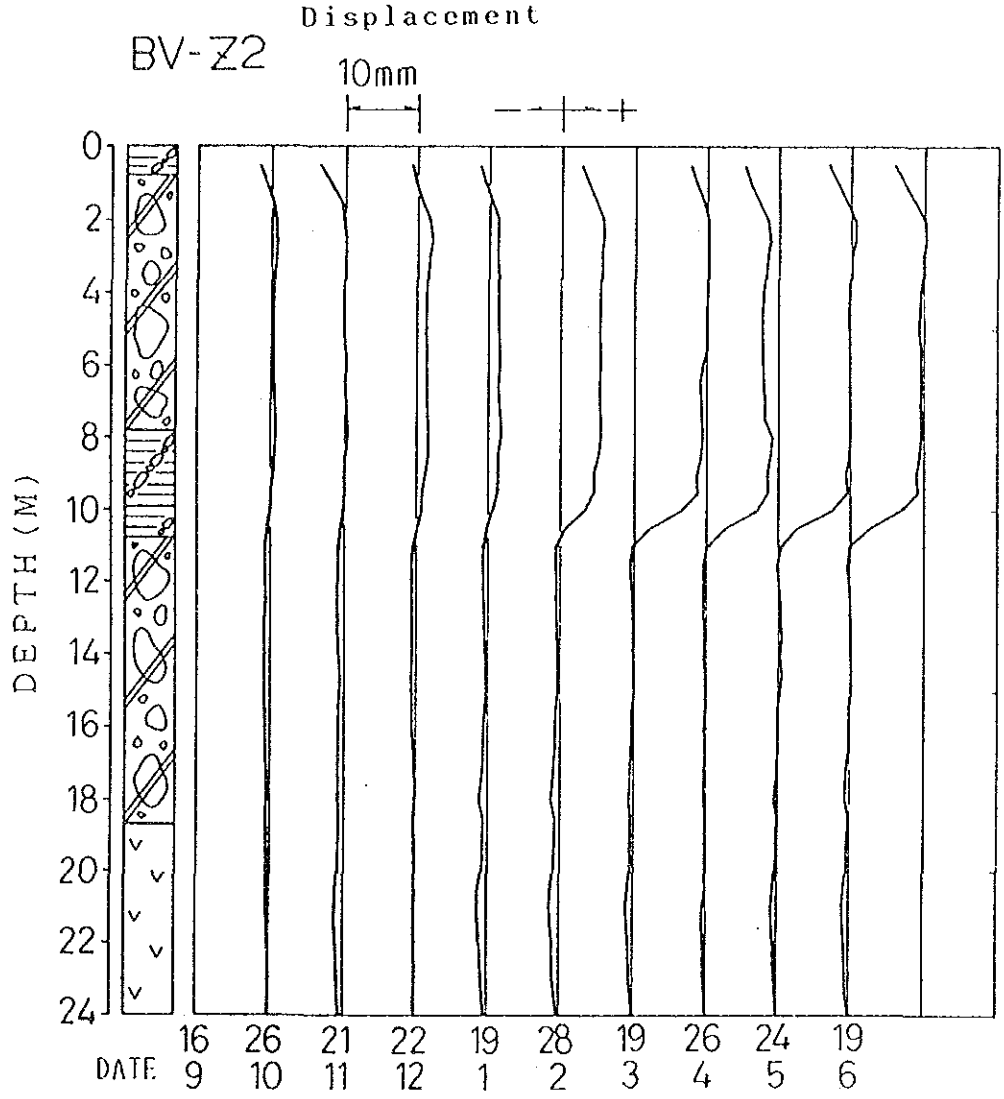


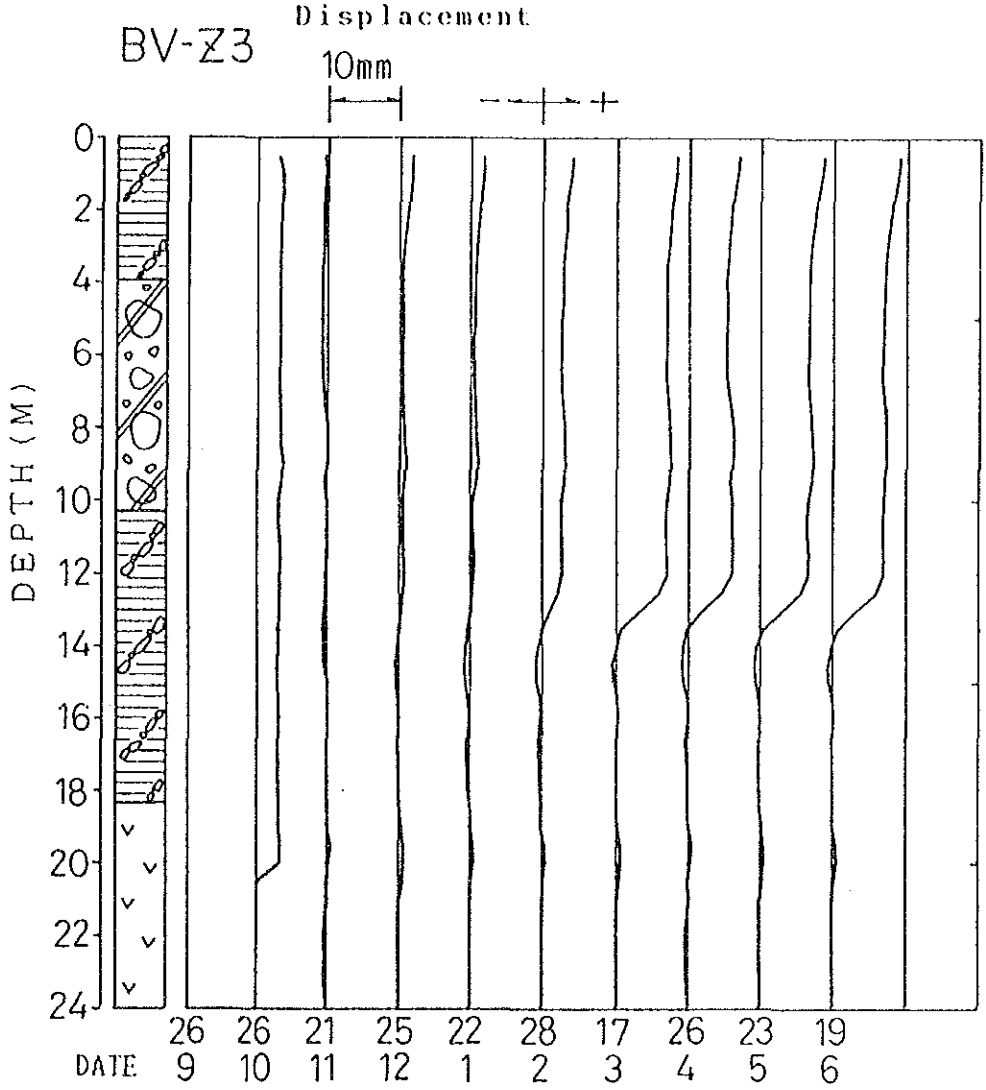
DISPLACEMENT OF BOREHOLE INCLINOMETER IN BOREHOLE, BV-Z1

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



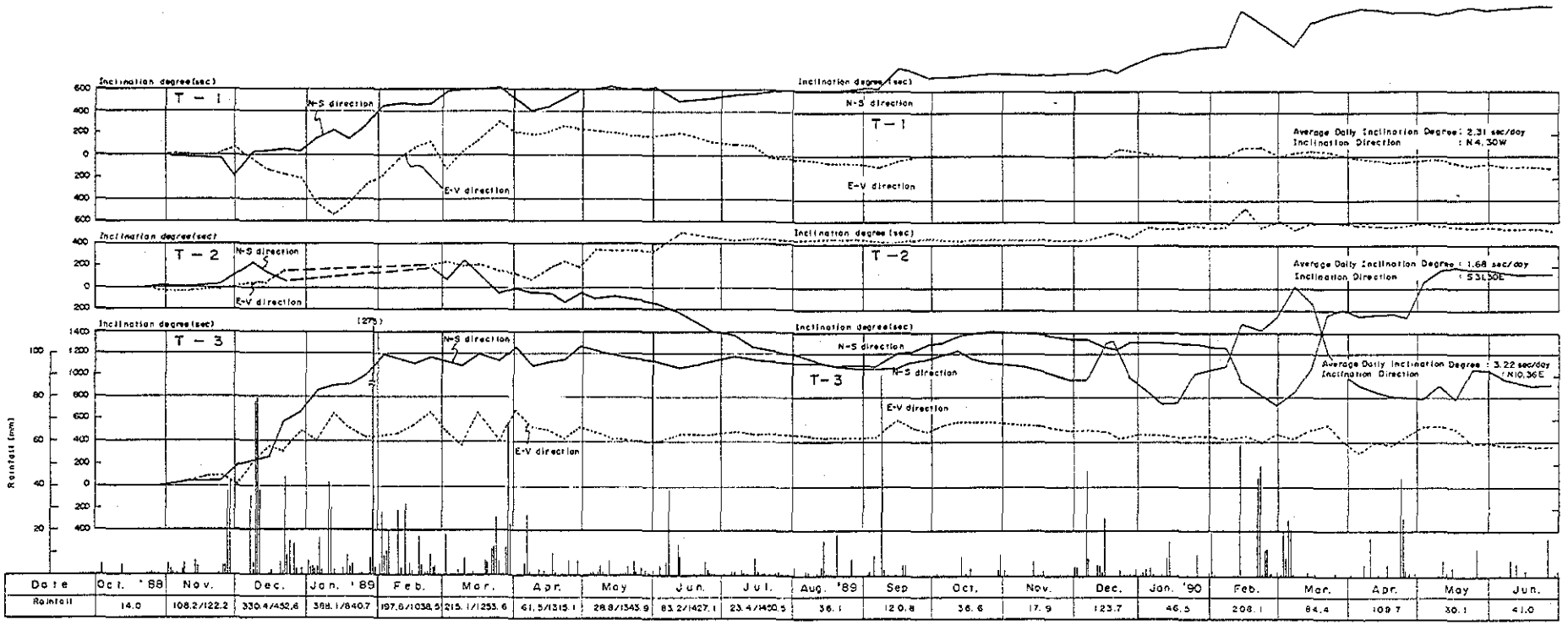
DISPLACEMENT OF BOREHOLE INCLINOMETER IN BOREHOLE, BV-Z2

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



DISPLACEMENT OF BOREHOLE INCLINOMETER IN BOREHOLE, BV-Z3

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

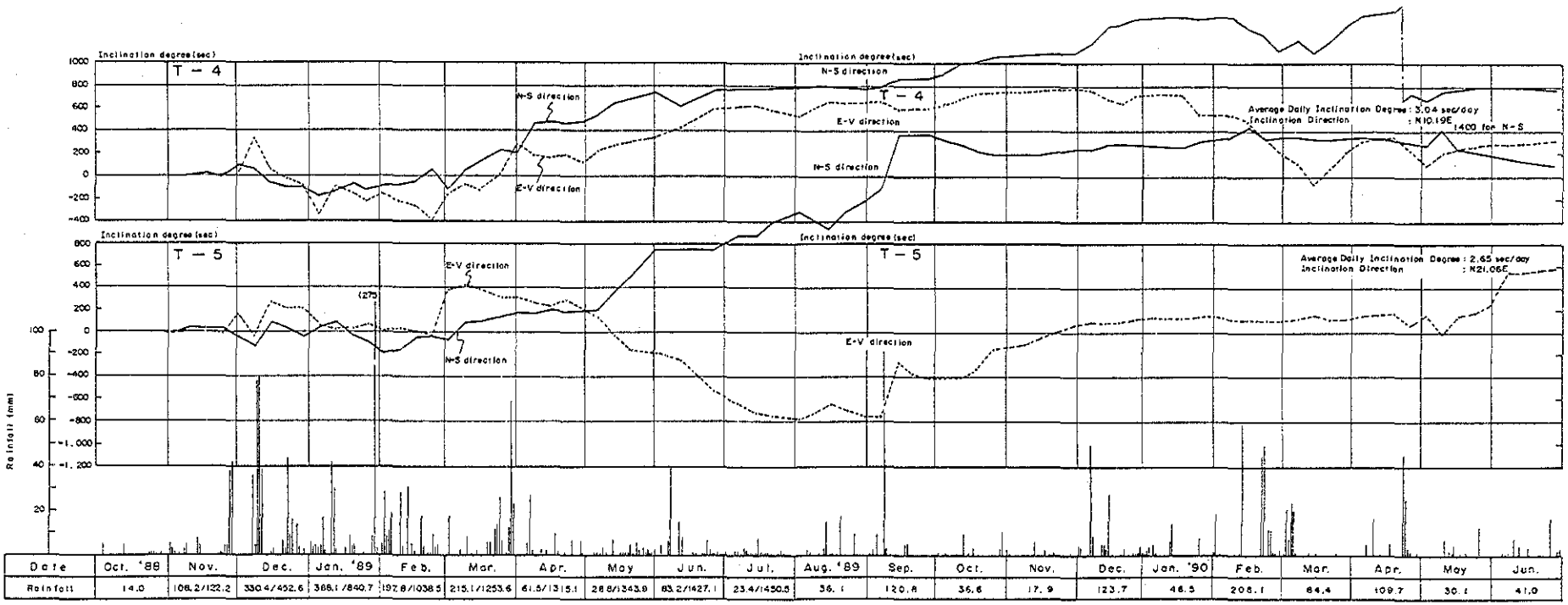


Date	Oct. '88	Nov.	Dec.	Jan. '89	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug. '89	Sep	Oct.	Nov.	Dec.	Jan. '90	Feb.	Mar.	Apr.	May	Jun.
Rainfall	14.0	108.2/122.2	330.4/452.6	388.1/840.7	197.8/1038.5	215.1/1253.6	61.5/1315.1	28.8/1343.9	83.2/1427.1	23.4/1450.5	36.1	120.8	36.6	17.9	123.7	46.5	208.1	84.4	109.7	30.1	41.0

F-26

DISPLACEMENT OF TILTMETERS, T-1 - T-3

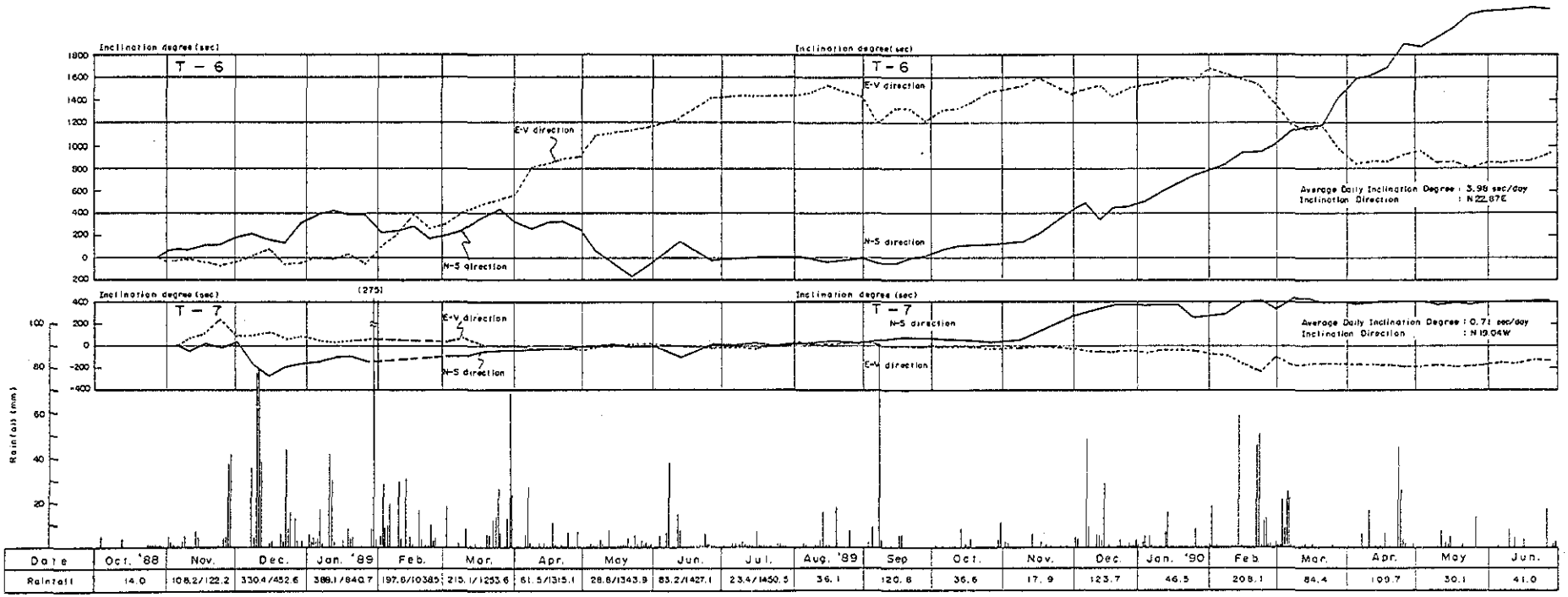
GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



Date	Oct. '88	Nov.	Dec.	Jan. '89	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug. '89	Sep.	Oct.	Nov.	Dec.	Jan. '90	Feb.	Mar.	Apr.	May	Jun.
Rainfall	14.0	108.2/122.2	330.4/452.6	388.1/840.7	197.8/1038.5	215.1/1253.6	61.5/1315.1	28.8/1343.9	83.2/1427.1	23.4/1450.5	36.1	120.8	36.6	17.9	123.7	46.5	206.1	64.4	109.7	30.1	41.0

DISPLACEMENT OF TILTMETERS, T-4 - T-5

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

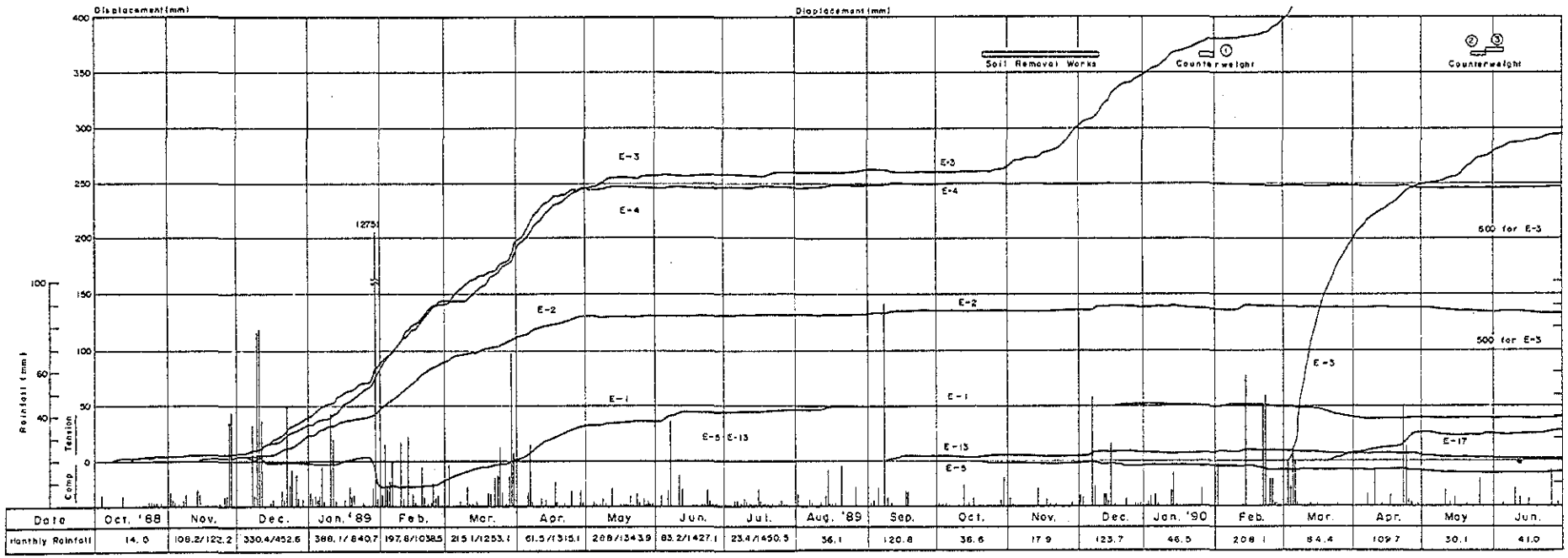


Date	Oct. '88	Nov.	Dec.	Jan. '89	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug. '89	Sep	Oct.	Nov.	Dec.	Jan. '90	Feb	Mar.	Apr.	May	Jun.
Rainfall	14.0	108.2/122.2	330.4/452.6	388.1/840.7	197.6/1038.5	215.1/1253.6	61.5/1315.1	28.8/1343.9	83.2/1427.1	23.4/1450.5	36.1	120.8	36.6	17.9	123.7	46.5	208.1	84.4	109.7	30.1	41.0

F-28

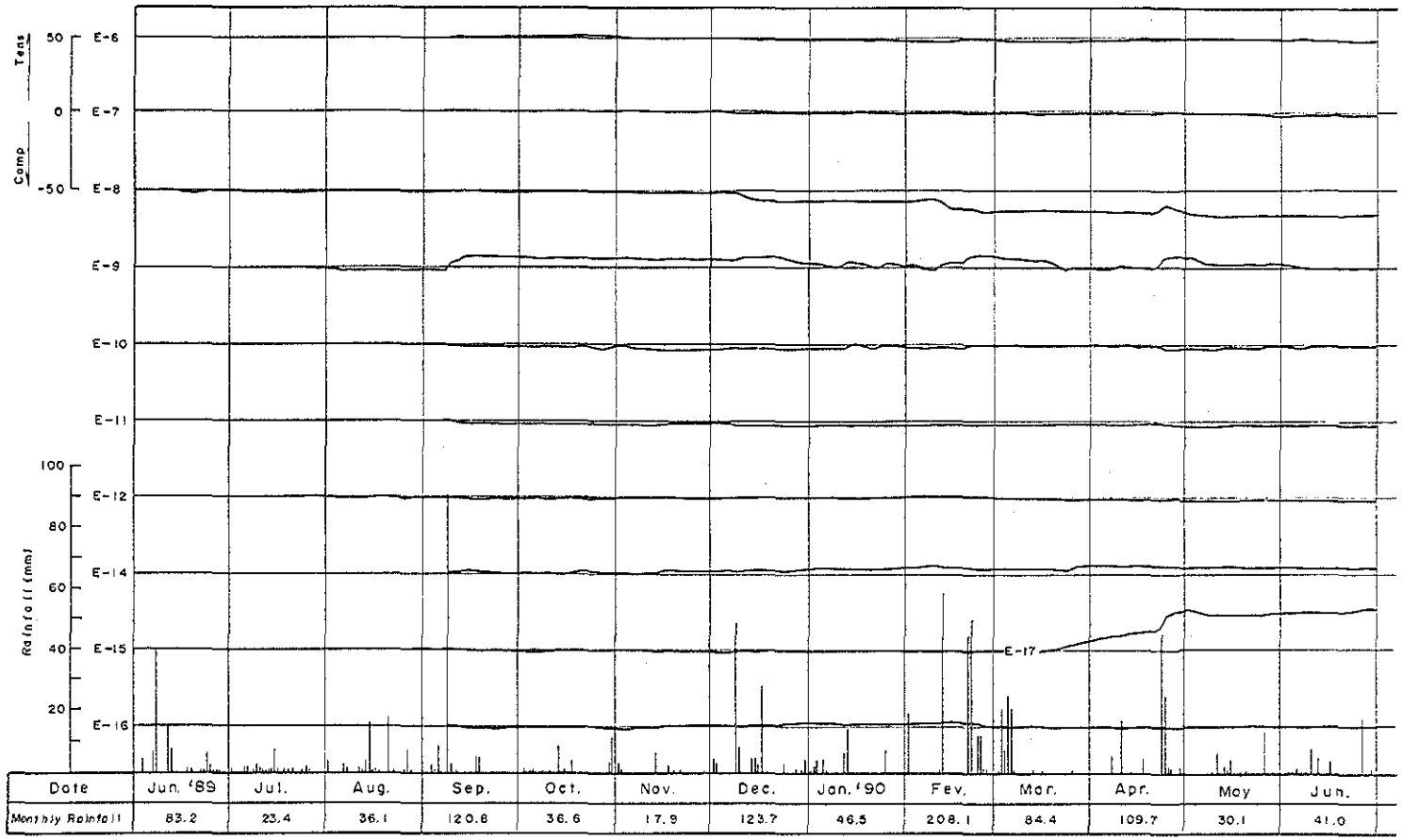
DISPLACEMENT OF TILTMETERS, T-6 - T-7

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



DISPLACEMENT OF EXTENSOMETER AT CROWN PORTION OF LANDSLIDE

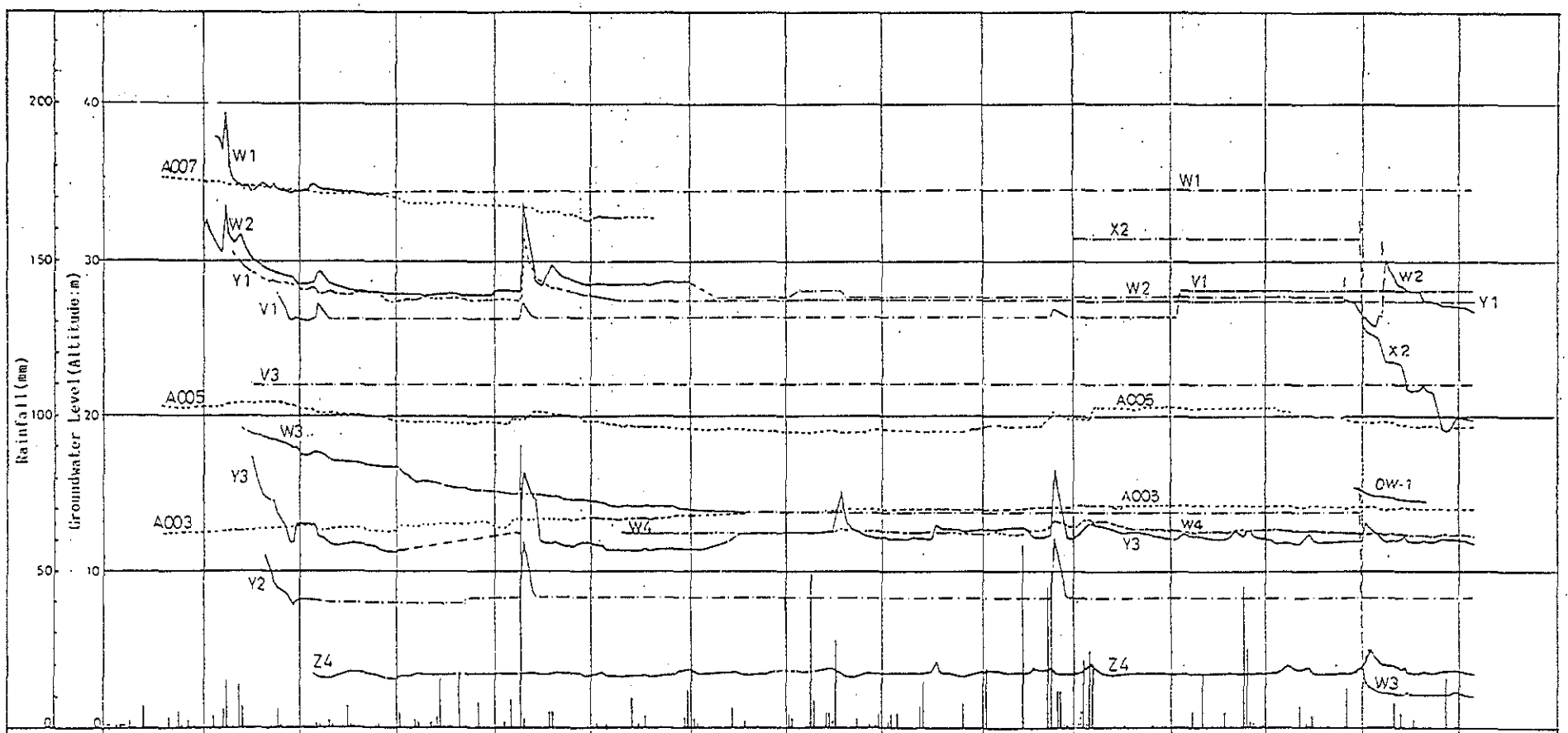
GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



Date	Jun. '89	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan. '90	Fev.	Mar.	Apr.	Moy	Jun.
Monthly Rainfall	83.2	23.4	36.1	120.8	36.6	17.9	123.7	46.5	208.1	84.4	109.7	30.1	41.0

DISPLACEMENT OF EXTENSOMETER AT CENTRAL AND TOE PORTION OF LANDSLIDE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



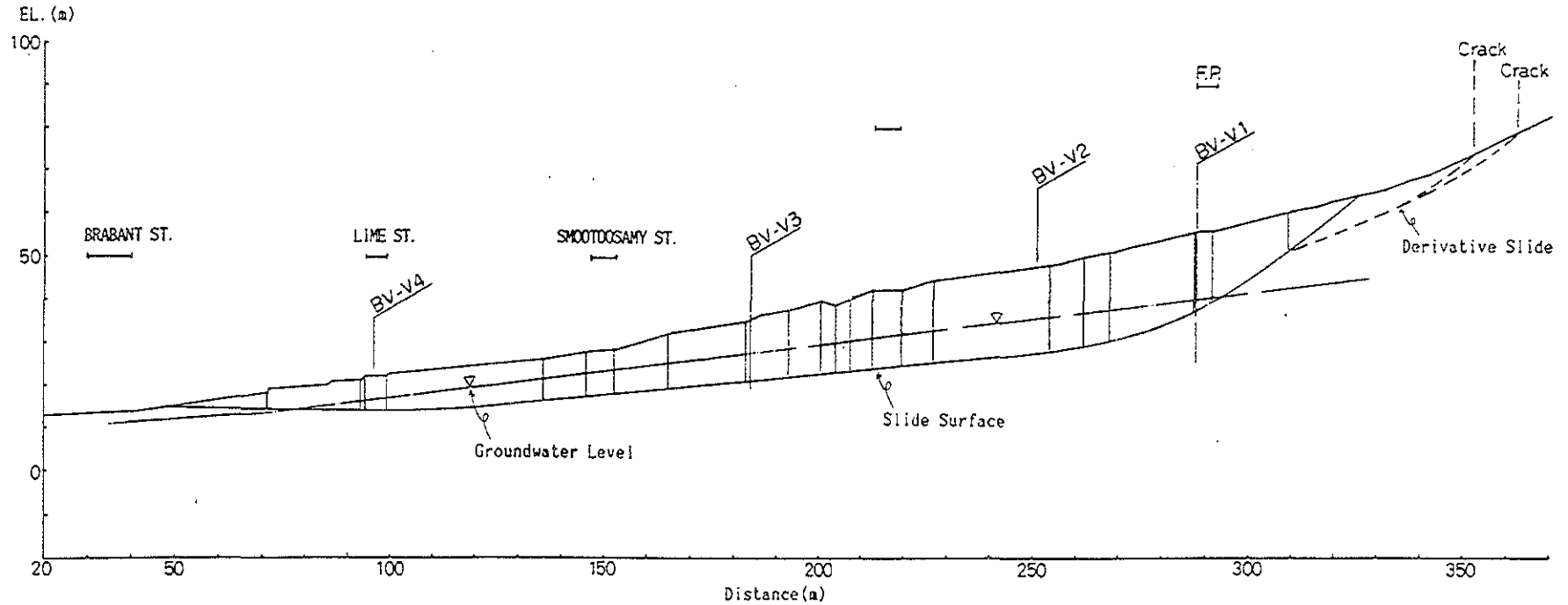
—·—·— :Groundwater level is deeper than the bottom of borehole

OBSERVATION RESULTS OF GROUNDWATER LEVELS IN BOREHOLES

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Cohesion of Slide Surface　　c=1.0 t/m²
Internal Friction Angle of Slide Surface　　φ=9.4° (tanφ=0.16478)

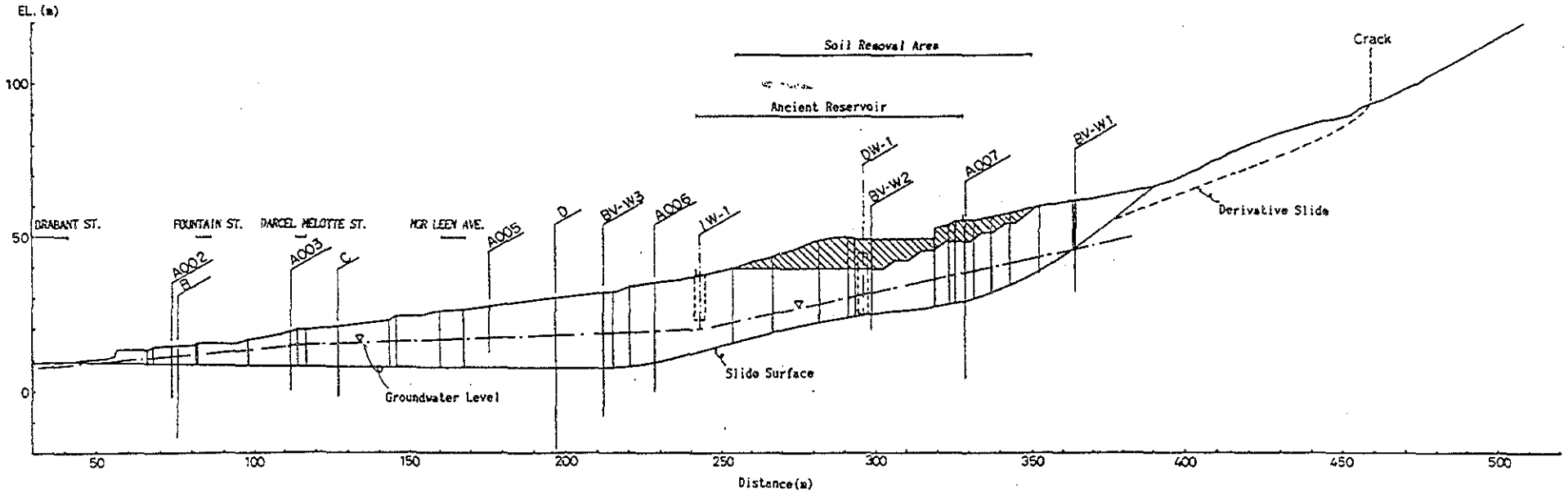
Safety Factor before Counter Measures　　Fs=1.00
Safety Factor after Conpletion of Drainage Well (Experimental Investigation)　　Fs=1.071



PROFILE OF STABILITY ANALYSIS ALONG V-LINE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Cohesion of Slide Surface	c=1.0 t/m²
Internal Friction Angle of Slide Surface	ϕ=9.7° (tanϕ=0.1708)
Safety Factor before Counter Measures	Fs=1.00
Safety Factor after Conpletion of Soil Removal Works	Fs=1.031
Safety Factor after Conpletion of Soil Removal Works and Drainage Well(Experimental Investigation)	Fs=1.092



PROFILE OF STABILITY ANALYSIS ALONG W-LINE

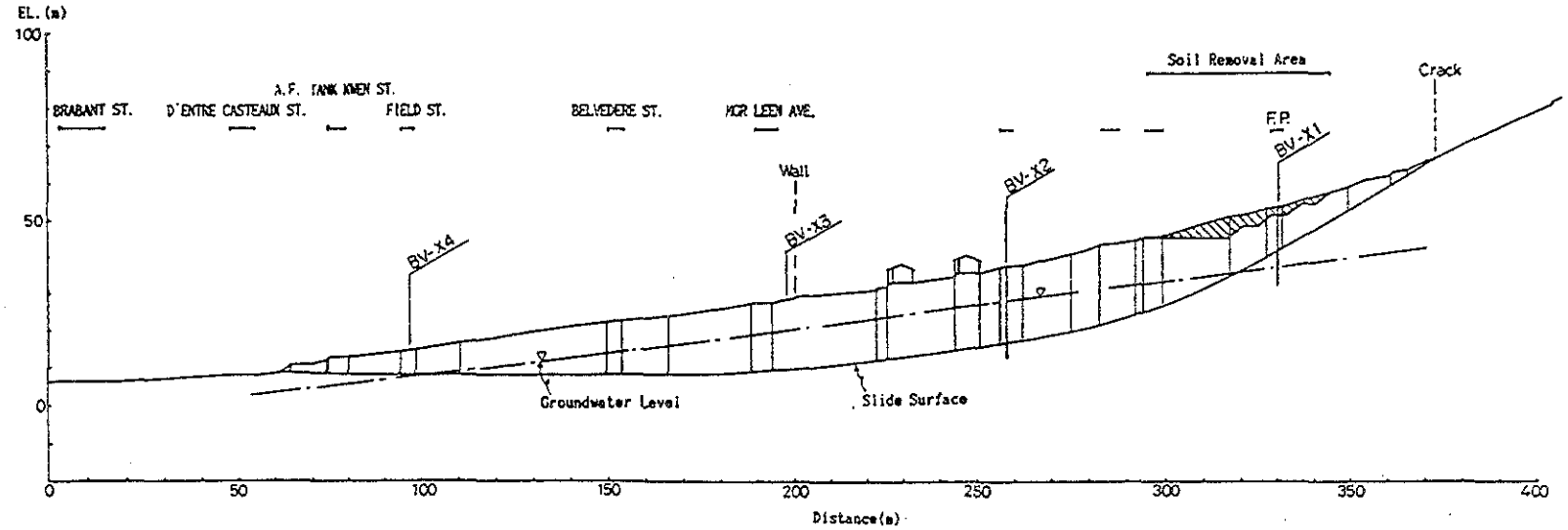
GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Cohesion of Slide Surface $c=1.0\ t/m^2$

Internal Friction Angle of Slide Surface $\phi=9.9°\ (\tan\phi=0.1740)$

Safety Factor before Counter Measures $Fs=1.00$

Safety Factor after Conpletion of Soil Removal Works $Fs=1.070$



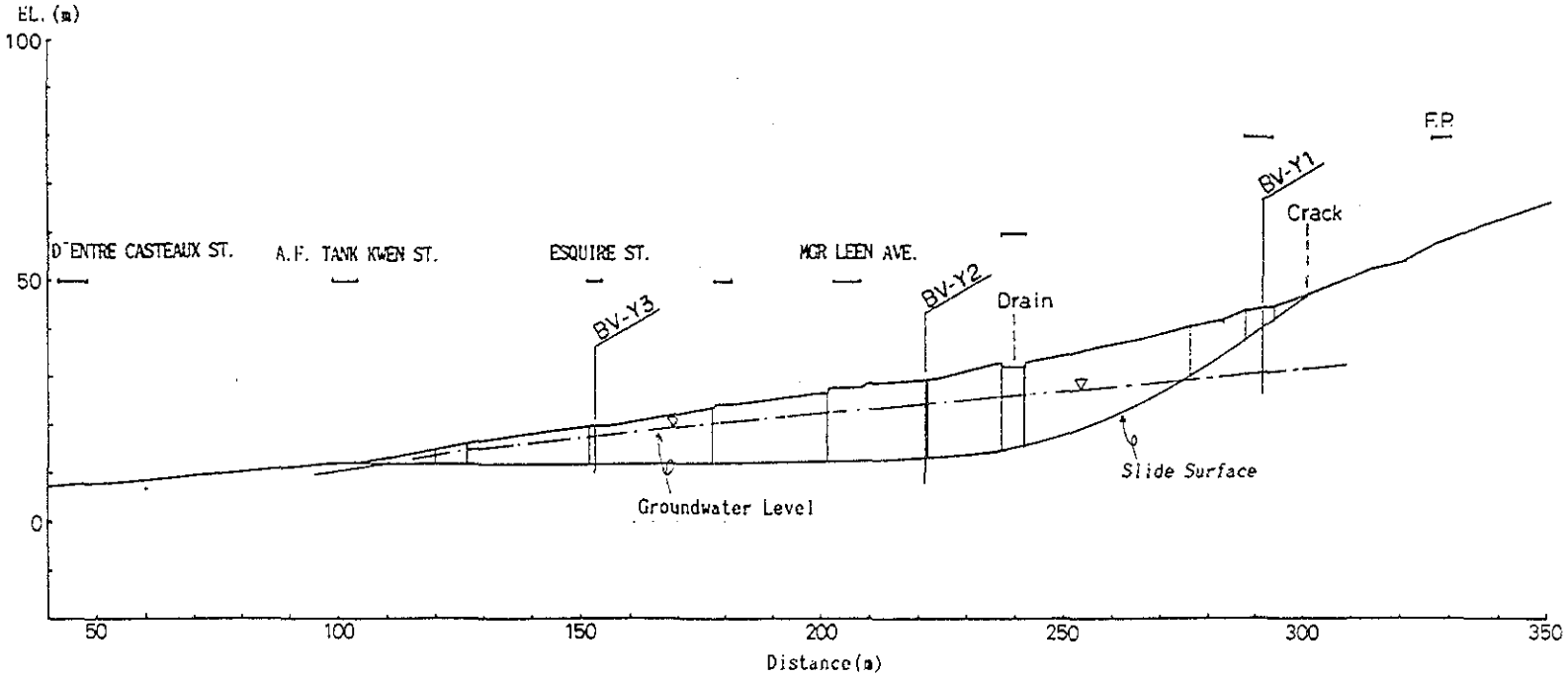
PROFILE OF STABILITY ANALYSIS ALONG X-LINE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Cohesion of Slide Surface $c=1.0\ t/m^2$

Internal Friction Angle of Slide Surface $\phi=8.8°\ (\tan\phi=0.155)$

Safety Factor before Counter Measures $Fs=1.00$



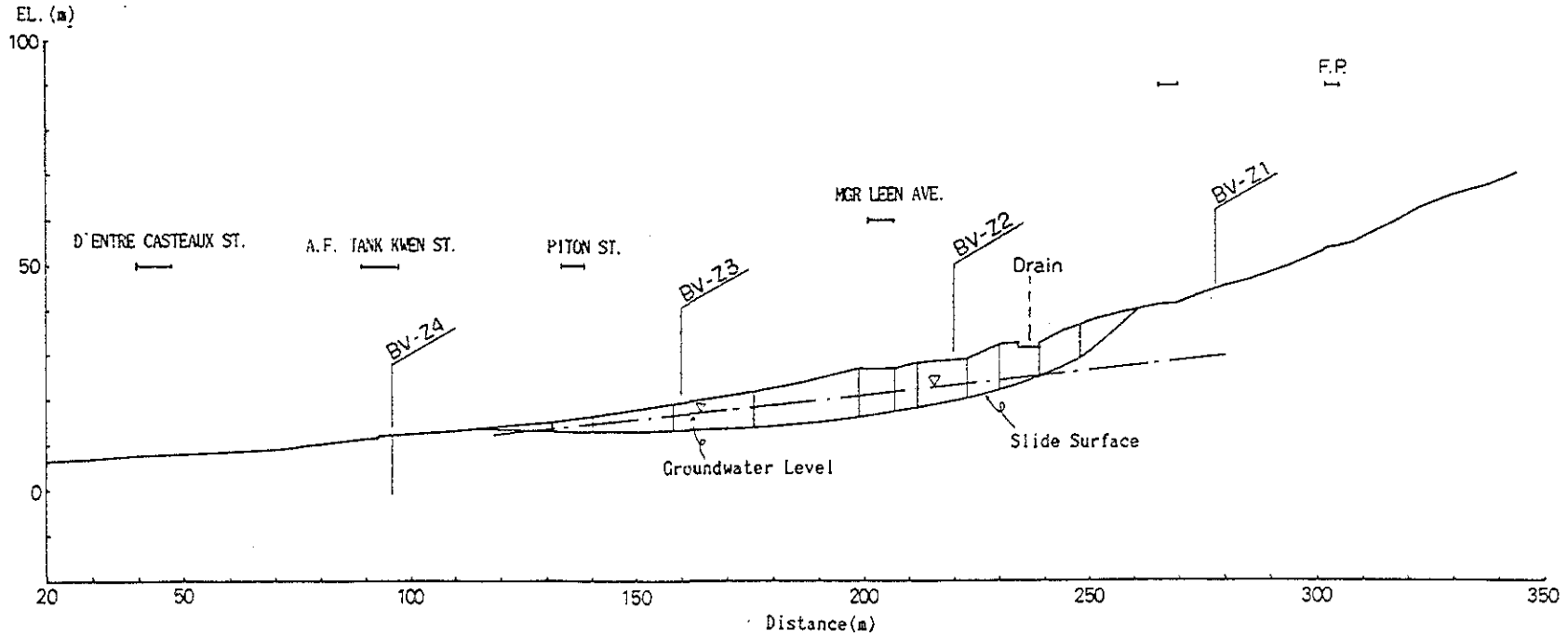
PROFILE OF STABILITY ANALYSIS ALONG Y-LINE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Cohesion of Slide Surface $c=1.0\ t/m^2$

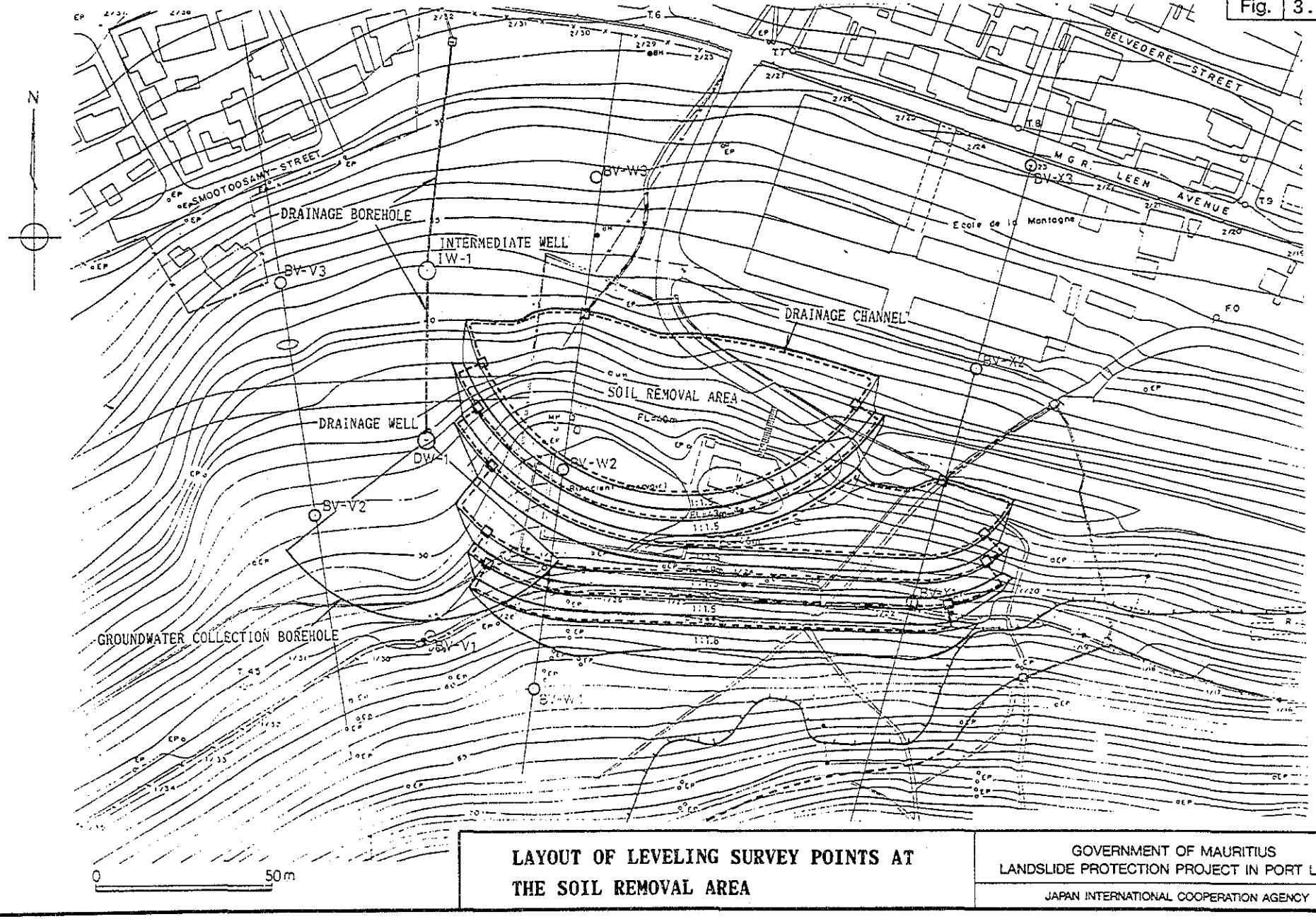
Internal Friction Angle of Slide Surface $\phi=6.9^\circ$ ($\tan\phi=0.121$)

Safety Factor before Counter Measures $Fs=1.00$



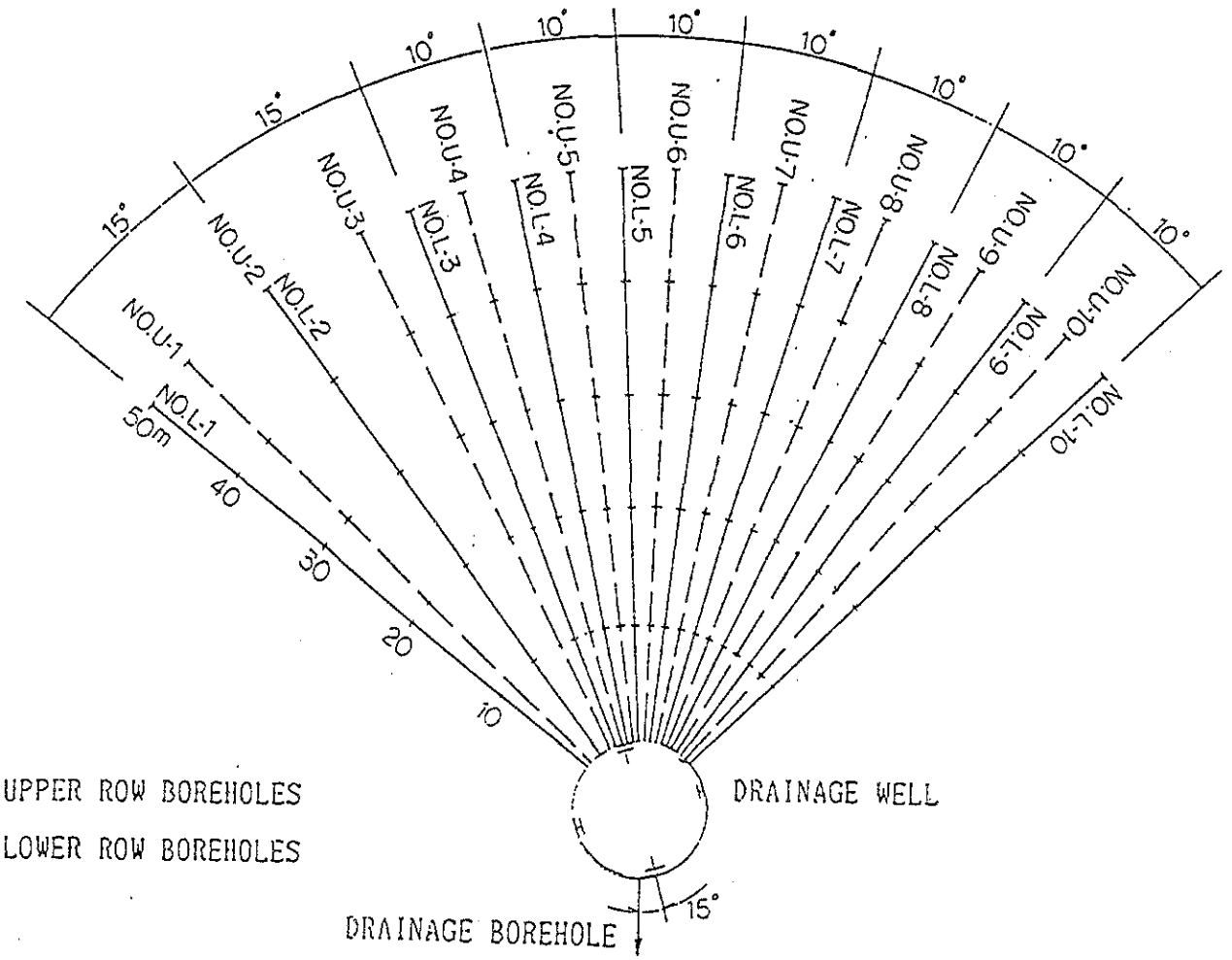
PROFILE OF STABILITY ANALYSIS ALONG Z-LINE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



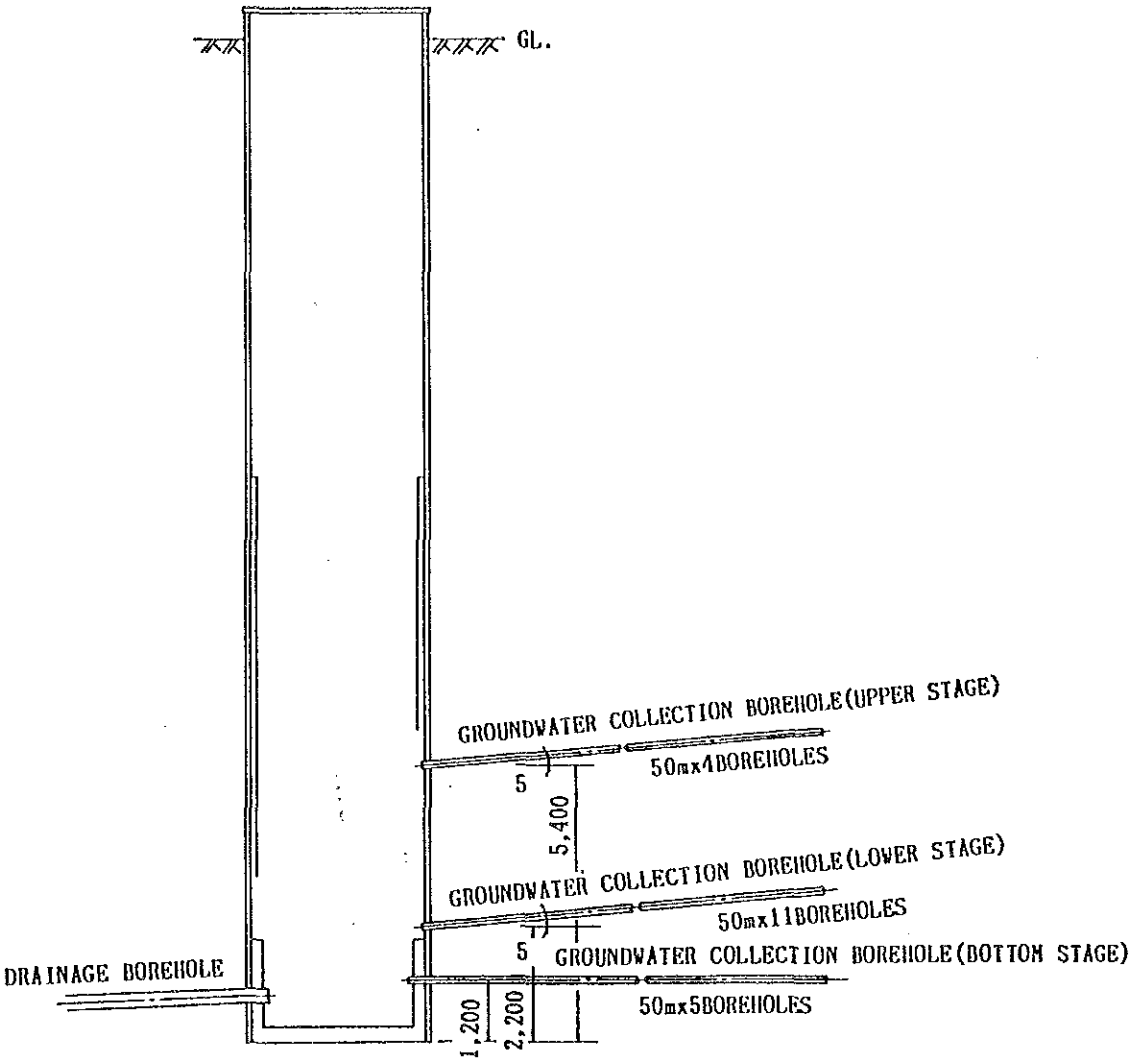
LAYOUT OF LEVELING SURVEY POINTS AT THE SOIL REMOVAL AREA

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



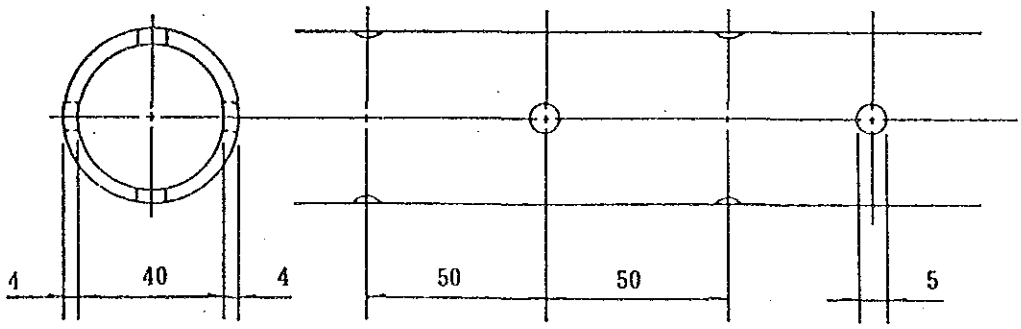
HORIZONTAL ARRANGEMENT OF GROUNDWATER COLLECTION BOREHOLES

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



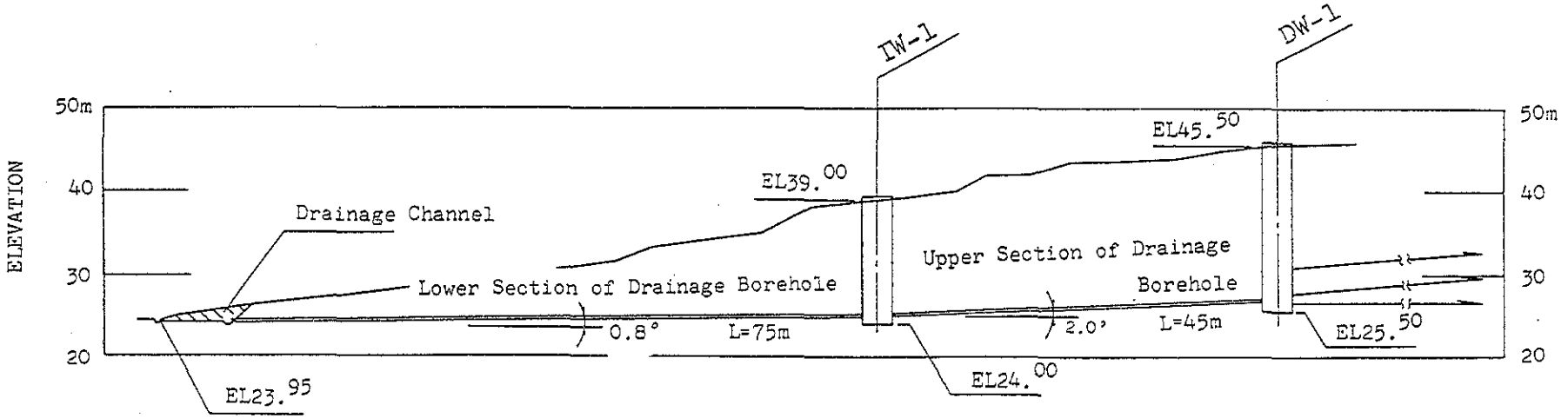
POLYVINYL CHLORIDE(PVC) PIPE

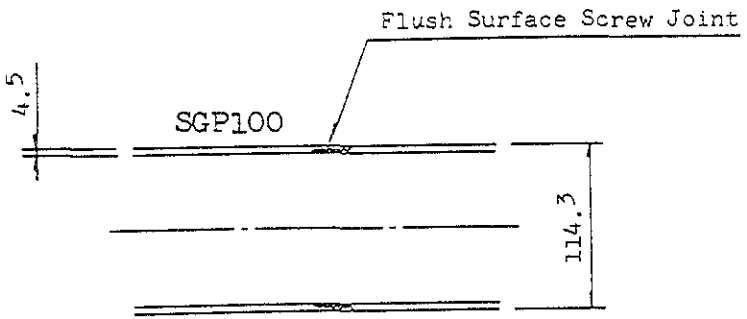
UNIT: mm



VERTICAL ARRANGEMENT OF GROUNDWATER COLLECTION BOREHOLES AND STRAINER PIPE	GOVERNMENT OF MAURITIUS LANDSLIDE PROTECTION PROJECT IN PORT LOUIS JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.2-3



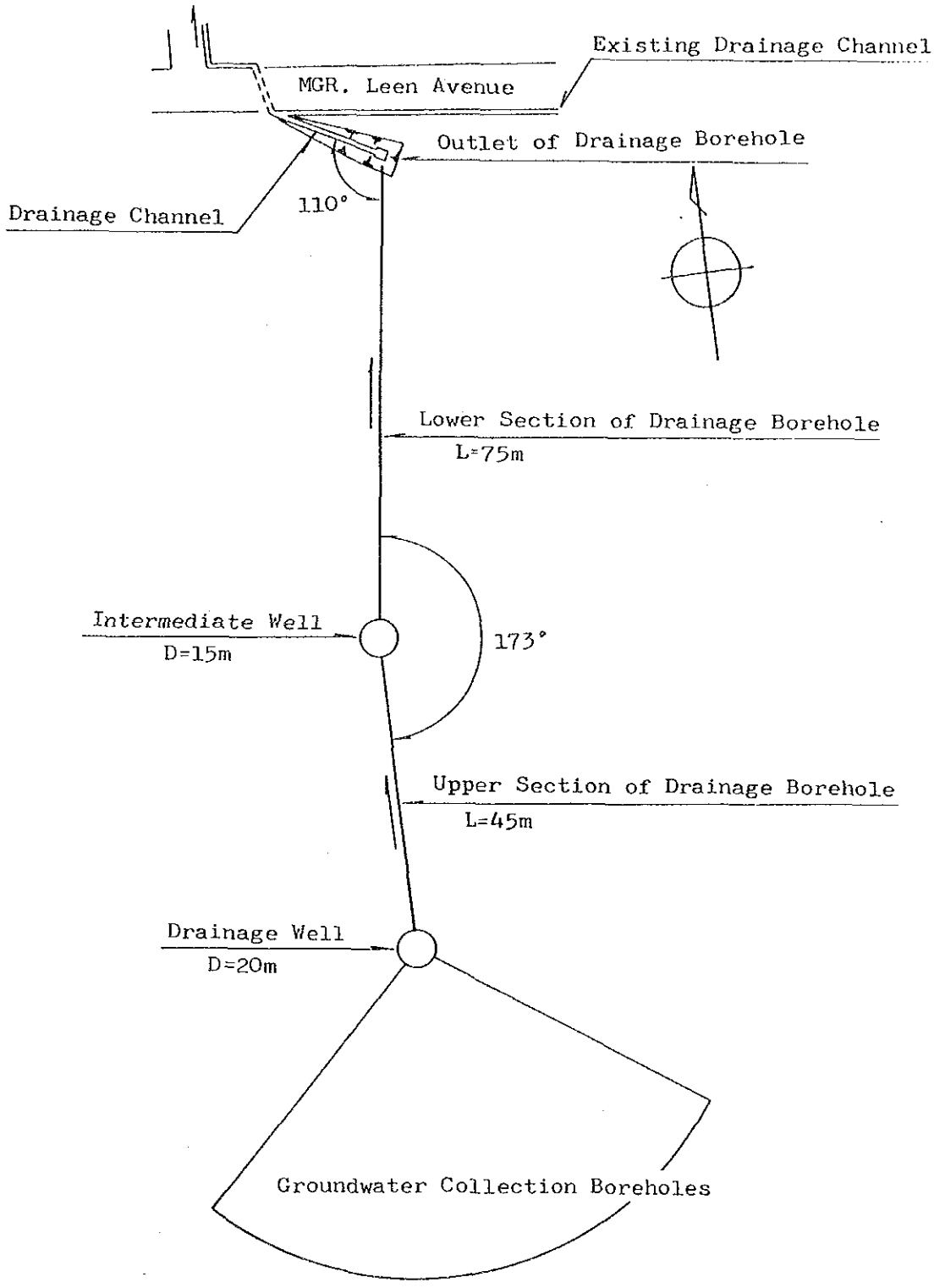


DRAINAGE BOREHOLE

PROFILE OF DRAINAGE BOREHOLES

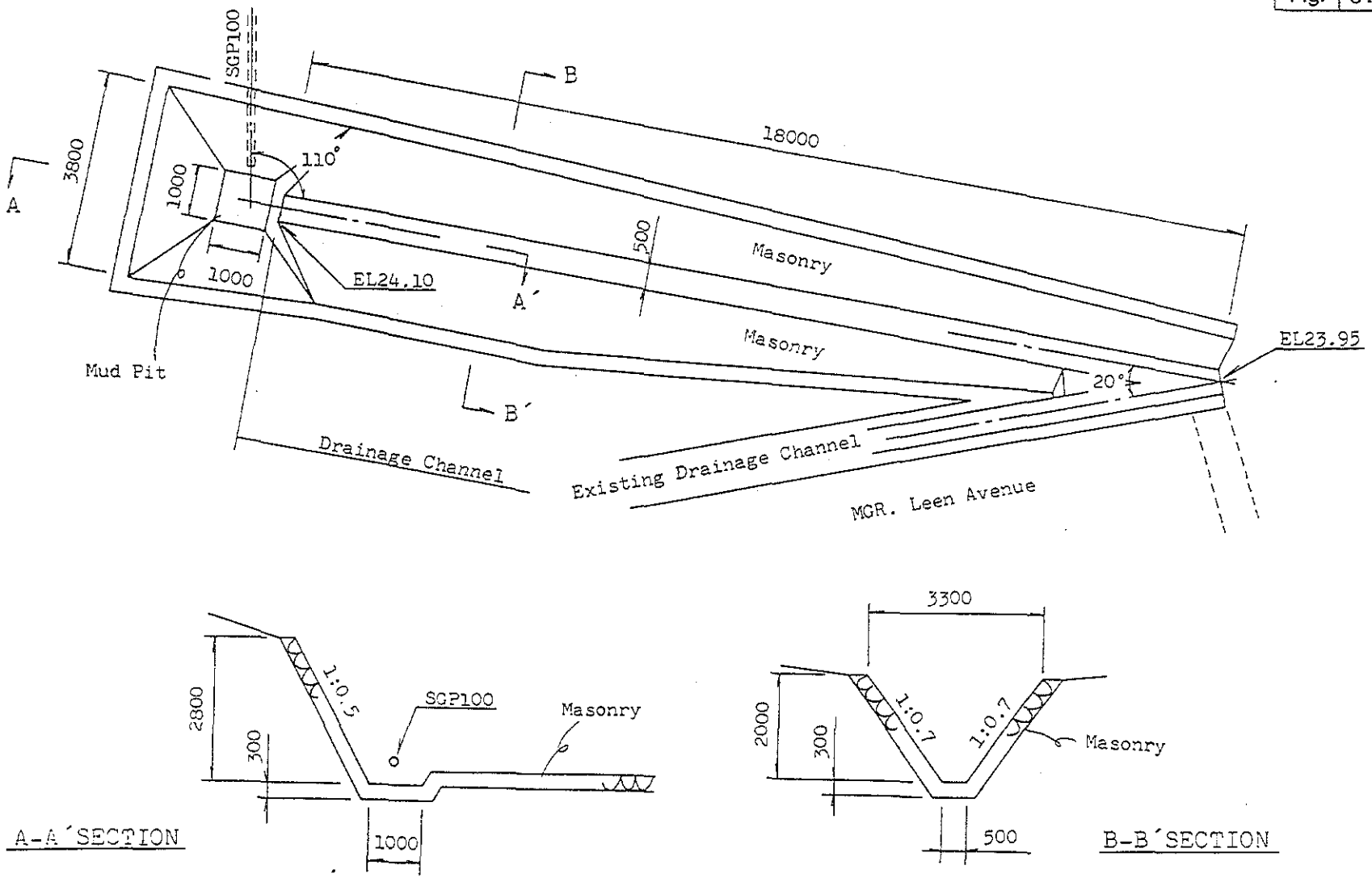
GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.2-4



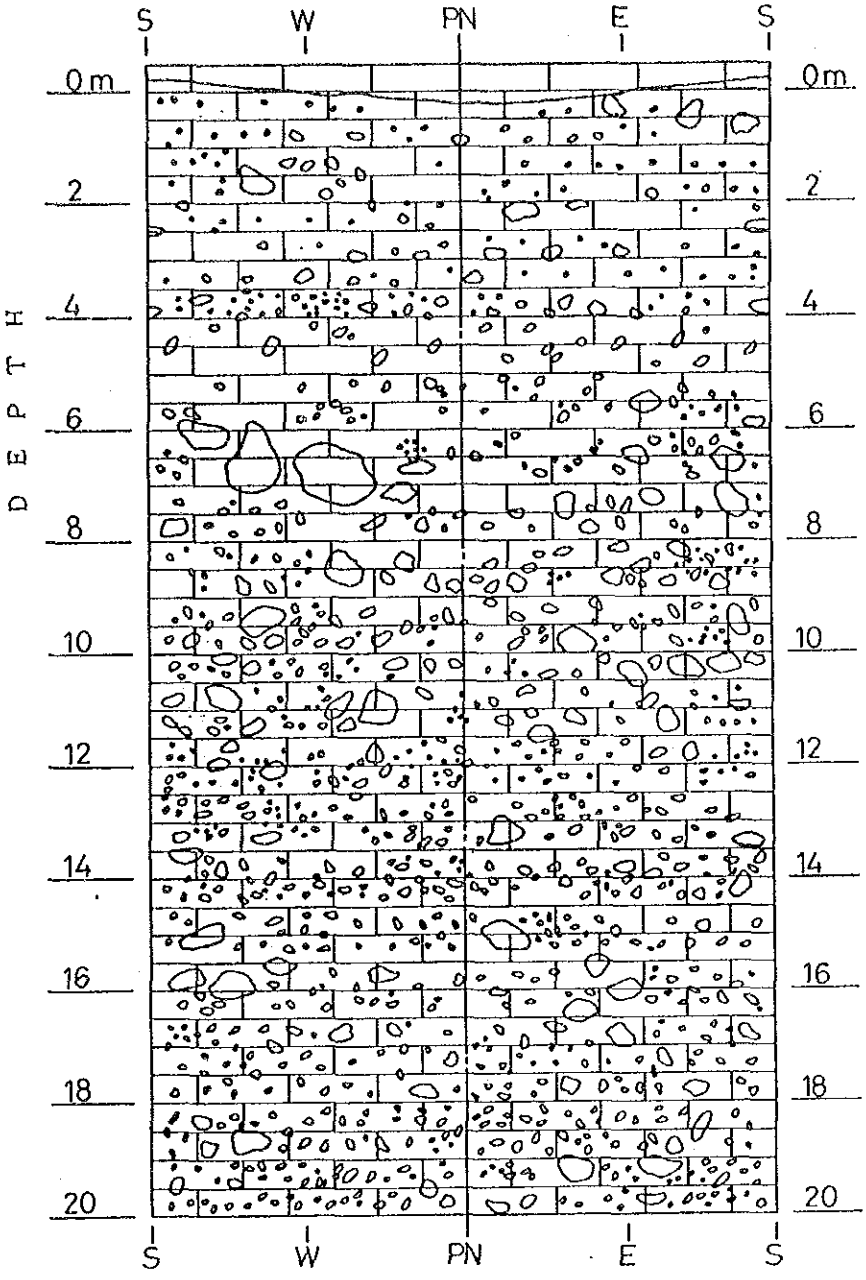
ALIGNMENT OF DRAINAGE BOREHOLES

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



OUTLET WORKS OF DRAINAGE BOREHOLE

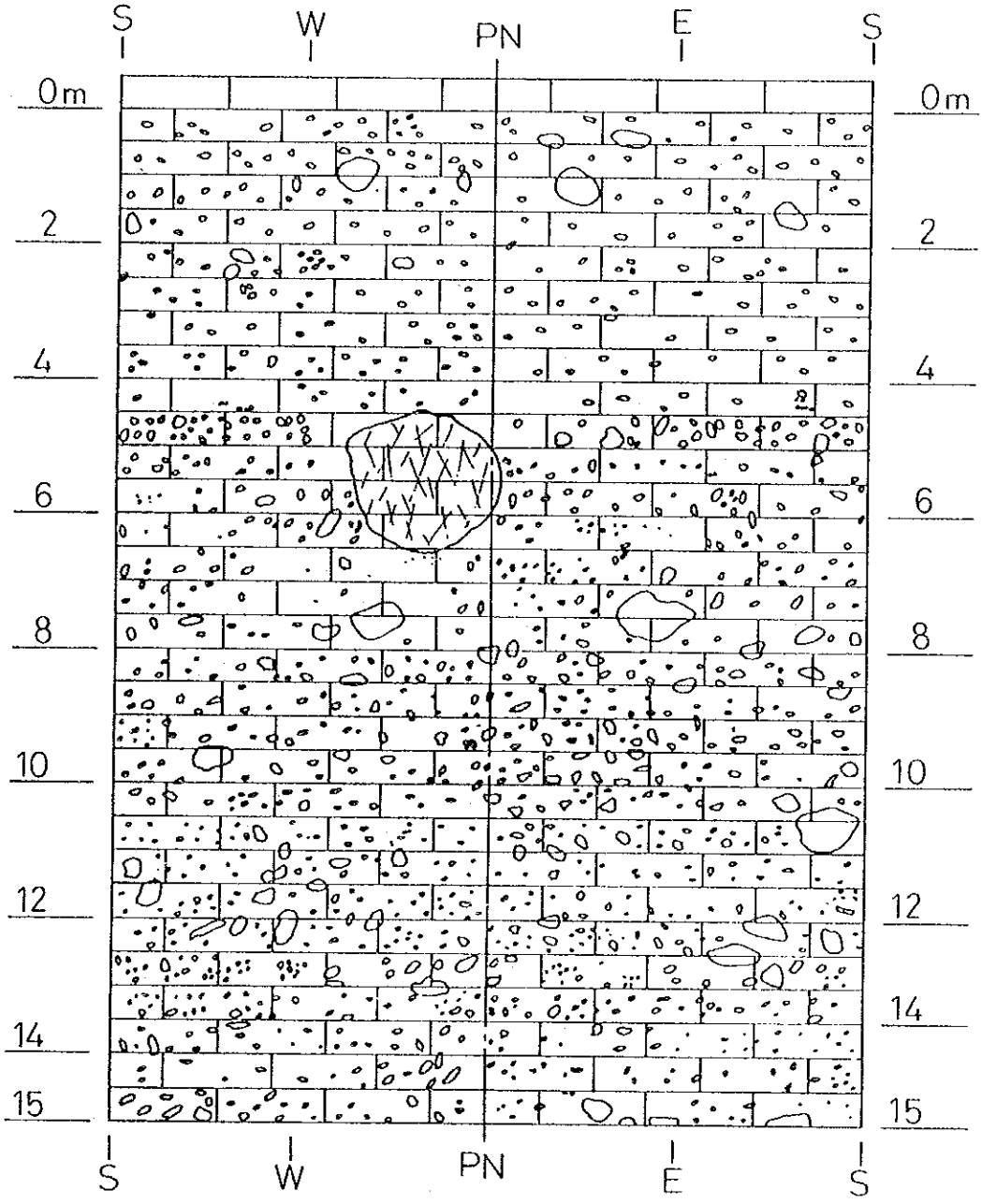
GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



Note.
Materials (surrounding the drainage well) are composed of basalt gravel and cohesive clayey soil.
No groundwater level is observed.
Clayey soil appears to be reddish brown.
Frequent slickensides are developed in clayey soil.
Clayey soil is slightly sandy below 13m.

SUBSURFACE CONDITION SURROUNDING DRAINAGE WELL

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

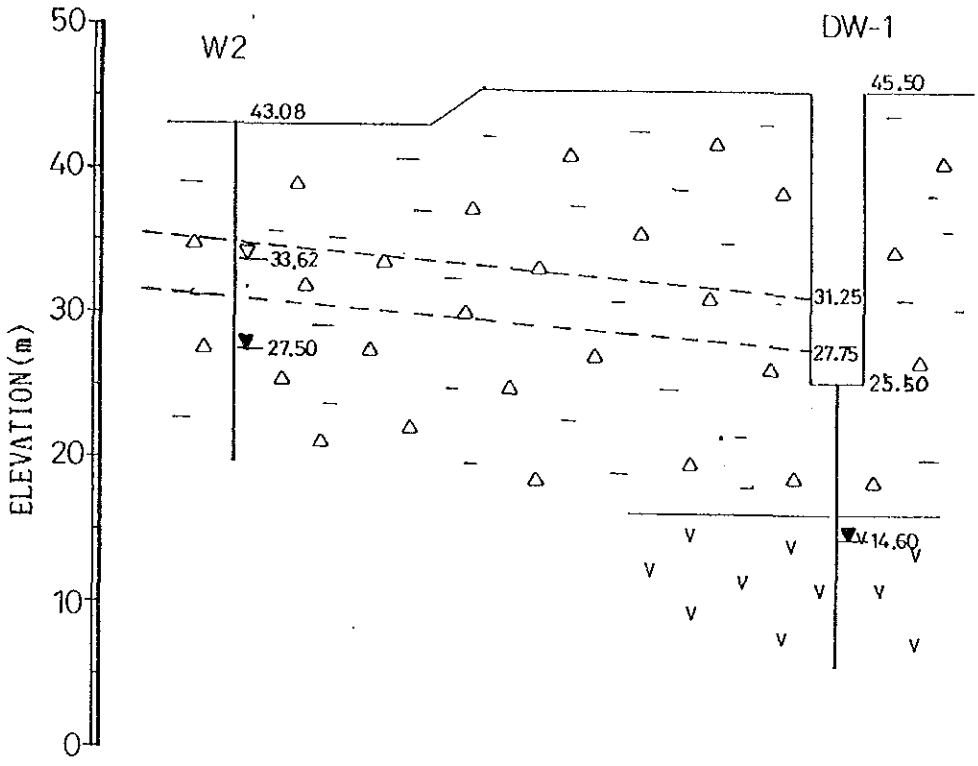


Note:

Materials(surrouding the intermediate well) are composed of basalt, gravel and cohesive clayey soil.
No groundwater level is observed.
Clayey soil appears to be reddish brown.
Frequent slickensides are developed in clayey soil.

SUBSURFACE CONDITION SURROUNDING INTERMEDIATE WELL

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



LEGEND

43.08 ELEVATION(m)

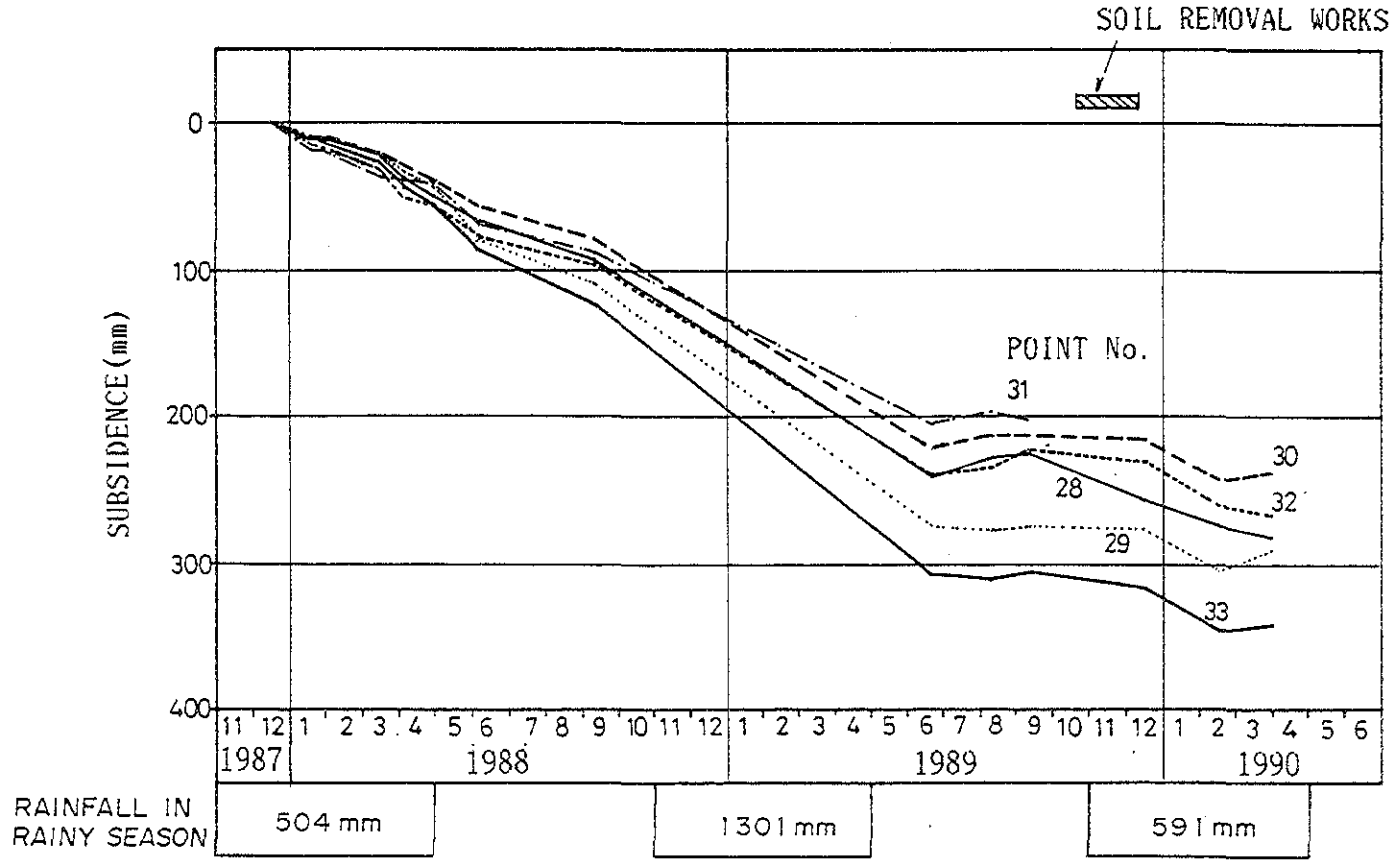
——— GROUNDWATER COLLECTION BOREHOLE

▽ GROUNDWATER TABLE(7, JUN., 1989)

▼ GROUNDWATER TABLE(19, JUN., 1990)

GROUNDWATER LEVEL IN DRAINAGE WELL-1 AND BOREHOLE BV-W2

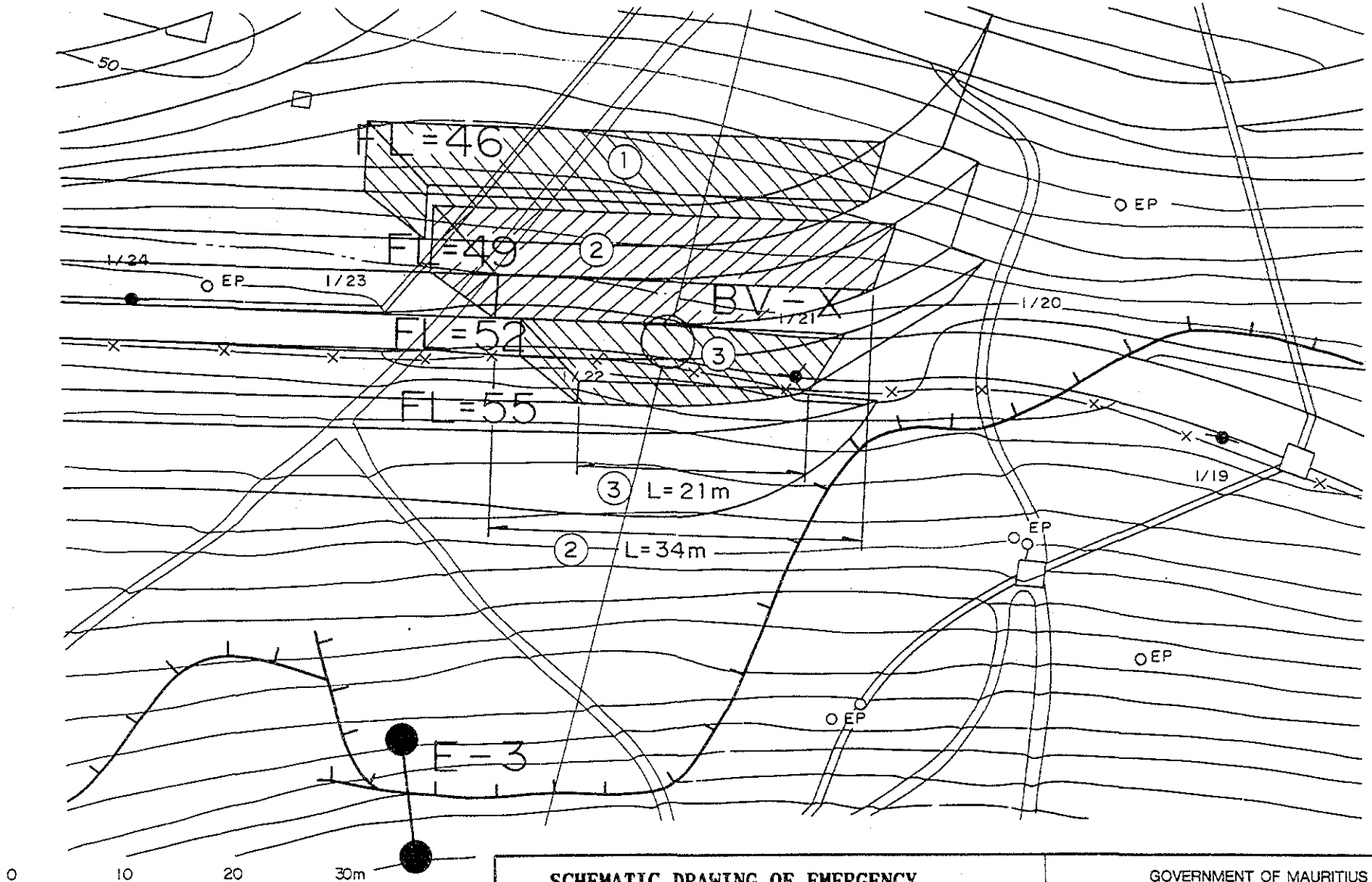
GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY



RESULT OF LEVELING SURVEY ALONG LINE-1 FROM DEC. 1987 TO APR. 1990

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.2-10

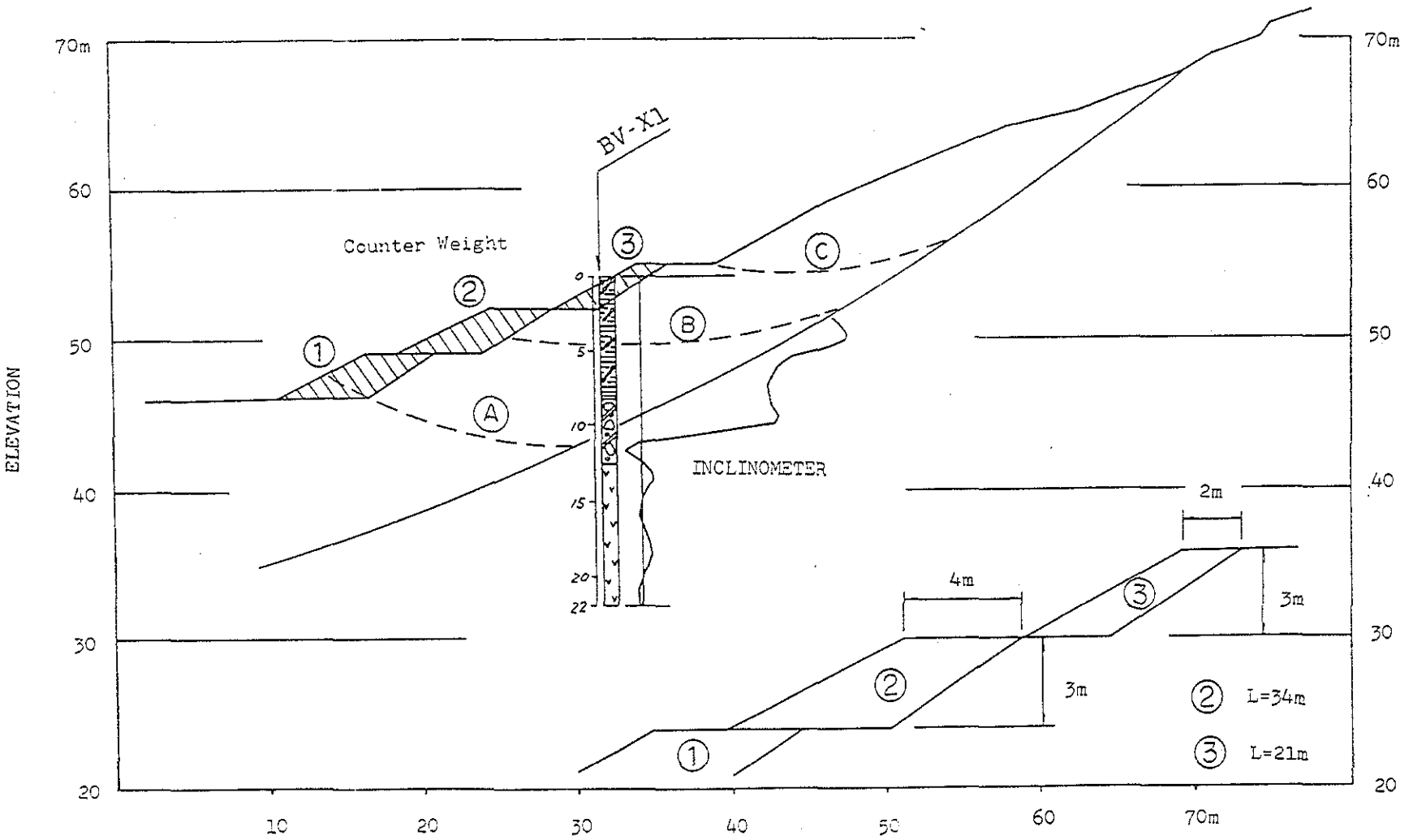


SCHEMATIC DRAWING OF EMERGENCY COUNTERWEIGHT

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS

JAPAN INTERNATIONAL COOPERATION AGENCY

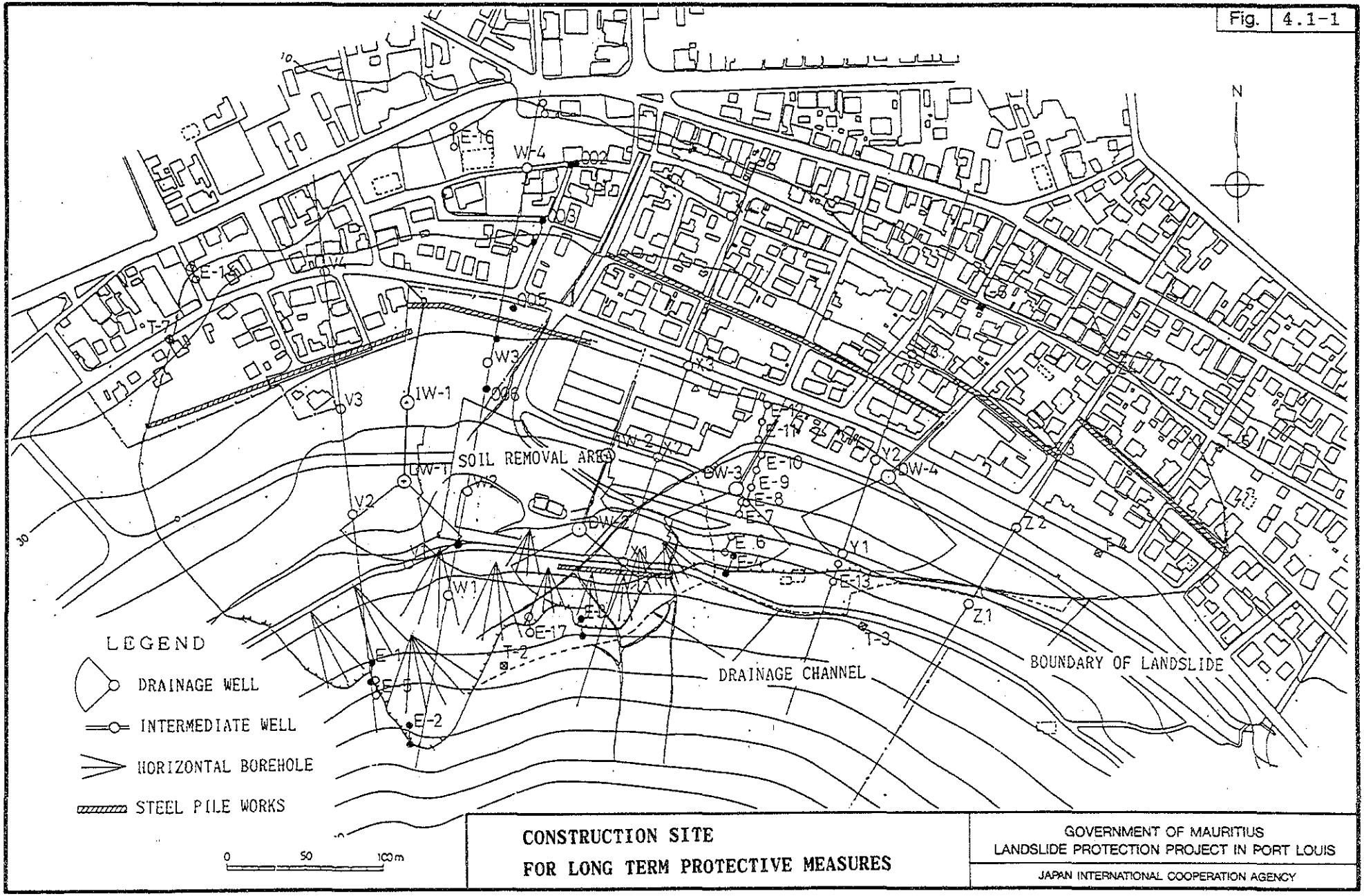
Fig. 3.2-11



PROFILE OF EMERGENCY COUNTERWEIGHT

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

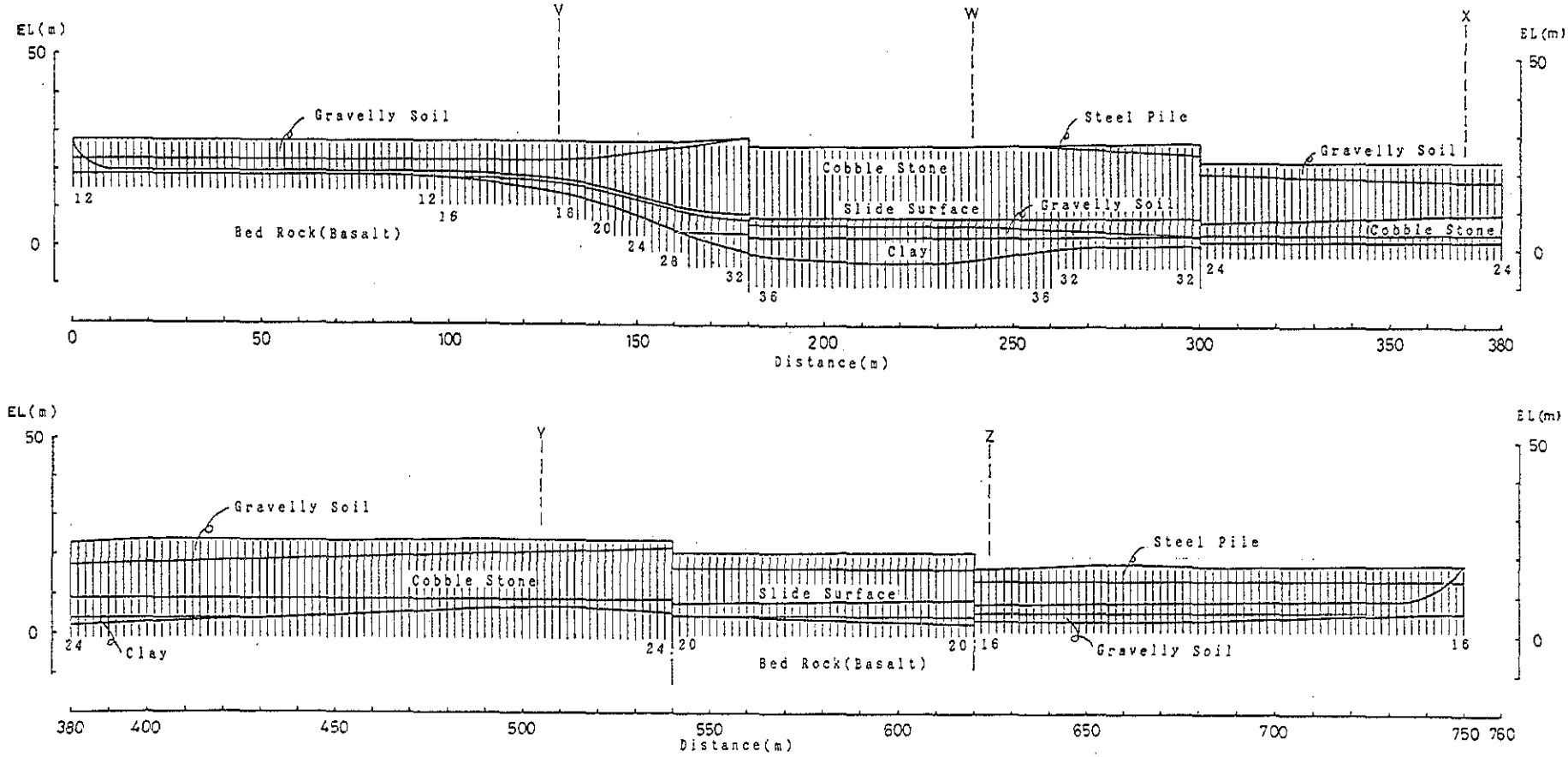
Fig. 4.1-1



CONSTRUCTION SITE FOR LONG TERM PROTECTIVE MEASURES

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

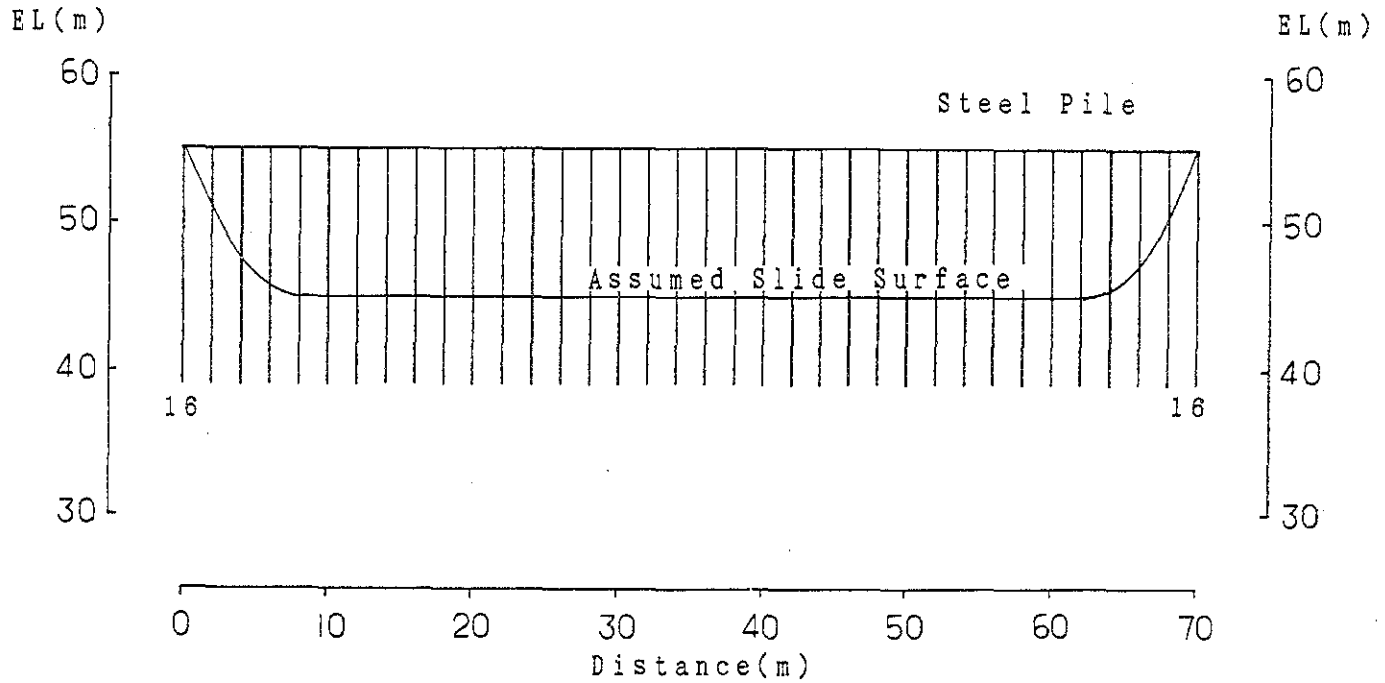
Fig. 4.3-1



CROSS SECTIONAL ALIGNMENT OF STEEL PILES FOR MAIN LANDSLIDE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.3-2

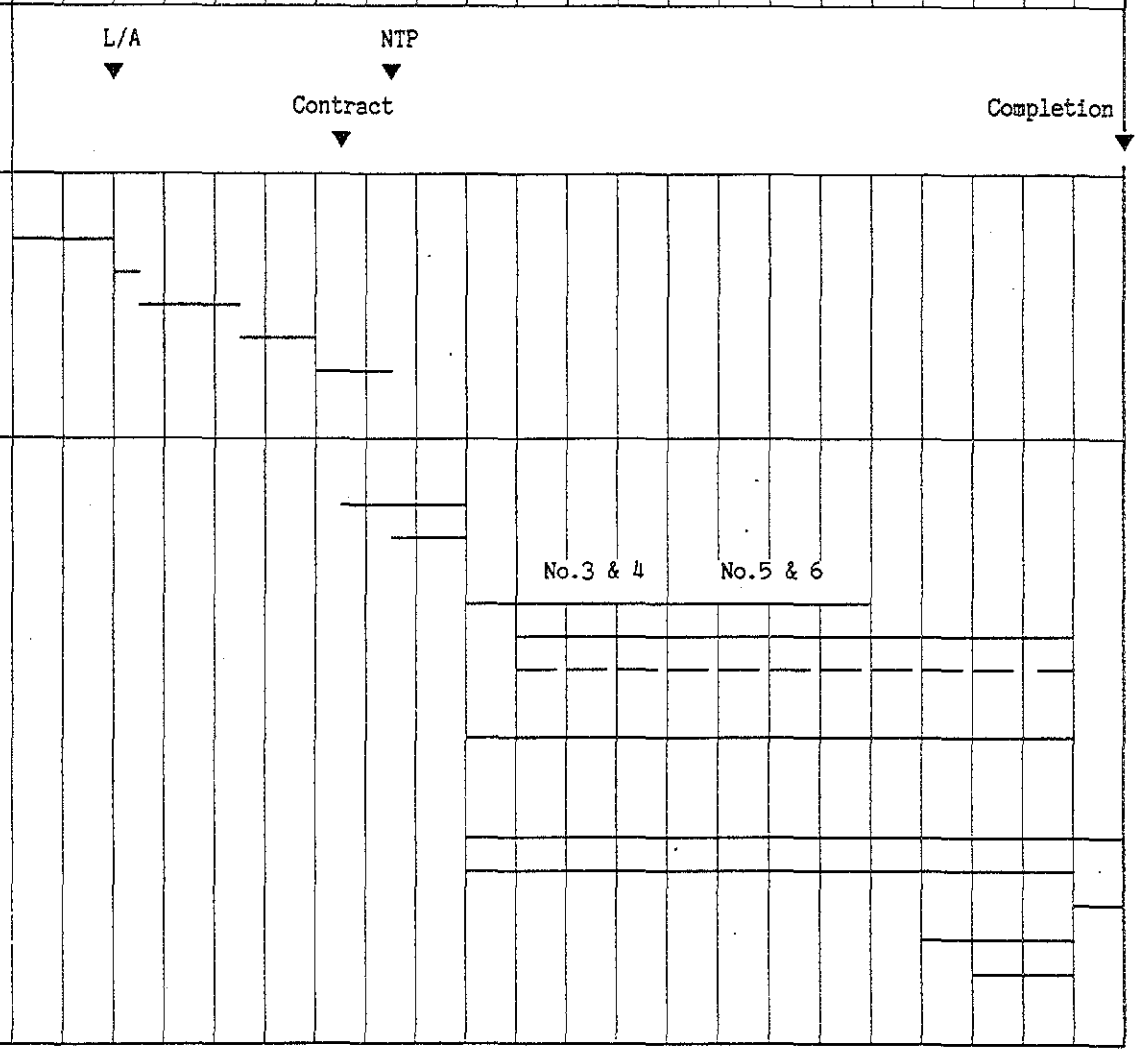


CROSS SECTIONAL ALIGNMENT OF STEEL PILES FOR SMALL LANDSLIDE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.5-1

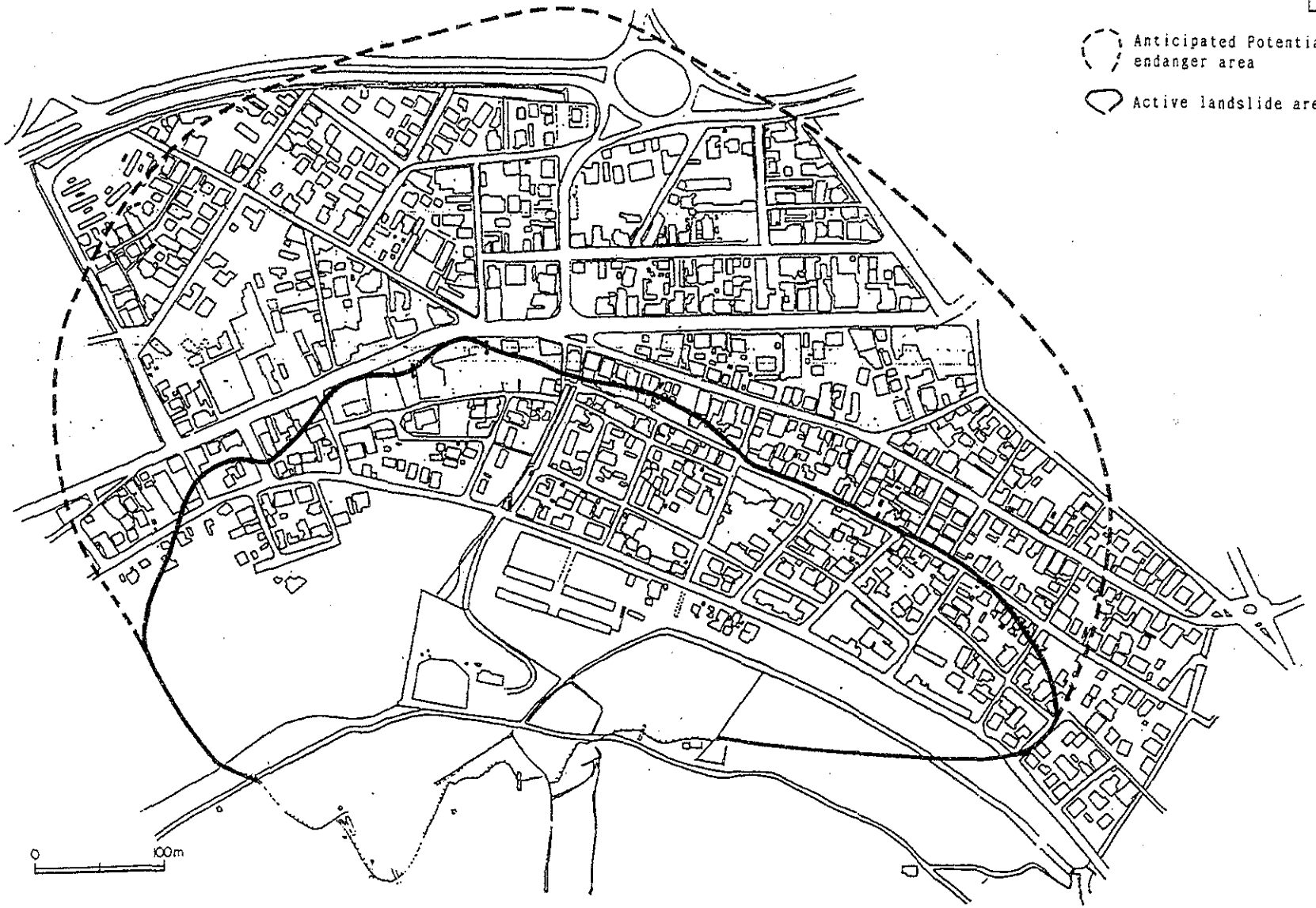
Items	Quantity
KEY EVENTS	L.S.
PRE-CONSTRUCTION STAGE	
1.Loan Procedure	L.S.
2.Selection of Consultant	L.S.
3.Tender Document	L.S.
4.Tendering and Evaluation	L.S.
5.Contract and Award	L.S.
CONSTRUCTION STAGE	
1.Mobilization	L.S.
2.Temporary Works	L.S.
3.Drainage Well	
a.Excavation	45 m
b.Water collection boring	2,100 m
c.Water drainage boring	200 m
4.Horizontal Boring	1,670 m
5.Piling	
a.Vertical boring	9,376 m
b.Pile installation	8,420 m
c.Pile installation	576 m
d.Filling in piles	416 nos.
e.Plug works	416 nos.



IMPLEMENTATION TIME SCHEDULE

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.7-1



ANTICIPATED POTENTIALLY ENDANGER AREA

GOVERNMENT OF MAURITIUS
LANDSLIDE PROTECTION PROJECT IN PORT LOUIS
JAPAN INTERNATIONAL COOPERATION AGENCY