Appendix 3.1.13

Work plan for evaluation of the countermeasure

M.G.Form 2(L)

GOVERNMENT OF MAURITIUS

MY REF: MPIP/A/482/GEN/V16

Date: 14 December 2017

From : Senior Chief Executive, Ministry of Public Infrastructure and Land Transport

Thru' : Director (Civil Engineering) 15/12/2017

To : The Chief Advisor, JICA Expert Team, **(Attn: Dr. T.Iwasaki)**

SUBJECT: Evaluation of Landslide Countermeasures - Chitrakoot

Reference is made to your enclosed letter dated 13 December 2017 on the above subject.

The Ministry of Public Infrastructure and Land Transport (MPI) will provide the necessary support for the "Evaluation of the Landslide Countermeasures at Chitrakoot". In that respect, MPI shall initiate the necessary procedures for the procurement of equipment required for the monitoring of groundwater.

On behalf of this Ministry, we would like to once again convey our sincere appreciation to the JICA Expert Team, for their invaluable help throughout the Technical Cooperation Projects on Landslide Management in Mauritius.

(M.Gobin - Engineer/Senior Engineer)
For Senior Chief Executive

Encl.

cc: *Senior Chief Executive (MPI), (Att.: Mr. G.Bundhooa - DPS)*
Director (CE)
Mr. D.Chinasamy (LE)
File

Work plan for evaluation of the landslide countermeasure in Chitrakoot

(Draft)

December 2017

MINISTRY OF PUBLIC INFRASTRUCTURE & LAND TRANSPORT
Civil Engineering

1. Work flow for Evaluation by the stability analysis

The effects of the landslide countermeasure works are evaluated by the stability analysis, in accordance with the work flow shown below, after completion of the countermeasure, Phases I and II, in Chitrakoot.

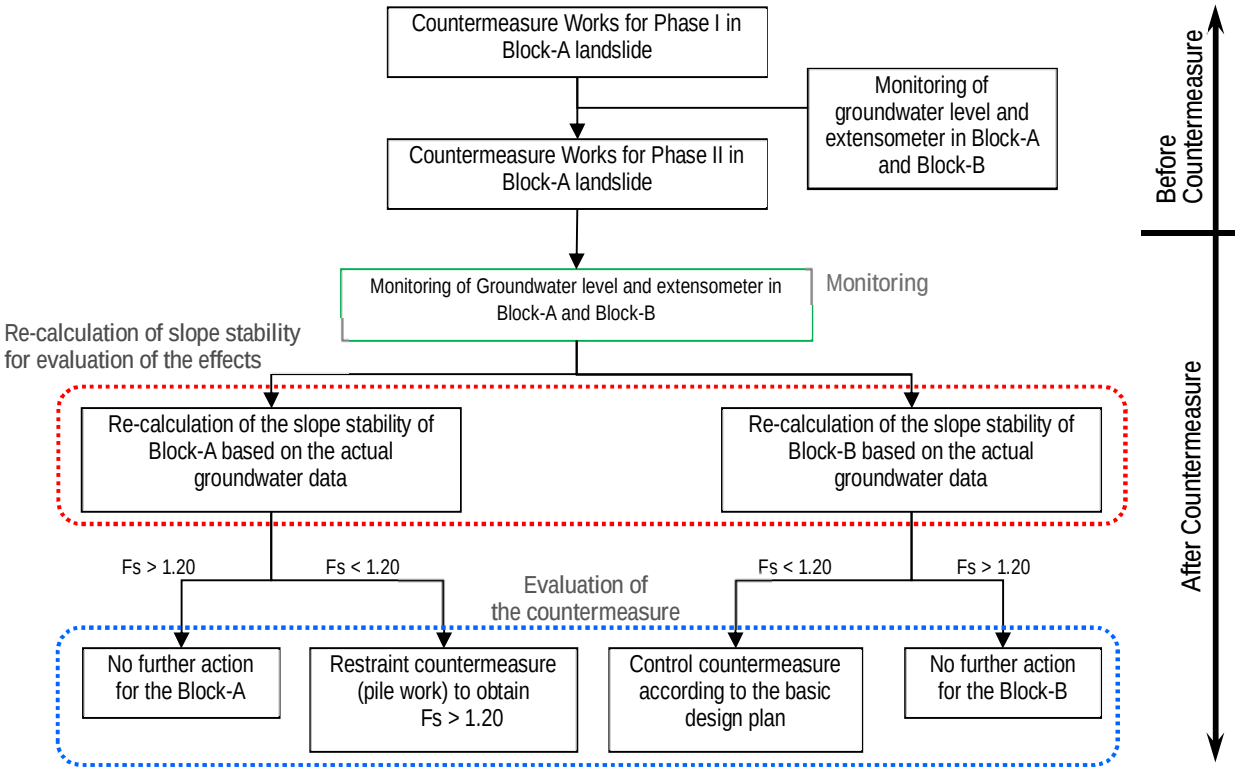


Figure 1 Flow chart for re-calculation of slope stability for the evaluation of the effects of landslide countermeasure works in Chitrakoot Area (Source: JET)

After completion of the works of Phase II, groundwater level and landslide activity shall be confirmed by monitoring. Regarding the stability analysis to check the factor of safety of the landslide after completion of the countermeasure works, the landslide analysis model used during the design stage shall be used. The parameters for the analysis, such as cohesion, internal friction angle or unit weight, shall not be changed except for groundwater level, which will be re-established as the highest level measured during the rainy season.

2. Monitoring of groundwater level and extensometer

After completion of the works of Phase II, groundwater level and landslide activity shall be confirmed by monitoring. MPI/LMU has to monitor groundwater level in wet season after the countermeasure completion, 2018-2020, and get the highest groundwater level of the monitoring period for each year.

Water level meter: [Block-A] BPP 16, BPP 11, W-2, BPP 8, [Block-B] B-P1, B-P2, BPX-2

Extensometer: [Block-A] E(5), E-C1, [Block-B] E(1), E(2)

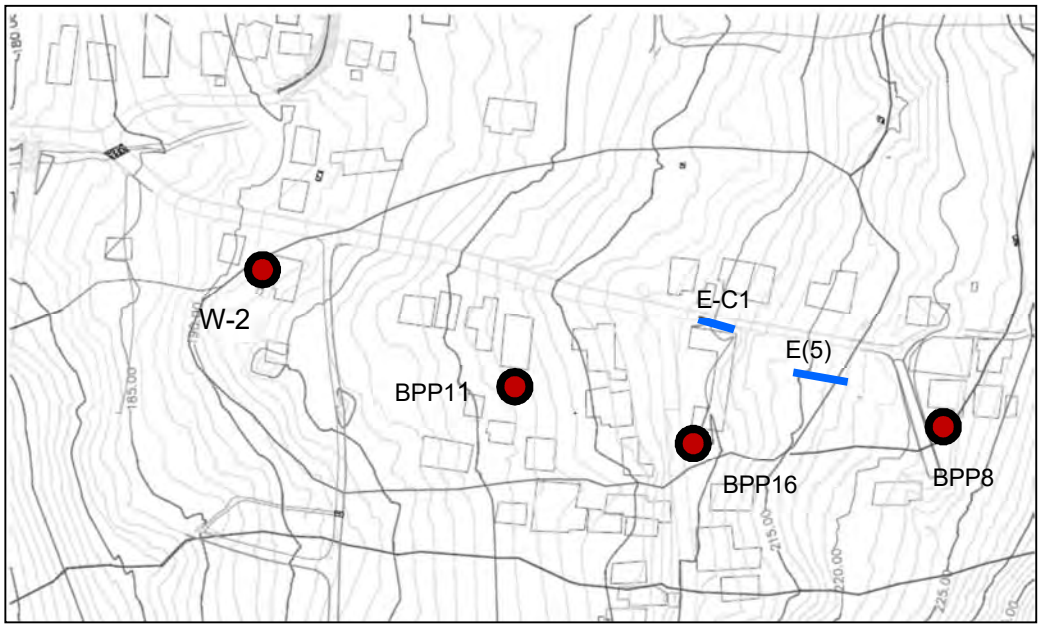


Figure 2 Location of monitoring for Block-A landslide (Source: JET)

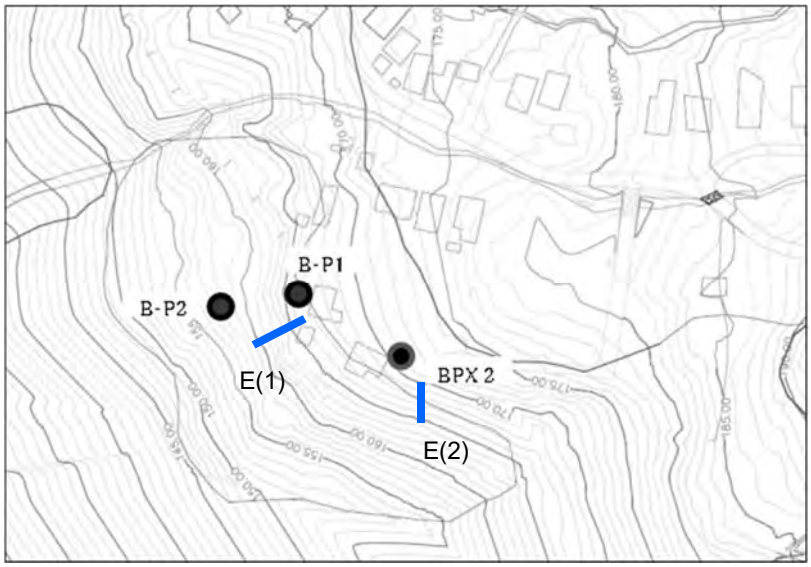


Figure 3 Location of monitoring for Block-B landslide (Source: JET)

3. Evaluation of the landslide countermeasure

The stability analysis must be carried out using the highest water level after the countermeasure, and the effect of the countermeasure is evaluated based on the result of stability analysis.

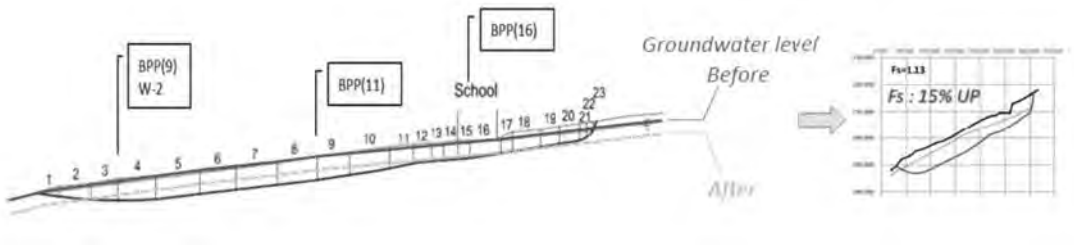


Figure 3 Concept of the evaluation of the countermeasure based on the stability analysis (Source: JET)

Fs after the countermeasure is evaluated as follows,

Table 1 Evaluation of Fs after the landslide countermeasure work

Fs, after countermeasure	Necessary measure, additional countermeasure
$Fs_1 < 1.05$	The additional countermeasure should be carried out.
$1.05 < Fs_1 < 1.20$	The additional countermeasure should be planned. (If the landslide is active again, the additional countermeasure can be installed quickly.)
$1.20 < Fs_1$	The additional countermeasure is not necessary.

4. Work schedules for evaluation of the landslide countermeasure in Chitrakoot

No.	Work Item	Work period	Remarks
1	Completion of the countermeasure work	6 Jul 2017 - 31 Jun 2018	
2	Monitoring of groundwater level and extensometer	1 Feb 2018 - 31 May 2018	
3	Evaluation of the landslide countermeasure using stability analysis	1 Jun 2018 - 31 Jul 2018	1st Evaluation
4	Monitoring of groundwater level and extensometer	1 Jun 2018 - 31 May 2019	
5	Evaluation of the landslide countermeasure using stability analysis	1 Jun 2019 - 31 Jul 2019	2nd Evaluation
6	Monitoring of groundwater level and extensometer	1 Jun 2019 - 31 May 2020	
7	Evaluation of the landslide countermeasure using stability analysis	1 Jun 2020 - 31 Jul 2020	3rd Evaluation (Completion of Evaluations)

JICA Expert Team
Civil Engineering Section,
Ministry of Public Infrastructure
and Land Transport,
Phoenix.

13 December 2017

Mr. T. Parbhunath
Director
Civil Engineering Section
Ministry of Public Infrastructure and Land Transport
Phoenix

cc: The Senior Chief Executive (MPI)
Mr. D.Chinasamy (Lead Engineer)

Dear Sir

Subject: Evaluation of Landslide Countermeasures - Chitrakoot

As you are aware, following the completion of Chitrakoot - Phase II Project, there would be a need to evaluate the effectiveness of the countermeasure works.

For that matter, continuous monitoring of groundwater level and ground movement would be necessary. The proposed work plan for the evaluation of the landslide countermeasure works in Chitrakoot shall be as follows:

No.	Work Item	Work period	Remarks
1	Completion of the countermeasure work	6 Jul 2017 - 31 Jan 2018	Expected
2	Monitoring of groundwater level and extensometer	1 Feb 2018 - 31 May 2018	
3	Evaluation of the landslide countermeasure using stability analysis	1 Jun 2018 - 31 Jul 2018	1st Evaluation
4	Monitoring of groundwater level and extensometer	1 Jun 2018 - 31 May 2019	
5	Evaluation of the landslide countermeasure using stability analysis	1 Jun 2019 - 31 Jul 2019	2nd Evaluation
6	Monitoring of groundwater level and extensometer	1 Jun 2019 - 31 May 2020	
7	Evaluation of the landslide countermeasure using stability analysis	1 Jun 2020 - 31 Jul 2020	3rd Evaluation (Completion of Evaluations)

We therefore seek the contribution of the Ministry of Public Infrastructure and Land Transport in this endeavour. Grateful if you could kindly communicate your support by 14 December 2017 for onward transmission to JICA Headquarters. The short notice is deeply regretted.

We seize this opportunity to convey our sincere appreciation to you and the officers of the Landslide Management Unit.

Best regards,

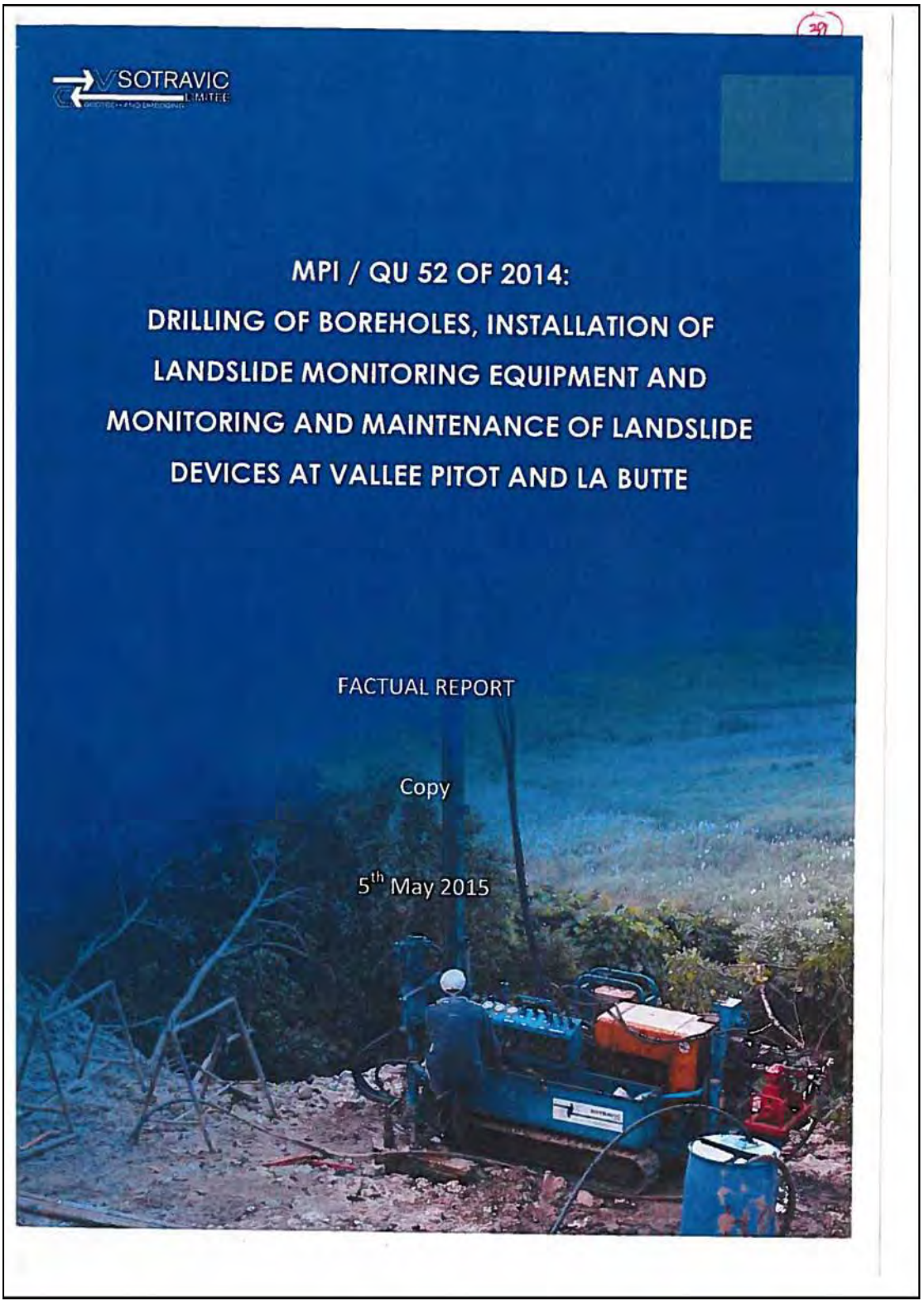
Dr. T.Iwasaki
JICA Expert Team
Email: tomoharu_iwasaki@kk-grp.jp

Appendix 3.1.14

Landslide investigation by MPI in Vallee Pitot

Landslide investigation by MPI in Vallee Pitot

Using a manual, a landslide investigation was carried out by MPI in Vallee Pitot.



SOTRAVIC 25 years

FACTUAL REPORT

DRILLING OF BOREHOLES, INSTALLATION OF LANDSLIDE MONITORING EQUIPMENT AND MONITORING AND MAINTENANCE OF LANDSLIDE DEVICES AT VALLEE PITOT AND LA BUTTE

(Procurement Reference No MPI/Qu 52 of 2014)

Prepared for:
MINISTRY OF PUBLIC INFRASTRUCTURE, NDU,
LAND TRANSPORT AND SHIPPING (P.I. DIVISION)
MAURITIUS

Prepared by:

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On Behalf of
SOTRAVIC LTEE
Industrial Zone, La Tour Koenig, Mauritius
Tel: (230) 405 7800, Fax : (230) 405 7801,
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Submitted on
May 4, 2015

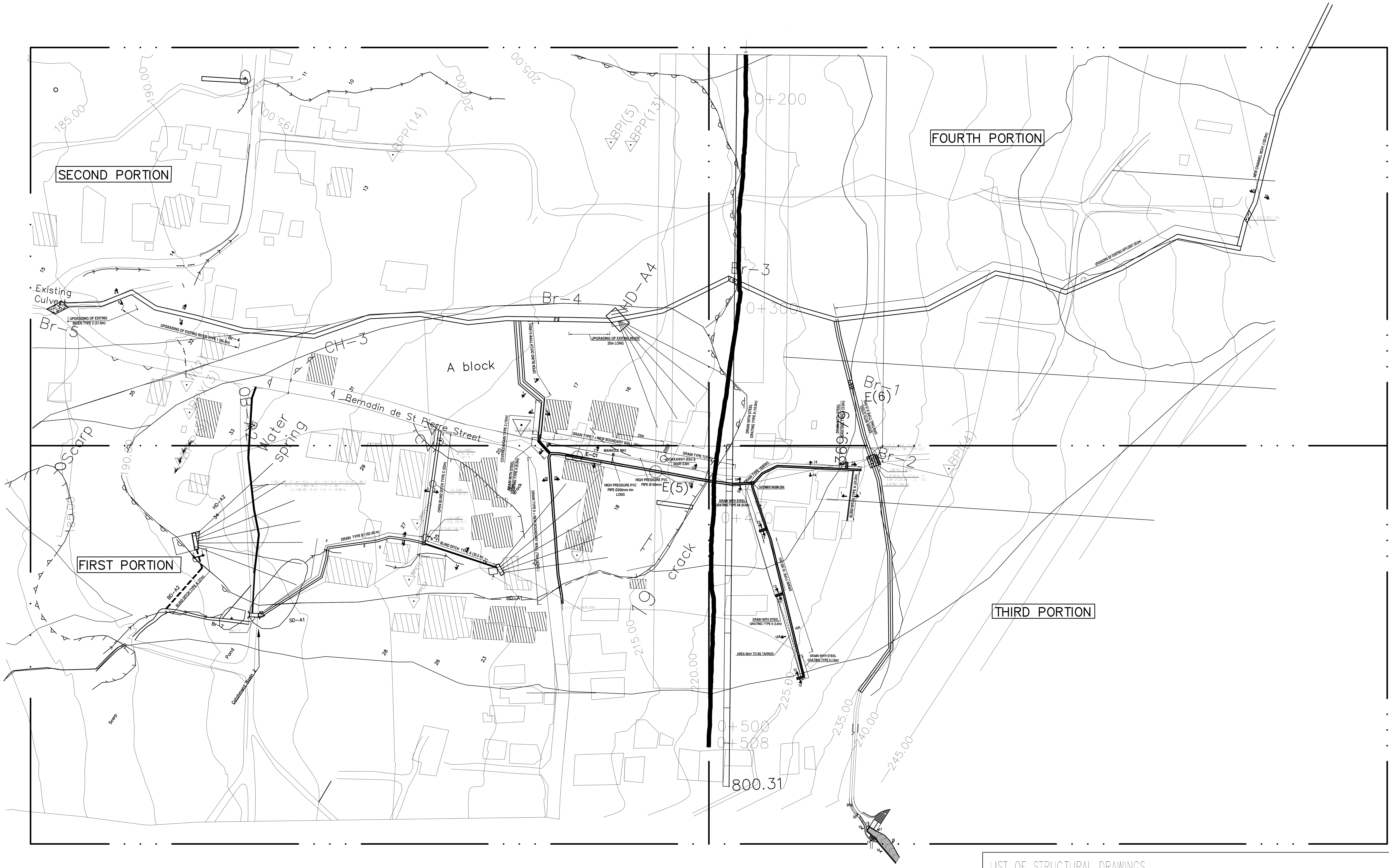
Revision No.	Issued date	Issued by	Descriptions	Prepared by	Reviewed & Approved by
0	May 4, 2015	GC	Drilling of Boreholes, Installation of Landslide Monitoring Equipment and Monitoring and Maintenance of Landslide Devices at Vallee Pitot and La Butte	GK	CA

Table of Contents

LIST OF TABLES

Appendix 3.1.15

D/D of the countermeasure for Chitrakoot



NOTES

1. Read this drawing with all Architect's and Engineer's relevant details.
2. No deviation from the details shown on this drawing is allowed without prior permission in writing.
3. If any discrepancy between this drawing and any contract document 's discovered – Please ask.
4. Contractor is to verify all site dimensions.
5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project:

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title:

KEY PLAN OF THE FOUR PORTIONS

DIRECTOR (C.E)	M.R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER / ENGINEER	S.P. ANADACHEE
PRINCIPAL TECHNICAL DESIGN OFFICER	V. THOMSON
SENIOR TECHNICAL DESIGN OFFICER	J.P.E, N.T.
TECHNICAL DESIGN OFFICER	A. DOOKHY
SCALE: 1:1000	DATE :JAN 2015 PRINT : 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

COMP. NO. S

REVISION

DWG. No. G433/ST16

LIST OF STRUCTURAL DRAWINGS

Bernadin de St Pierre Street

3 NOS. OF ø200mm P.V.C. HIGH PRESSURE PERFORATED PIPES FROM THE BLIND DITCH TYPE X WITH OUTLETS AT EXISTING DRAIN AND NEW BRIDGE.

HORIZONTAL DRAINAGE (HD2)

BLIND DITCH TYPE X (112m)

BLIND DITCH TYPE A (67m)

BD–A2

HD–A2

F DRAIN TYPE B (102.46 m)

BLIND DITCH TYPE A (35.5 m)

OPEN BLIND DITCH TYPE C (62m)

GALVANISED METAL GATE TYPE P

GALVANISED METAL GRATING

GALVANISED METAL GRATING

CATCHMENT BASIN (CB1)

GALVANISED METAL GATE TYPE R

MANHOLE MH1

23m

Ø300

SOAKAWAY /FRENCH DRAIN ø3m & depth 0.8m

HIGH PRESSURE PVC PIPE ø200mm 4m LONG

HIGH PRESSURE PVC PIPE ø160mm

GALVANISED METAL GATE TYPE R

E–C1

HORIZONTAL DRAINAGE (HD3)

HD–A1

SD–A1

Br–7

BRIDGE BR7

Old crack

Pond

Catchment Basin 2

Scarp

BP(1)

BP(2)

BP(3)

BP(4)

BP(5)

BP(6)

18

22

23

25

26

27

28

29

34

A

B

C

D

E

1

2

3

4

NOTES

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No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

LAYOUT OF DRAINS, LOCATION OF HORIZONTAL DRAINAGE AND BRIDGE
(FIRST PORTION)

DIRECTOR (C.E)	M.R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER / ENGINEER	S. ANADACHEE
PRINCIPAL TECHNICAL DESIGN OFFICER	V. THOMSON
TECHNICAL DESIGN OFFICER	A. DOOKHY
S. TECHNICAL DESIGN OFFICER	N.TOUSSAINT

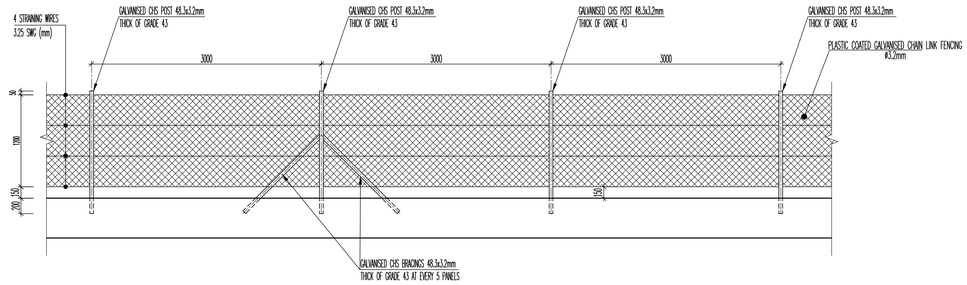
SCALE: 1:450 | DATE :JAN 2015 | PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHŒNIX

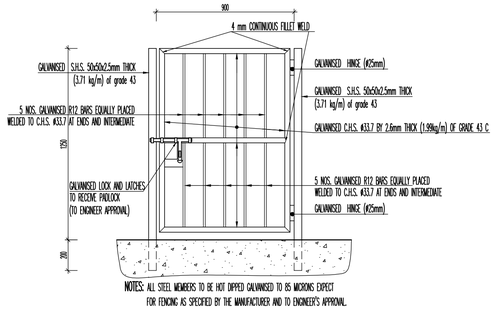
COMP. NO. S/0X/09

DWG. No. G433/ST17

REVISION

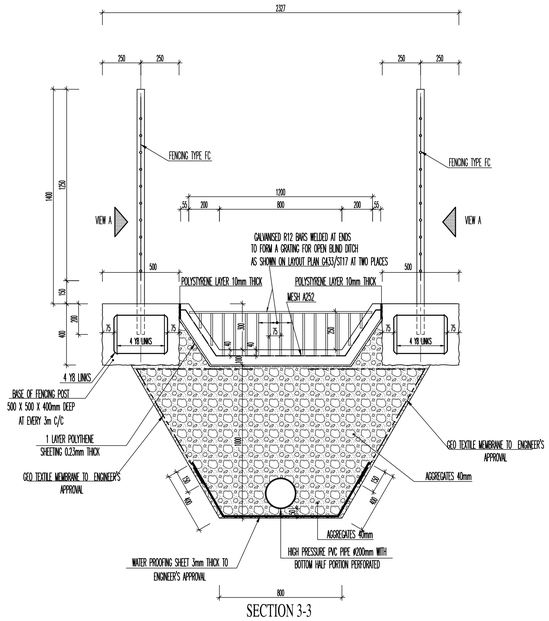


ELEVATION A OF FENCING TYPE FC

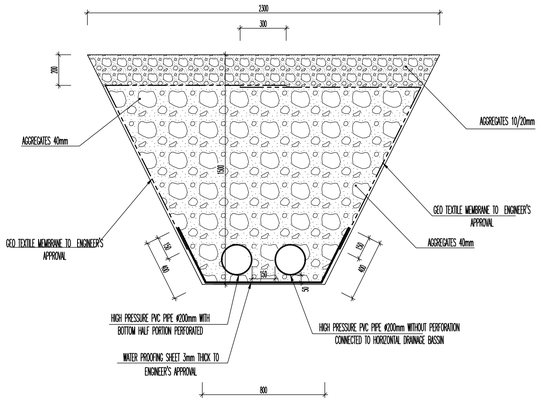


NOTES: ALL STEEL MEMBERS TO BE HOT DIPPED GALVANISED TO 85 MICRONS EXPECT FOR FENCING AS SPECIFIED BY THE MANUFACTURER AND TO ENGINEER'S APPROVAL.

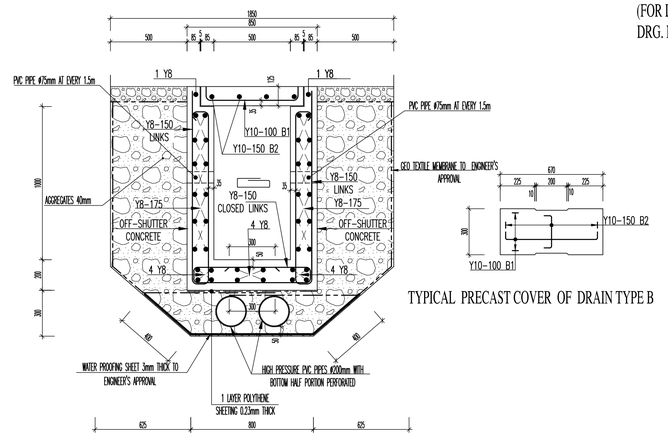
DETAILS OF GATE TYPE P
(1 No.)
(FOR LOCATION REFER TO
DRG. No. G433/ST17)



SECTION 3-3
TYPICAL CROSS SECTION OF OPEN BLIND DITCH TYPE C

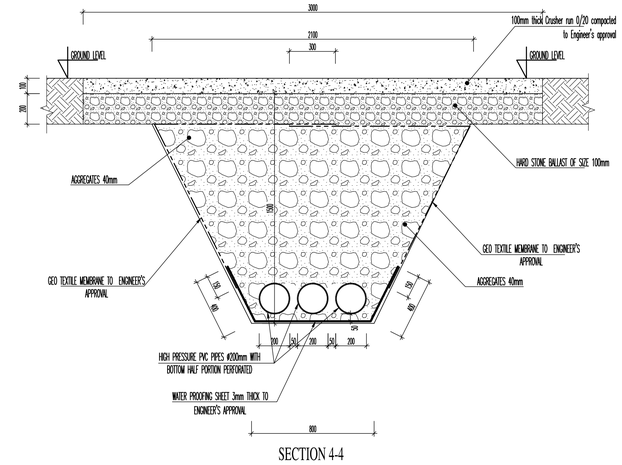


SECTION 1-1
TYPICAL CROSS SECTION OF BLIND DITCH TYPE A

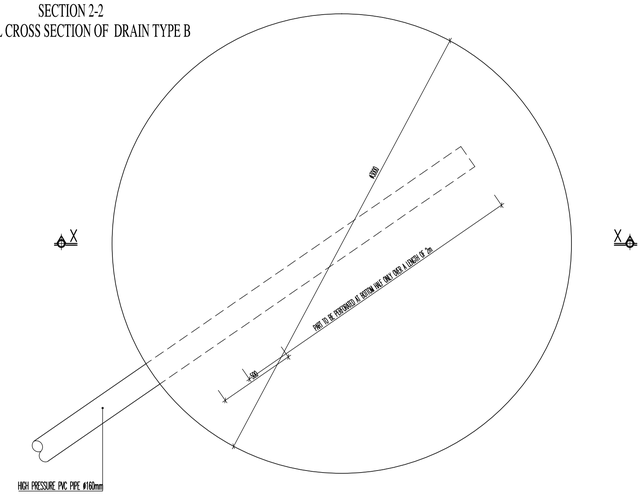


SECTION 2-2
TYPICAL CROSS SECTION OF DRAIN TYPE B

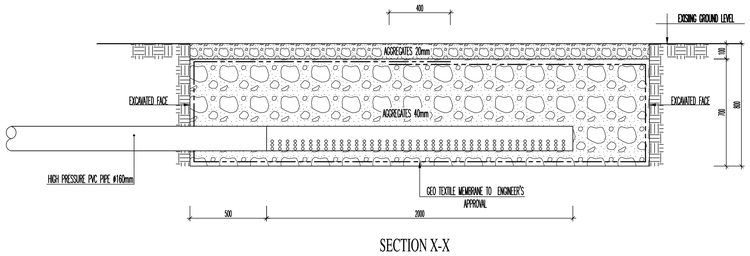
TYPICAL PRECAST COVER OF DRAIN TYPE B



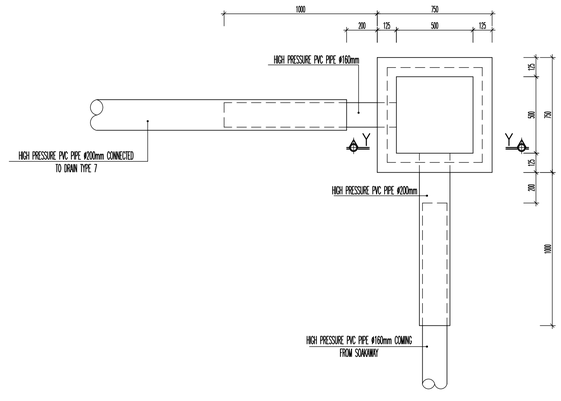
SECTION 4-4
TYPICAL CROSS SECTION OF BLIND DITCH TYPE X (112m)



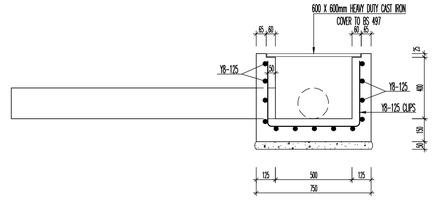
DETAILS OF SOAKAWAY / FRENCH DRAIN



SECTION X-X



DETAILS OF MANHOLE (MH 1)



SECTION Y-Y

NOTES

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No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

R.C. DETAILS OF DRAINS
AND
BLIND DITCHES
(FIRST PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
T.D.O	A. DOOKHY
S.T.D.O	N. TOUSSAINT

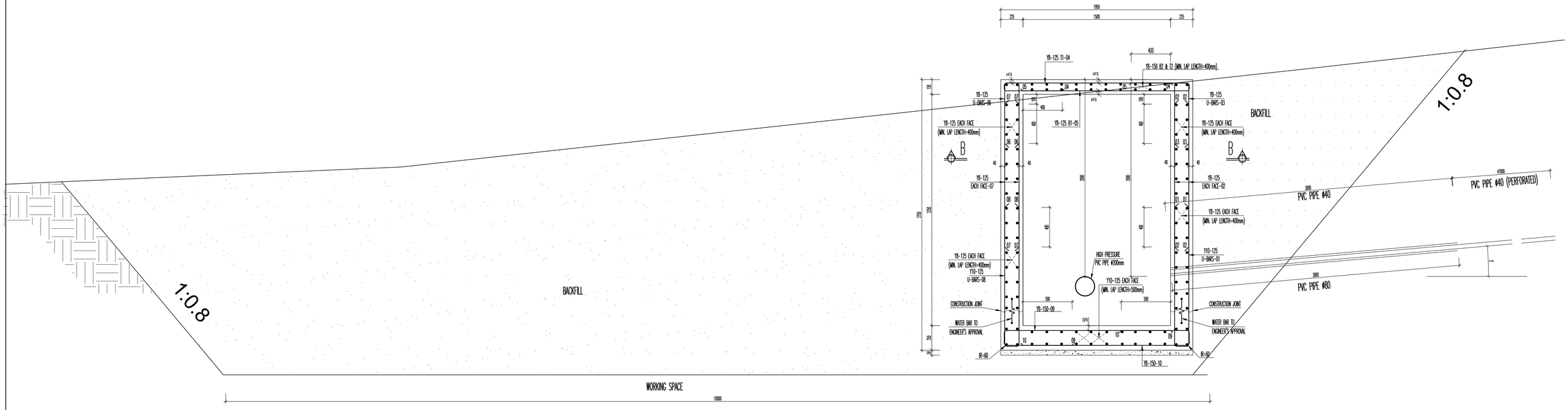
Scale: 1 : 20 | DATE: JAN 2015 | PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

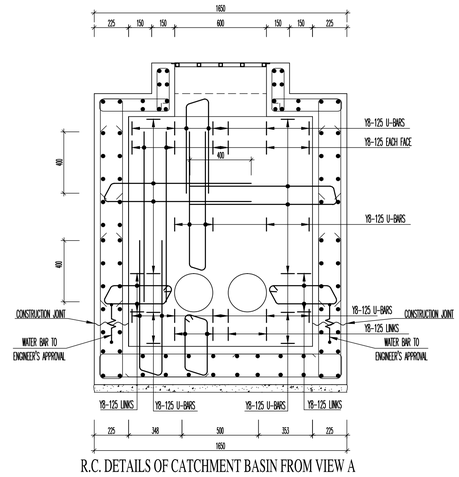
Comp. No. S

Revision

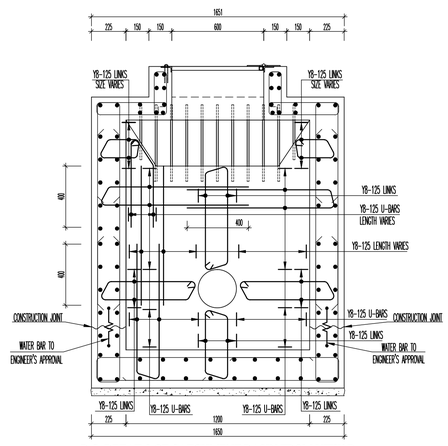
DRG. No. G433/ST18



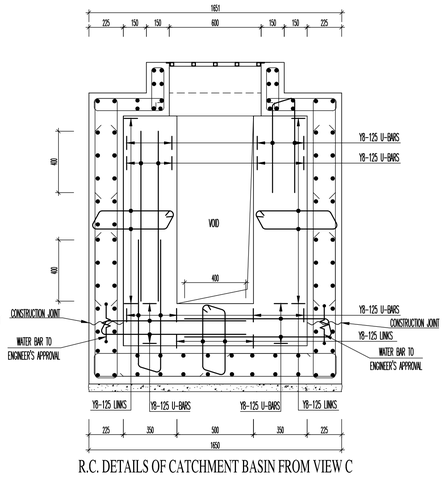
SECTION A-A (REFER TO DRAWING NO. G433/ST21 AND ST 22)



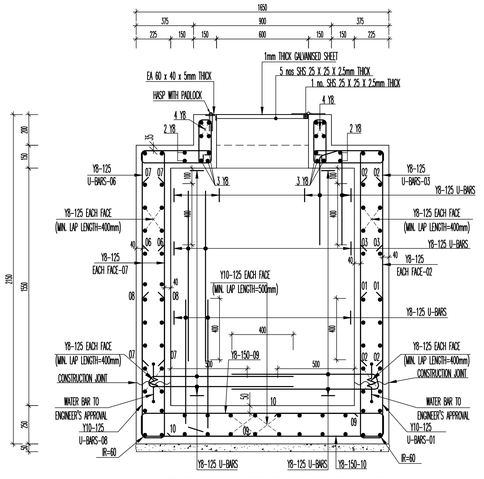
R.C. DETAILS OF CATCHMENT BASIN FROM VIEW A



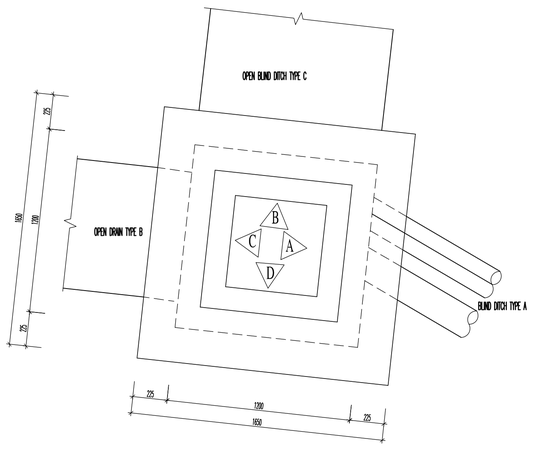
R.C. DETAILS OF CATCHMENT BASIN FROM VIEW B



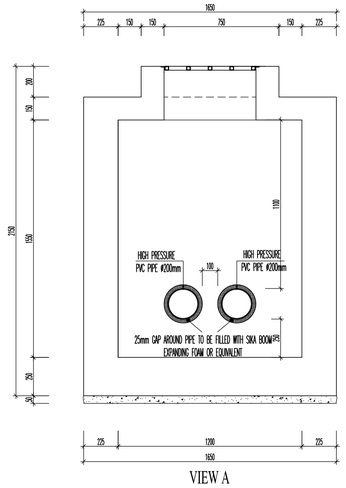
R.C. DETAILS OF CATCHMENT BASIN FROM VIEW C



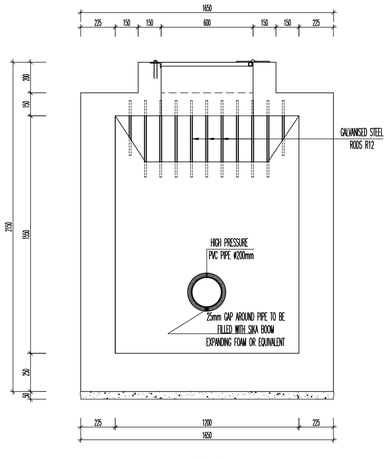
R.C. DETAILS OF CATCHMENT BASIN FROM VIEW D



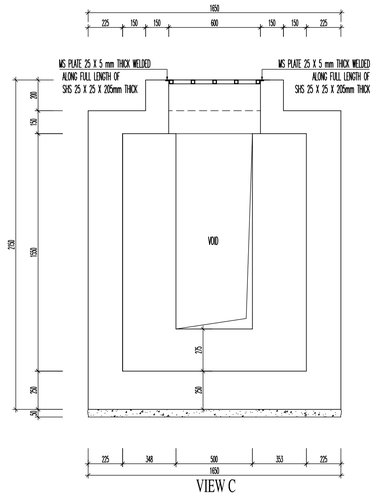
PLAN VIEW OF CATCHMENT BASIN (CB1)



VIEW A



VIEW B



VIEW C

	NOTES
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No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

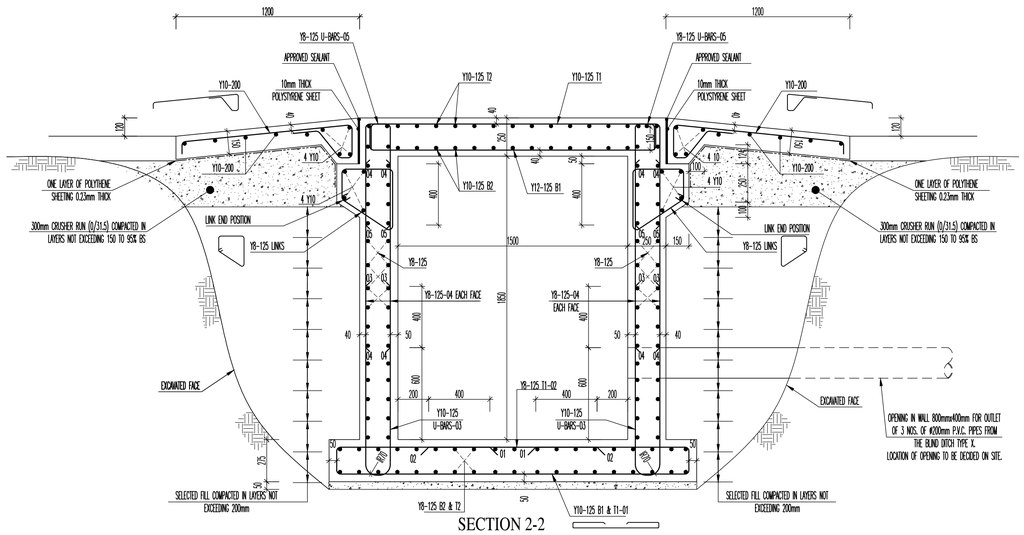
CATCHMENT BASIN (CB1)

(FIRST PORTION)

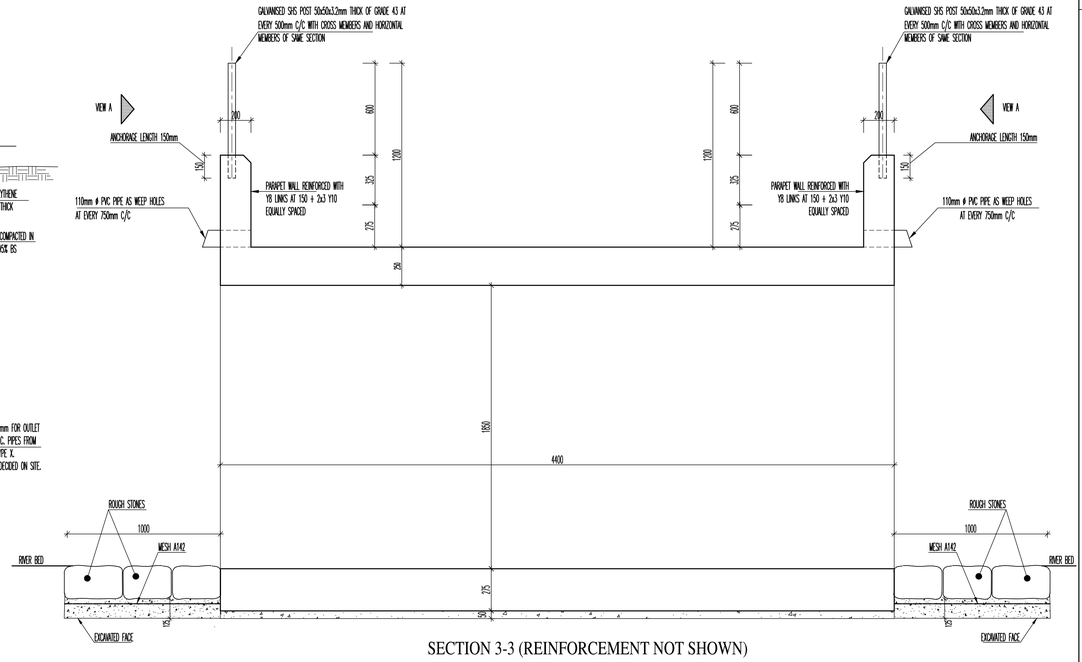
DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.I.D.O	V. THOMSON
T.D.O	A. DOOKHY
S.I.D.O	N.T.
Scale: 1 : 20	DATE: JAN 2015 — PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX — Comp. No. S

DRG. No. G433/ST19 — Revision



SECTION 2-2



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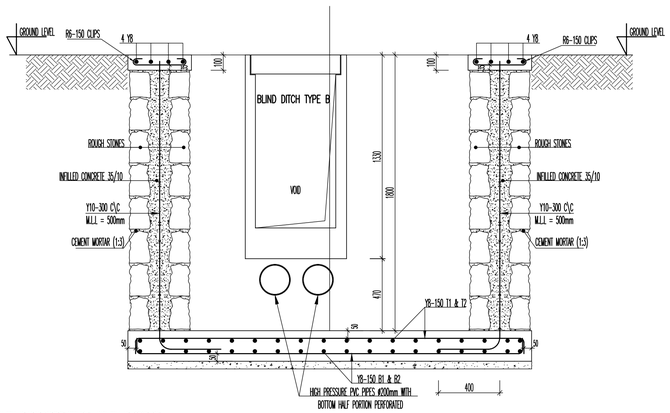

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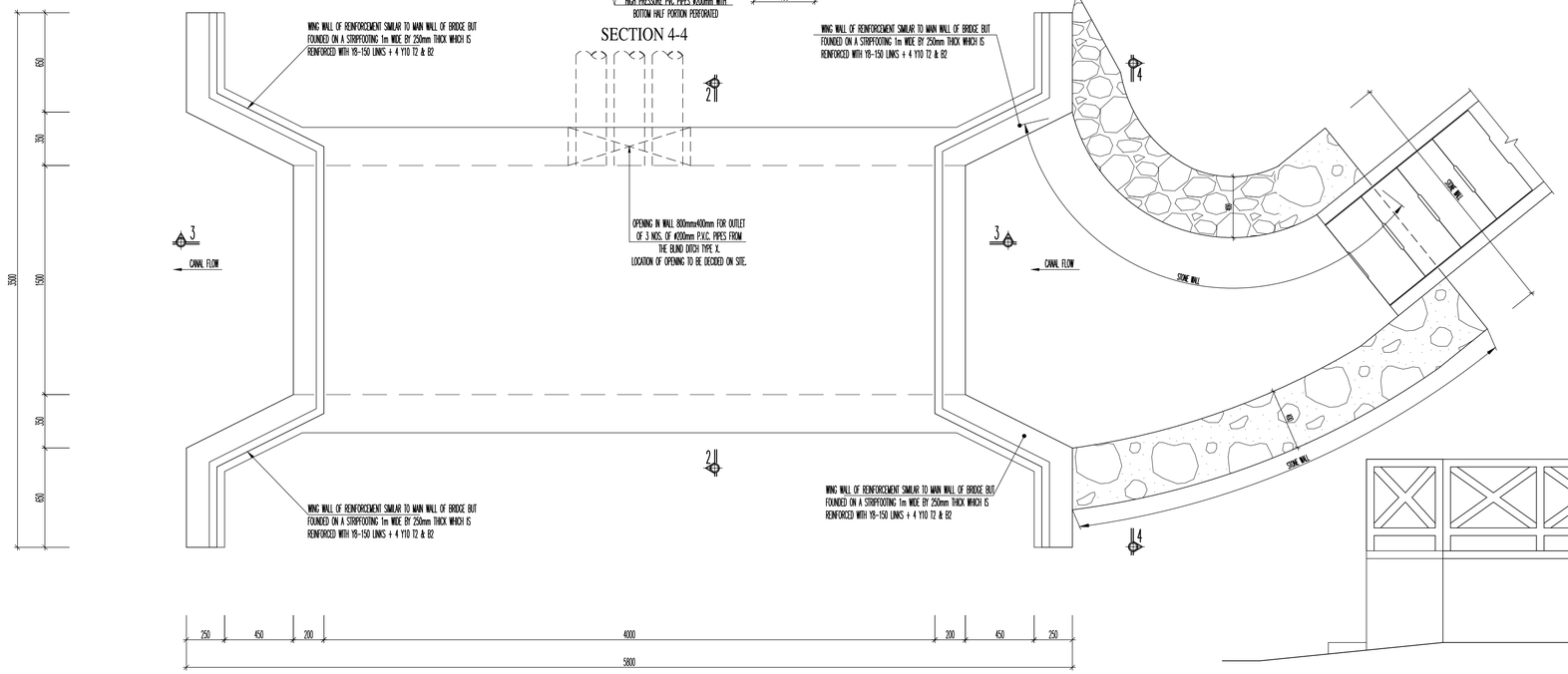
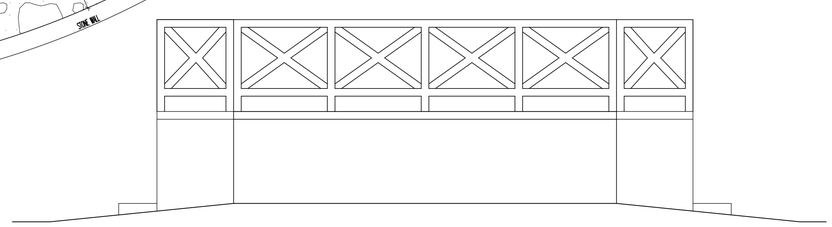


PLAN VIEW OF BRIDGE (BR7) AND STRUCTURE FOR CHANNELLING STORM WATER



VIEW A

NOTES

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5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

R.C. DETAILS OF VEHICULAR BRIDGE BR7

(FIRST PORTION)

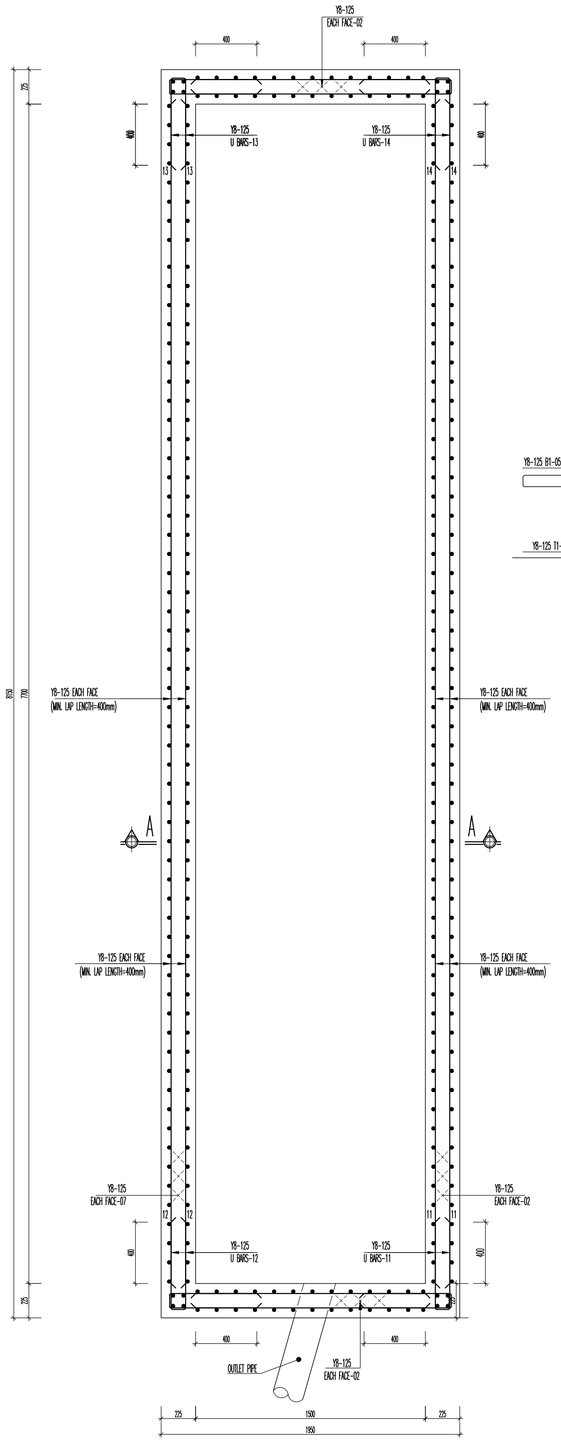
DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.I.D.O	V. THOMSON
T.D.O	A. DOOKHY
S.T.D.O	N.T.
Scale: 1 : 20	DATE: JAN 2015 — PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

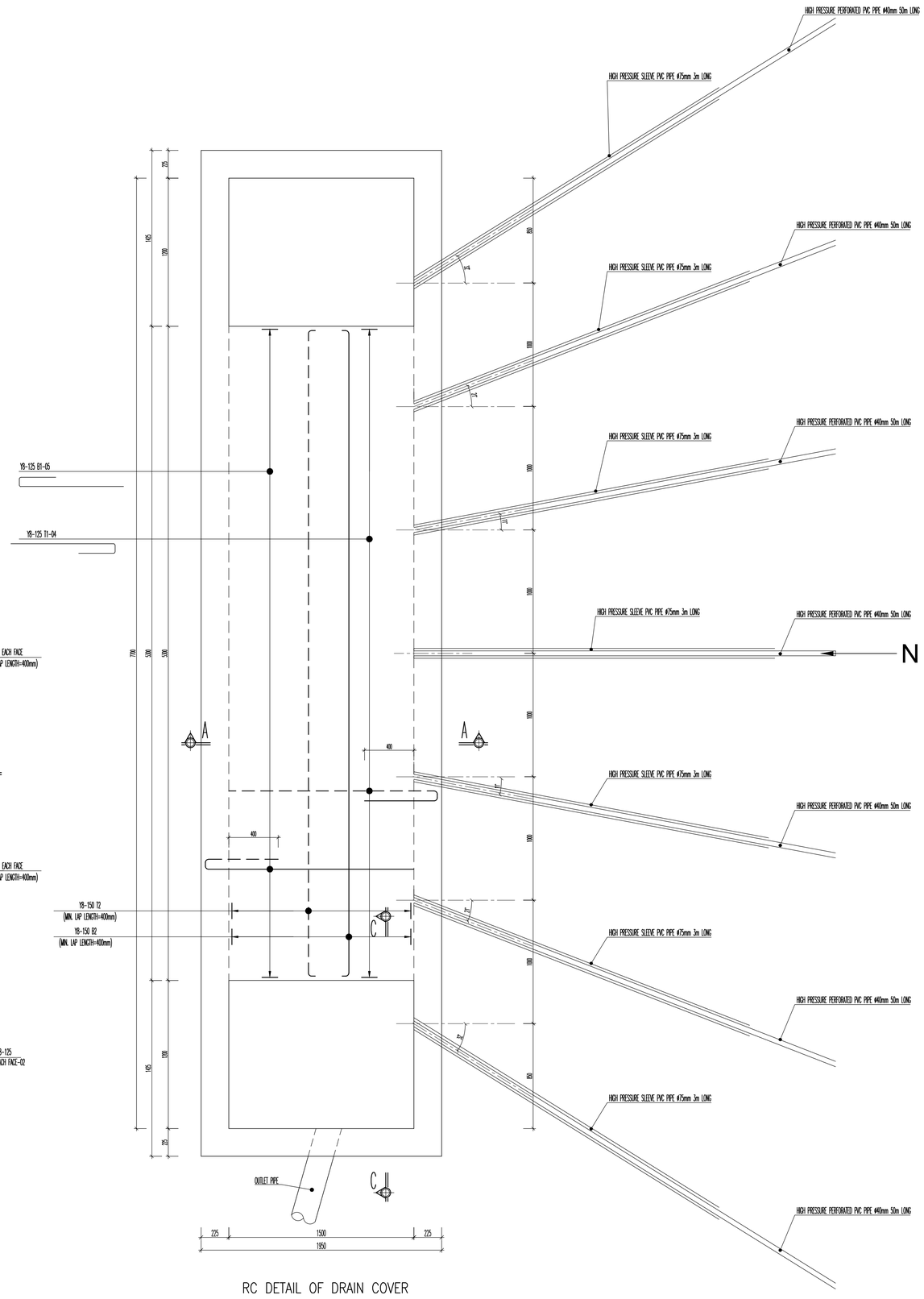
Comp. No. S

Revision

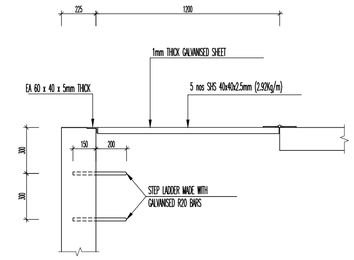
DRG. No. G433/ST20



SECTION B–B



RC DETAIL OF DRAIN COVER



SECTION C–C

FOR SECTION A–A REFER TO DRAWING No. G433/ST19

NOTES

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No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

R.C DETAILS OF HORIZONTAL DRAINAGE HD2

(FIRST PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
T.D.O	A. DOOKHY, N.T.

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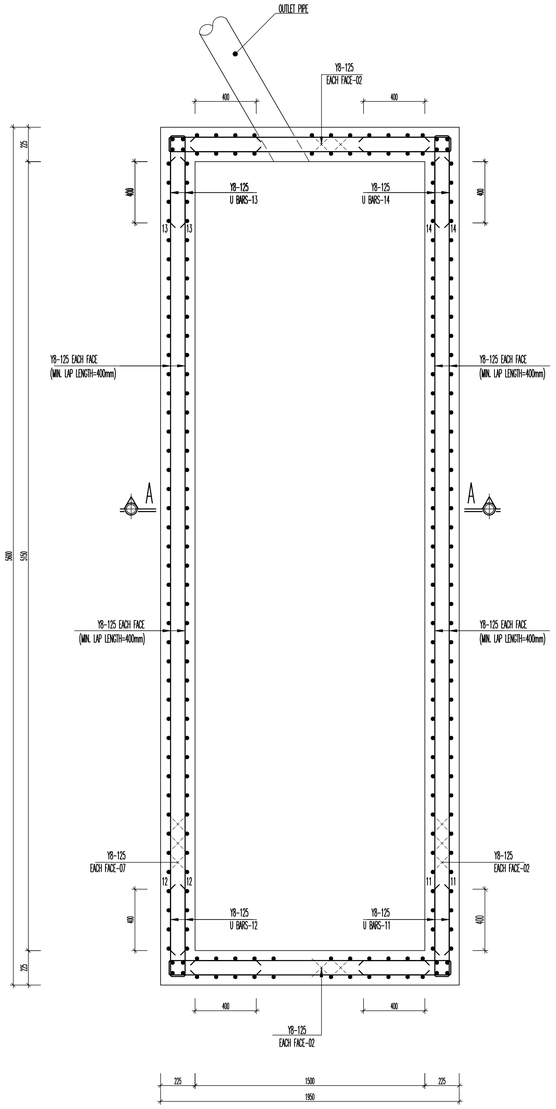
MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

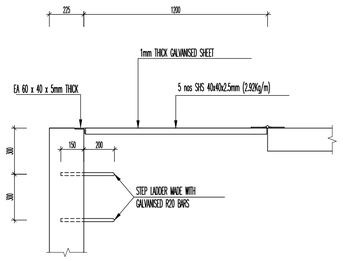
Comp. No. S

Revision

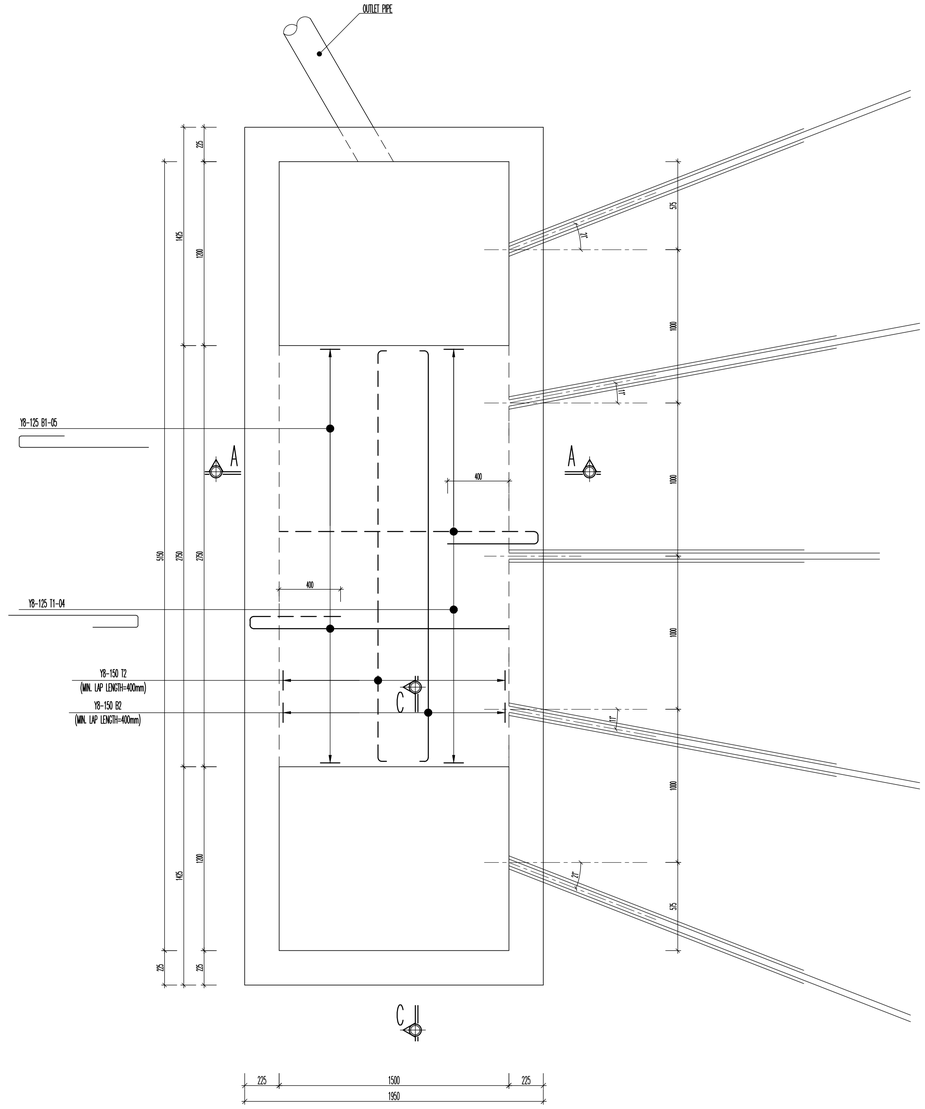
DRG. No. G433/ST21



SECTION B–B



SECTION C–C



R.C. DETAIL OF DRAIN COVER

FOR SECTION A–A REFER TO DRAWING No. G433/ST19

NOTES

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5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

R.C. DETAILS OF HORIZONTAL DRAINAGE HD3

(FIRST PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
T.D.O	A. DOOKHY, N.T.

Scale: 1 : 20	DATE: JAN 2015	PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX	Comp. No. S
DRG. No. G433/ST22	Revision

NOTES

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2. No deviation from the details shown on this drawing is allowed without prior permission in writing.
3. If any discrepancy between this drawing and any contract document is discovered – Please ask.
4. Contractor is to verify all site dimensions.
5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

LAYOUT OF DRAINS, LOCATION OF HORIZONTAL DRAINAGE AND BRIDGE
(SECOND PORTION)

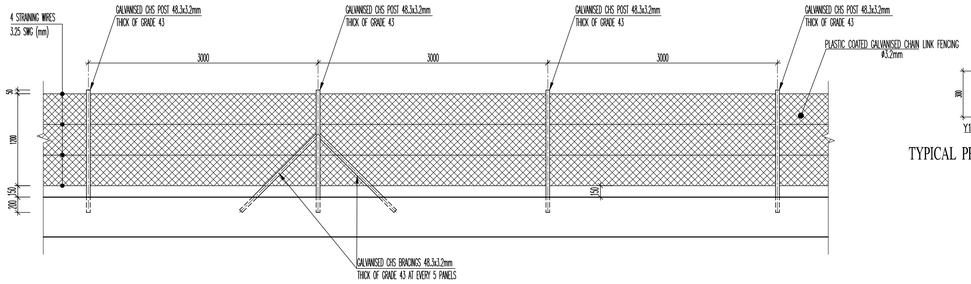
DIRECTOR (C.E)	M.R. JEWON
HEAD ENGINEER	N. CHINASAMY
SENIOR ENGINEER / ENGINEER	S. ANADACHEE
PROJECT TECHNICAL ASSISTANT	V. THOMSON
TECHNICAL DESIGN OFFICER	A. JOOKHY, N.T.
SCALE: 1 : 450	DATE JAN 2015 PRINT : 13.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

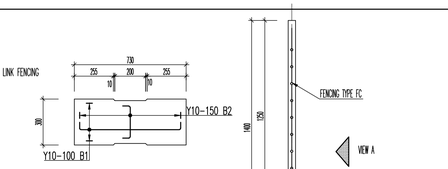
CODE NO. S

DWG. No. G433/ST23

REVISION

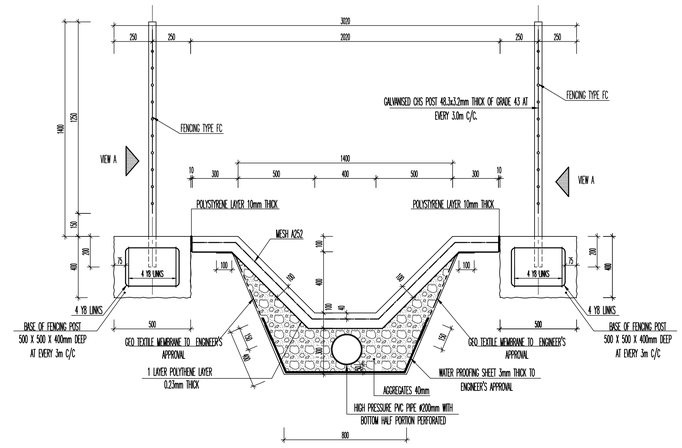


ELEVATION A OF FENCING TYPE FC

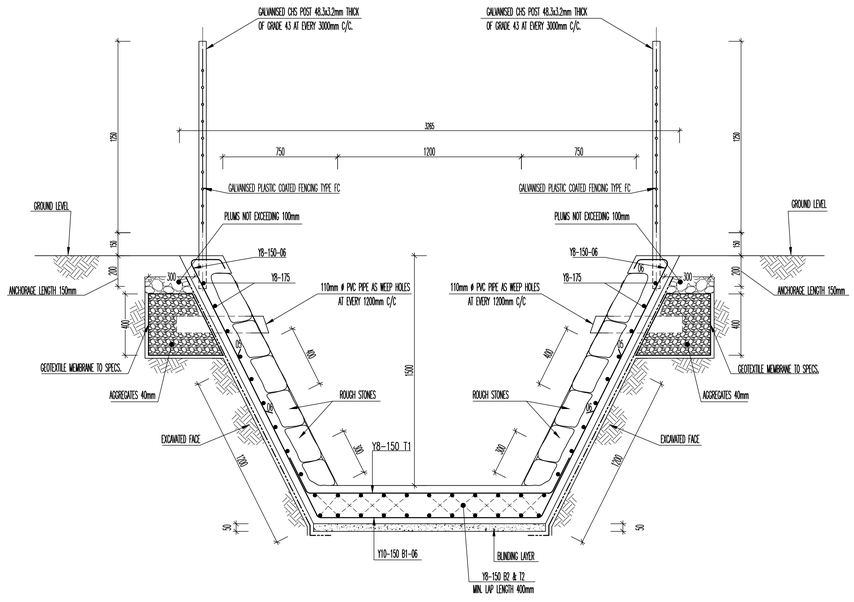


TYPICAL PRECAST COVER OF DRAIN TYPE 3 A

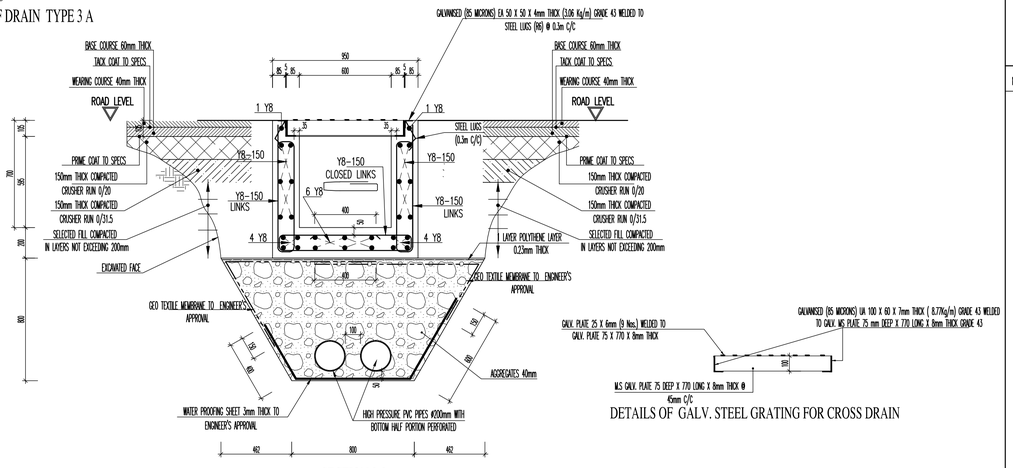
SECTION 8-8
TYPICAL CROSS SECTION OF DRAIN TYPE 3 A



SECTION 7-7
TYPICAL CROSS SECTION OF OPEN BLIND DITCH TYPE 5

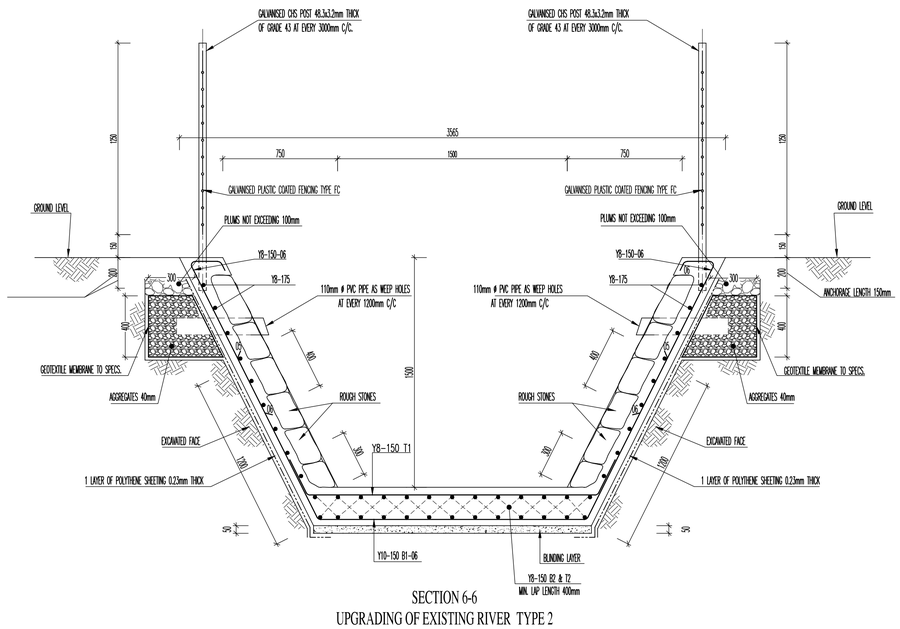


SECTION 5-5
UPGRADING OF EXISTING RIVER TYPE 1

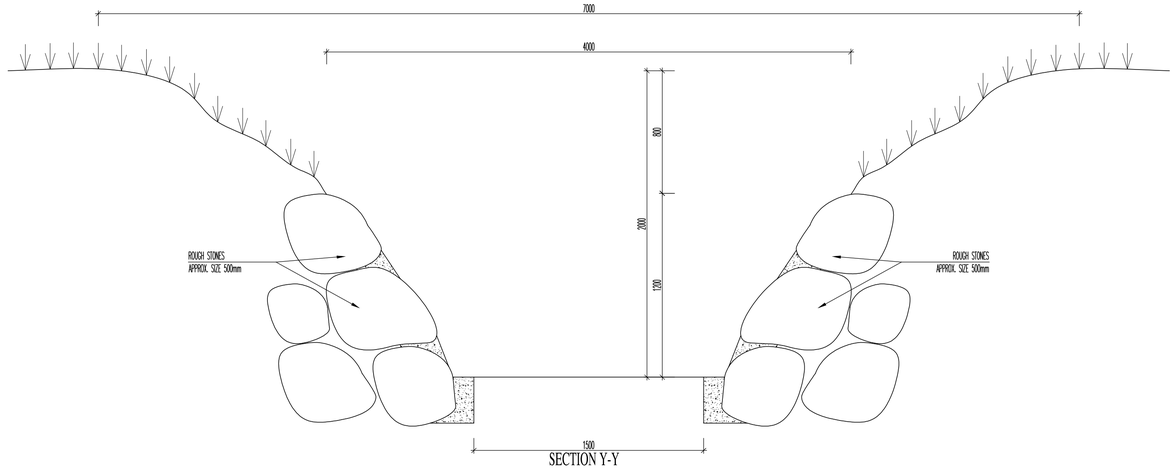


SECTION 9-9
TYPICAL CROSS SECTION OF DRAIN TYPE 4

DETAILS OF GALV. STEEL GRATING FOR CROSS DRAIN



SECTION 6-6
UPGRADING OF EXISTING RIVER TYPE 2



SECTION Y-Y
UPGRADING OF EXISTING AFFLUENT (20m)

NOTES

1. Read this drawing with all Architect's and Engineer's relevant details.
2. No deviation from the details shown on this drawing is allowed without prior permission in writing.
3. If any discrepancy between this drawing and any contract document is discovered – Please ask.
4. Contractor is to verify all site dimensions.
5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

R.C. DETAILS OF DRAINS AND UPGRADING OF EXISTING RIVER (SECOND PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
T.D.O	A. DOOKHY, N.T.

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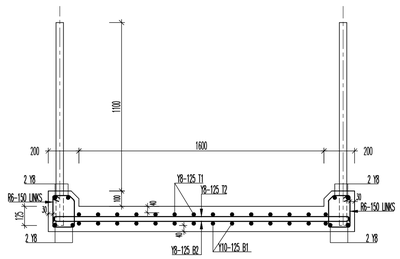
MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX

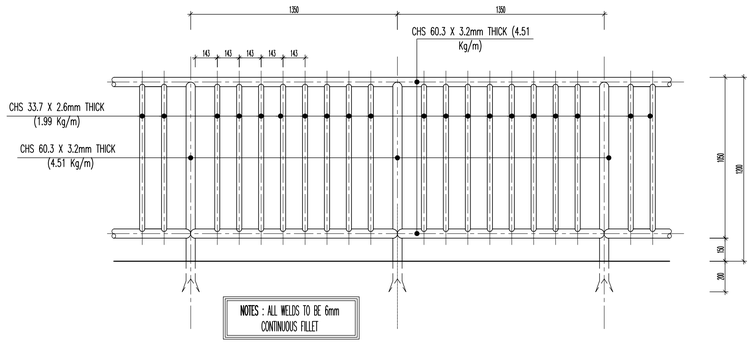
Comp. No. S

DRG. No. G433/ST24

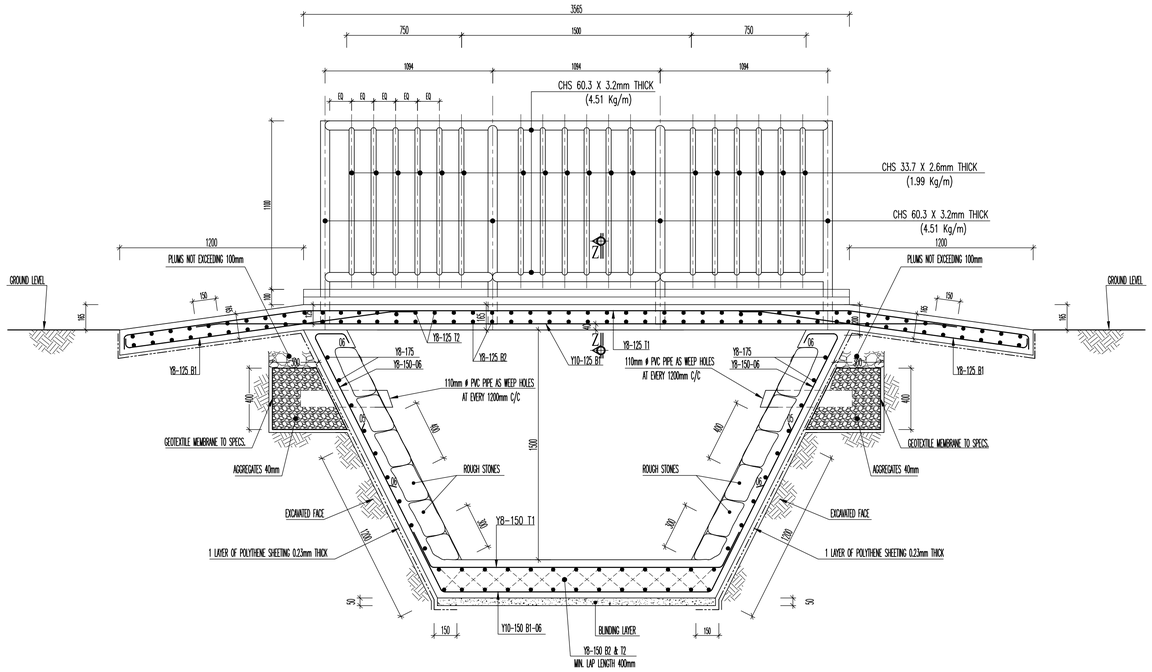
Revision



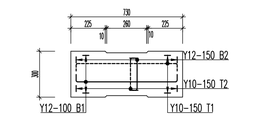
SECTION Z-Z



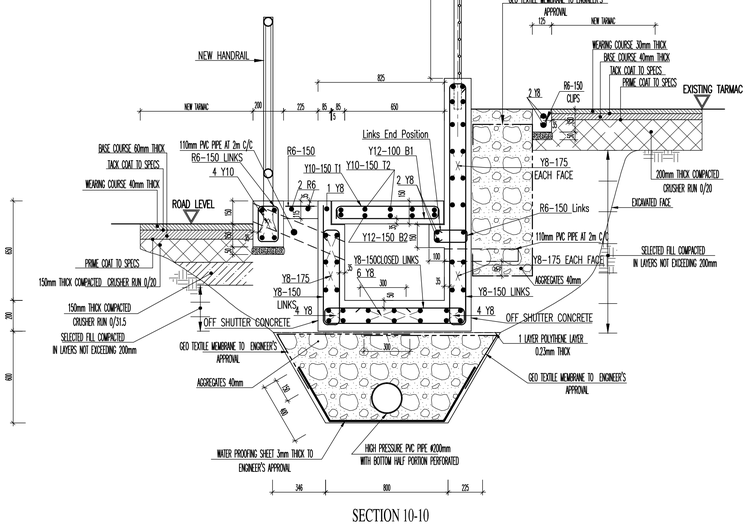
TYPICAL ELEVATION OF HANDRAIL



DETAILS OF PEDESTRIAN BRIDGE (PB1) OVER RIVER TYPE 2 (1 No.)



TYPICAL PRECAST COVER OF DRAIN TYPE 3 & 6



SECTION 10-10
THROUGH DRAIN TYPE 6 AND BOUNDARY WALL (70m LONG)
(EXISTING BLOCKWALL INCLUDING ITS FOUNDATION TO BE DEMOLISHED AND CART AWAY).

NOTES

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5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

R.C. DETAILS OF DRAINS AND BOUNDARY WALL

(SECOND PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
T.D.O	A. DOOKHY, N.T.

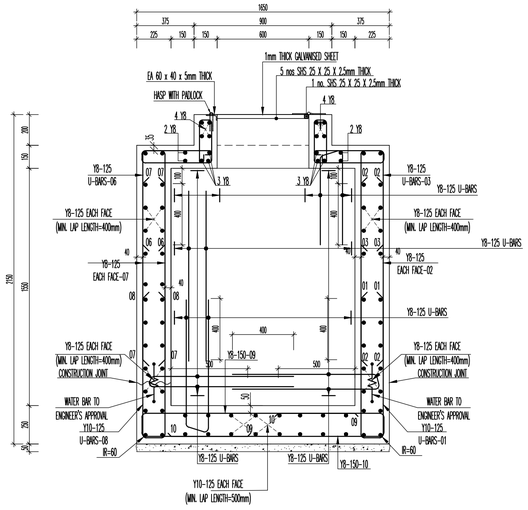
Scale: 1 : 20 | DATE: JAN 2015 | PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

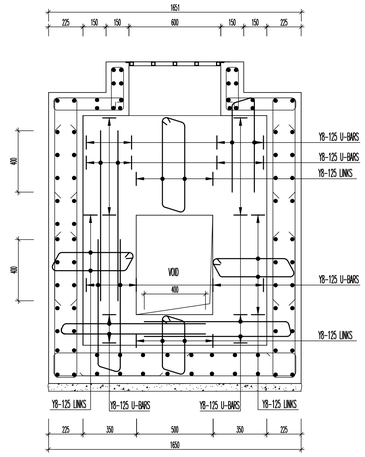
Comp. No. S

Revision

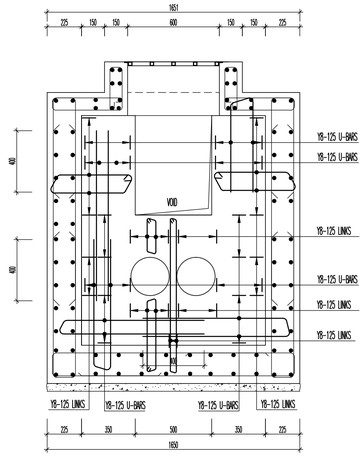
DRG. No. G433/ST25



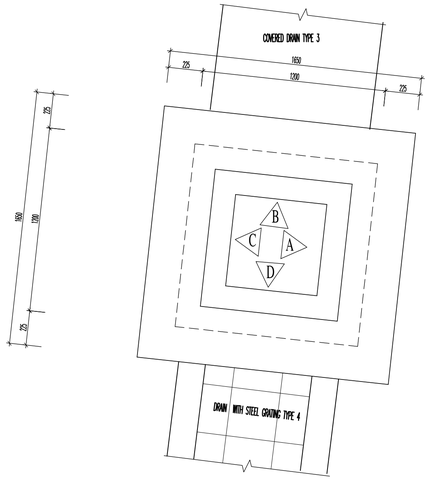
R.C DETAILS OF VIEW A & C



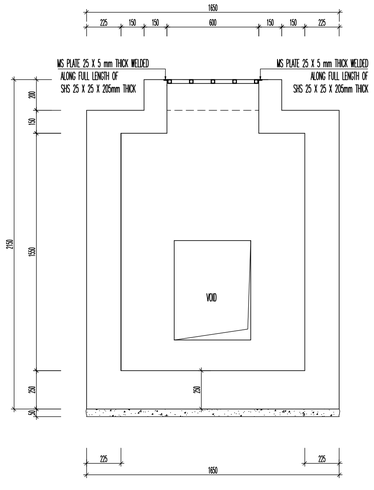
R.C DETAILS OF VIEW B



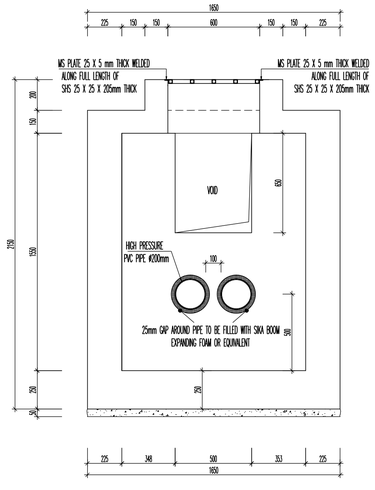
R.C DETAILS OF VIEW D



PLAN VIEW OF CATCHMENT BASSIN (CB2)



VIEW B



VIEW D

NOTES

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No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

CATCHMENT BASSIN (CB2)

(SECOND PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
T.D.O	A. DOOKHY, N.T.
Scale: 1 : 20	DATE: JAN 2015

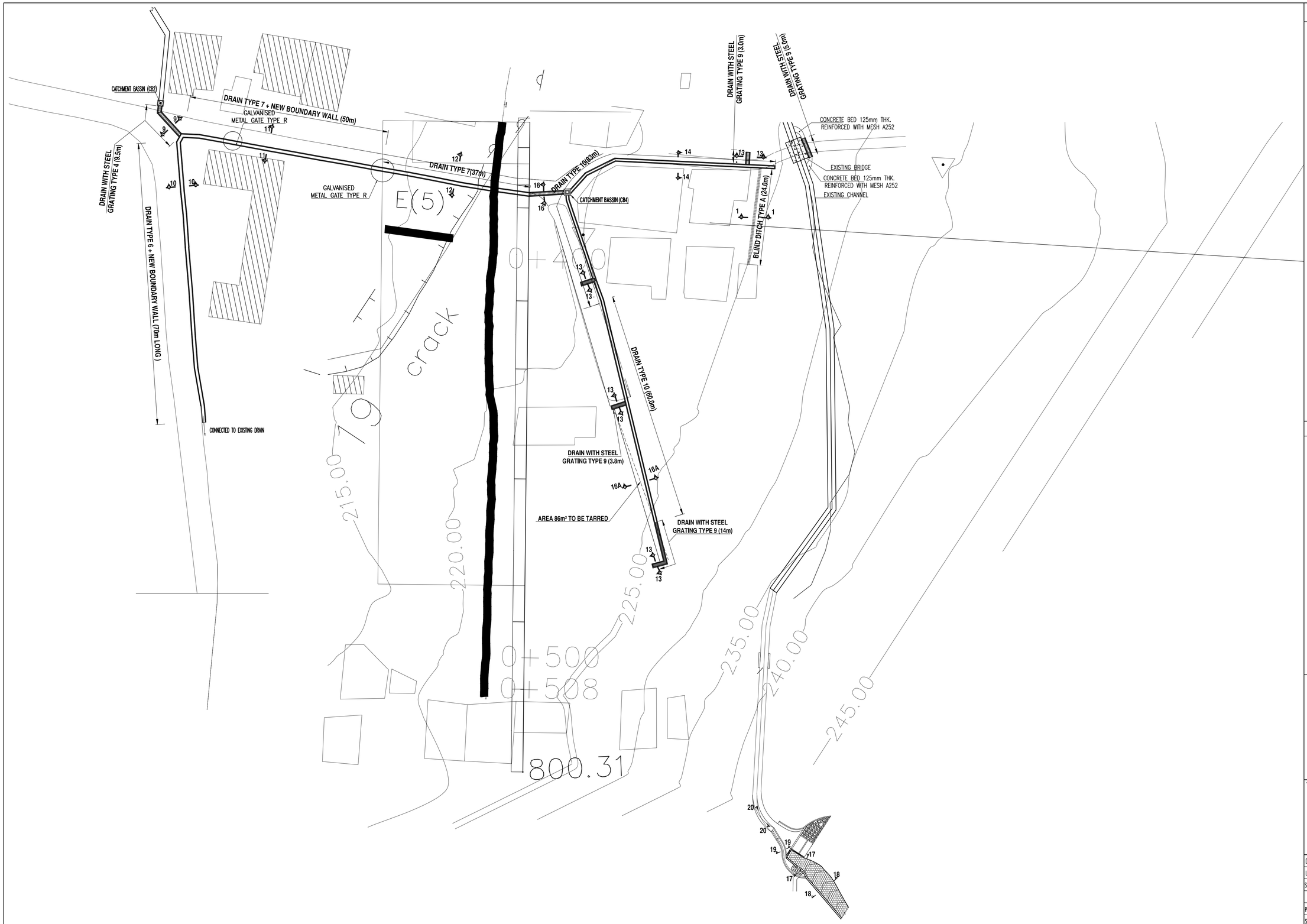
PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

Comp. No. S

DRG. No. G433/ST26

Revision



NOTES

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5. Do not scale – Use figured dimensions.

	Revision	Date

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS

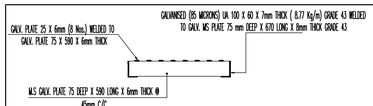
(PHASE II)

Title

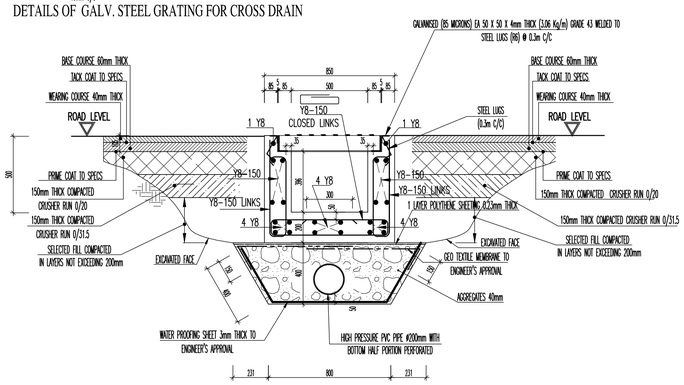
LAYOUT OF DRAINS, R.C DETAILS OF BOUNDARY WALL AND DETAILS OF BLIND DITCH

(THIRD PORTION)

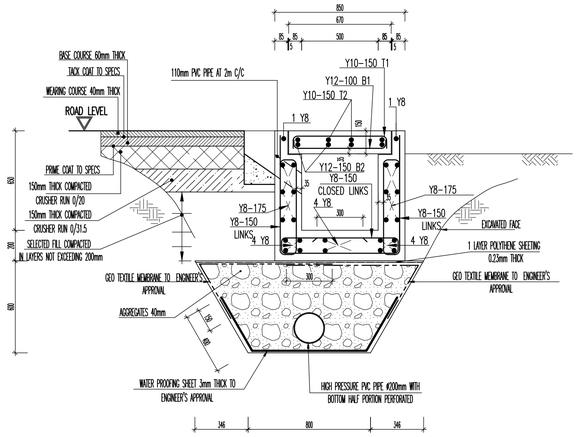
DIRECTOR (C.E)	M.R. JEWON	
LEAD ENGINEER	D. CHINASAMY	
SENIOR ENGINEER / ENGINEER	S. ANADACHEE	
PRINCIPAL TECHNICAL DESIGN OFFICER	V. THOMSON	
SENIOR TECHNICAL DESIGN OFFICER	JPE, N.T.	
TECHNICAL DESIGN OFFICER	A. DOOKHY	
SCALE: 1 : 450	DATE :JAN 2015	PRINT : 10.08.16
MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX		COMP. NO. S
DWG. No. G433/ST27		REVISION



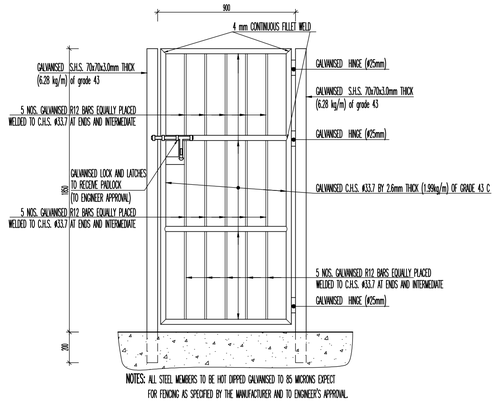
DETAILS OF GALV. STEEL GRATING FOR CROSS DRAIN



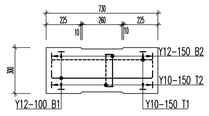
SECTION 13-13 TYPICAL CROSS SECTION OF DRAIN TYPE 9



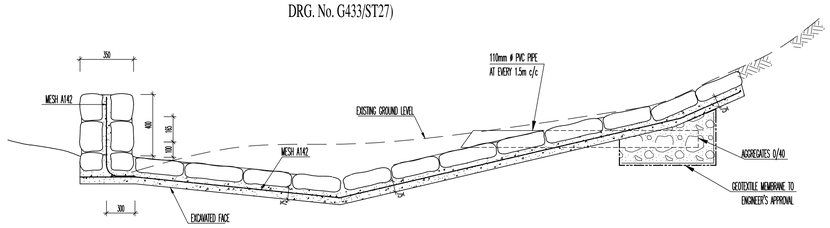
SECTION 12-12
THROUGH DRAIN TYPE 7(37m)



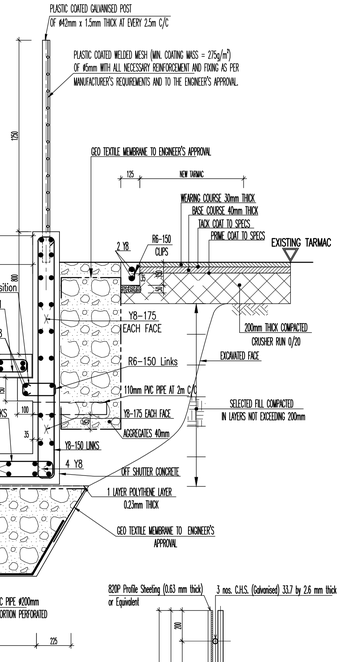
DETAILS OF GATE TYPE R
(2 Nos.)
(FOR LOCATION REFER TO DRG. No. G433/ST27)



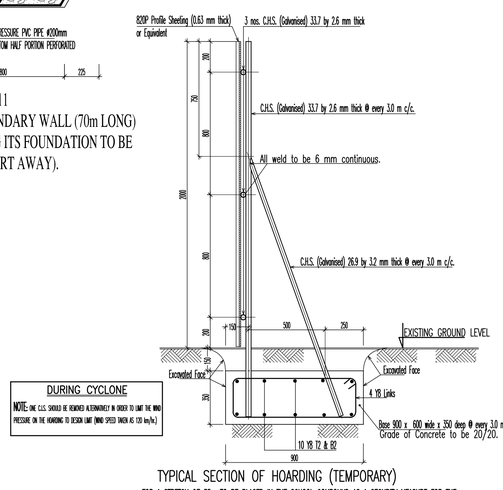
TYPICAL PRECAST COVER OF DRAIN TYPE 3 & 6



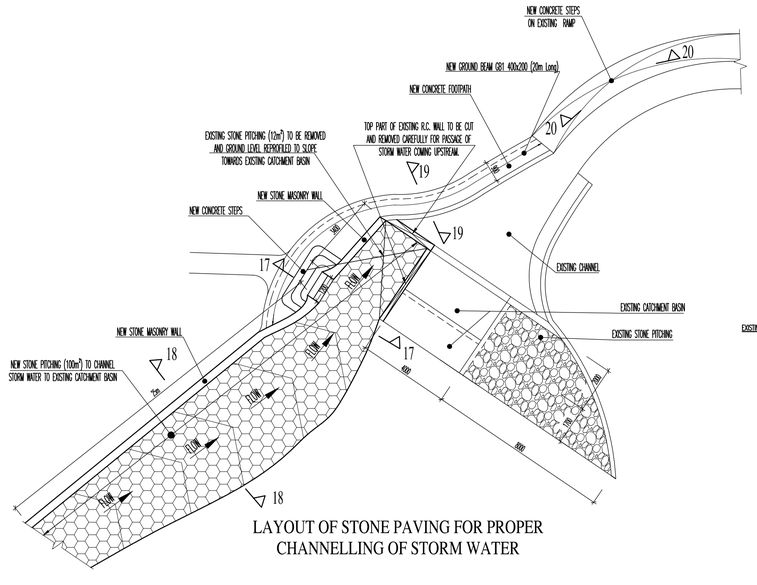
SECTION 18-18



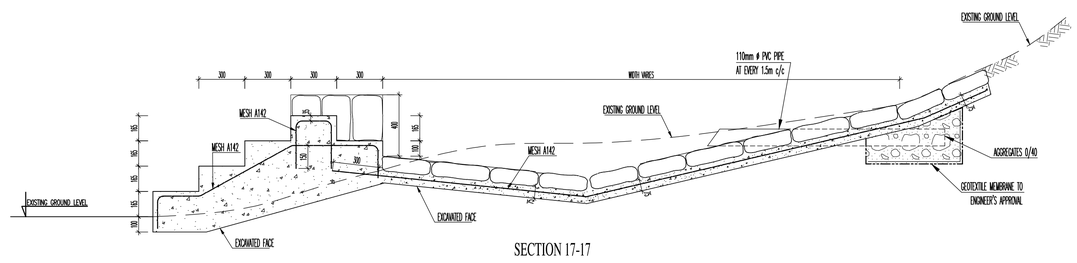
SECTION 11-11
THROUGH DRAIN TYPE 7 AND BOUNDARY WALL (70m LONG)
(EXISTING BLOCKWALL INCLUDING ITS FOUNDATION TO BE DEMOLISHED AND CART AWAY).



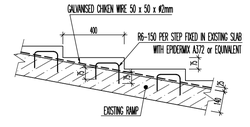
TYPICAL SECTION OF HOARDING (TEMPORARY)
FOR A STRETCH OF 35m TO BE PLACED IN THE SCHOOL COMPOUND AS A SECURITY MEASURE FOR THE PROPER RUNNING OF THE SCHOOL. THE LOCATION OF HOARDING WILL BE DECIDED ON SITE.



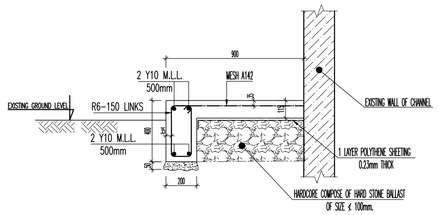
LAYOUT OF STONE PAVING FOR PROPER CHANNELLING OF STORM WATER



SECTION 17-17



DETAILS OF NEW STEPS TO EXISTING RAMP
(AREA TO BE COVERED = 10m²)



SECTION 19-19
DETAILS OF NEW RAMP
(AREA OF CONCRETING 25m²)

NOTES

1. Read this drawing with all Architect's and Engineer's relevant details.
2. No deviation from the details shown on this drawing is allowed without prior permission in writing.
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4. Contractor is to verify all site dimensions.
5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

RC DETAILS OF DRAINS AND BOUNDARY WALL

(THIRD PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
S.T.D.O	J.P.E, N.T.
T.D.O	A. DOOKHY
Scale 1 : 20	DATE: JAN 2015 PRINT: 10.08.16

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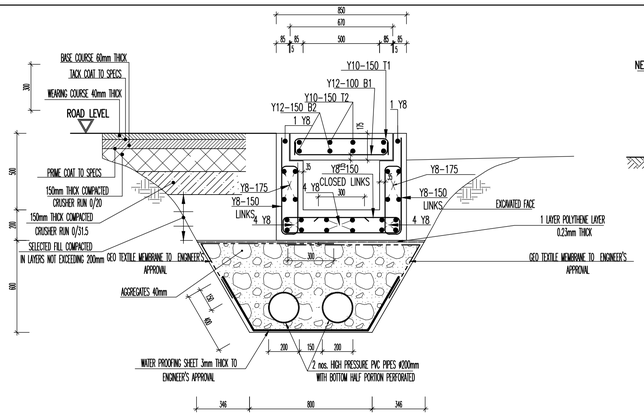
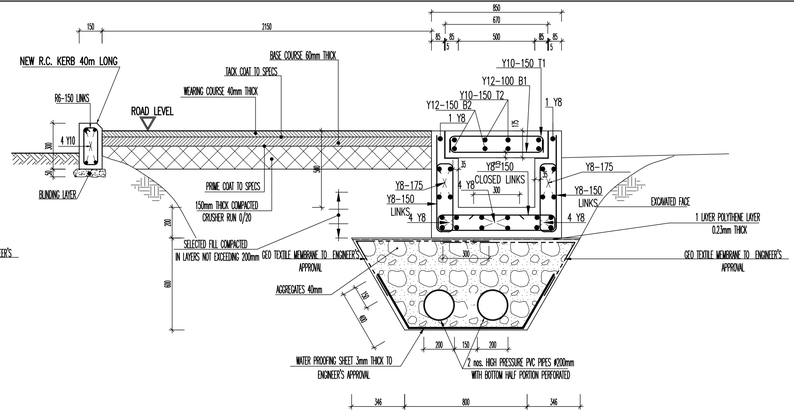
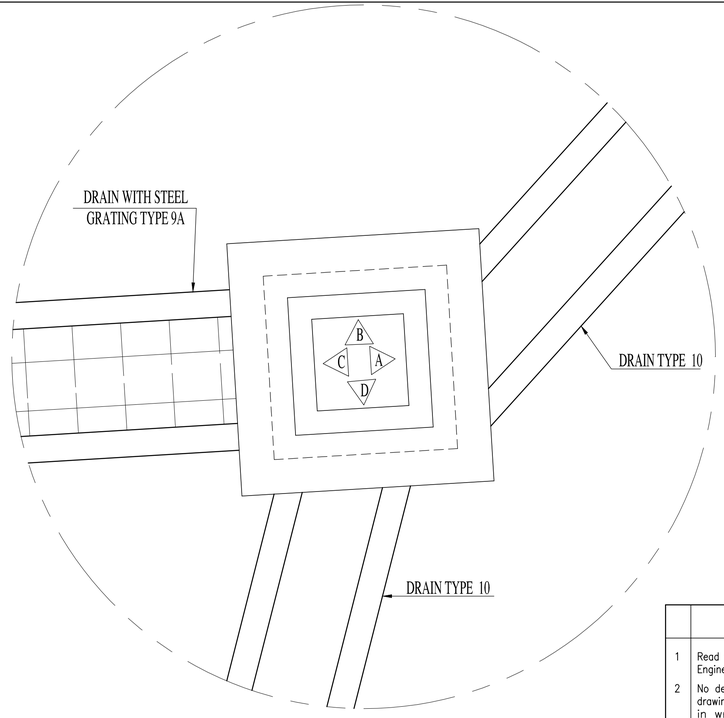
DRG. No. G433/ST28 — Revision



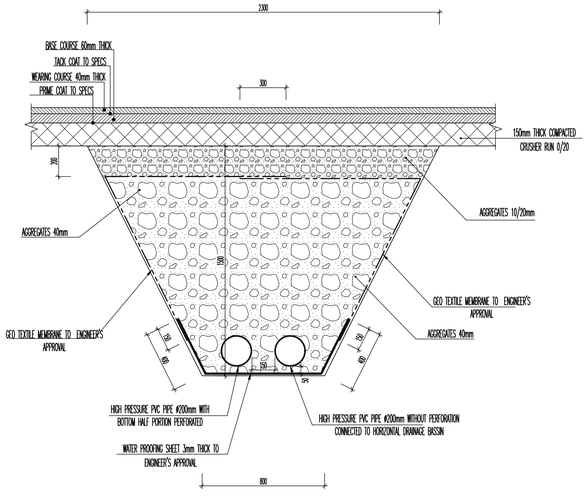
SECTION 14-14
THROUGH DRAIN TYPE 10 (143m)



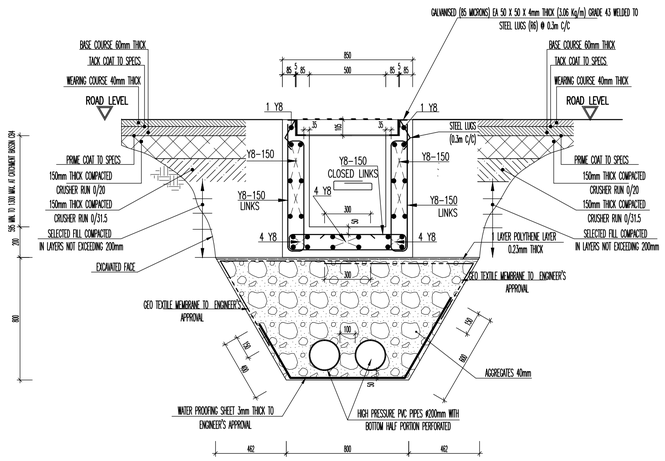
SECTION 16A-16A



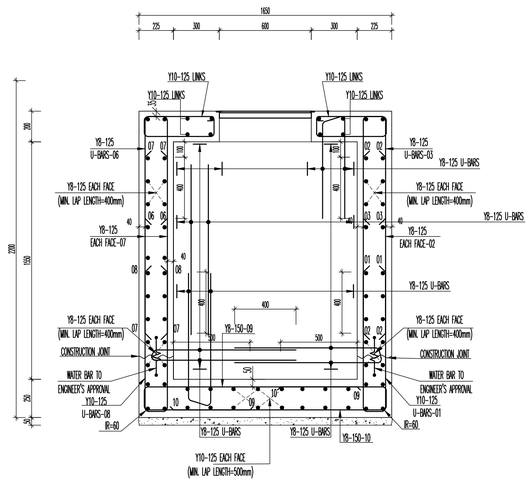
LAYOUT OF CATCHMENT BASSIN (CB4)



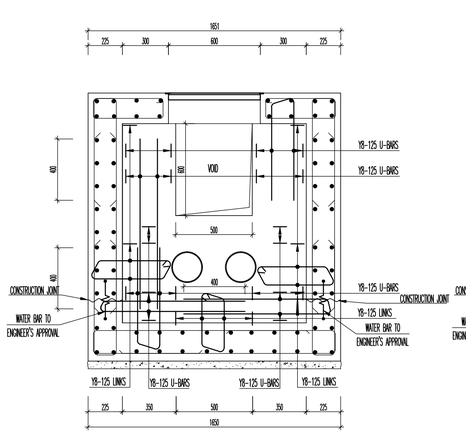
SECTION 1-1
TYPICAL CROSS SECTION OF BLIND DITCH TYPE A (24.0m)



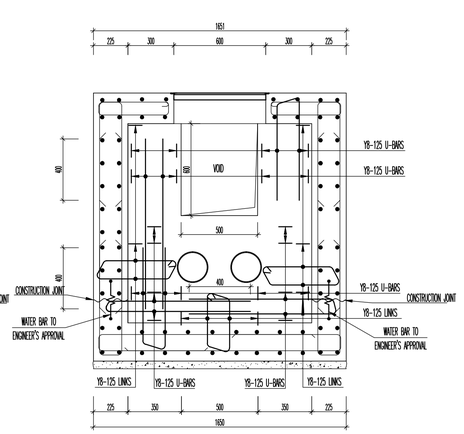
SECTION 16-16
DRAIN WITH STEEL
GRATING TYPE 9A (9.0m)



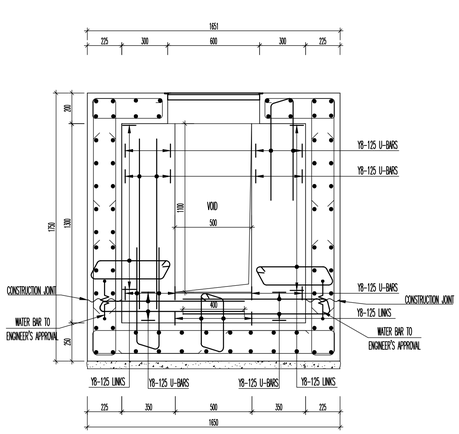
(VIEW B)
R.C. DETAILS OF CATCHMENT BASIN CB4



R.C. DETAILS OF CATCHMENT BASIN FROM VIEW A



R.C. DETAILS OF CATCHMENT BASIN FROM VIEW D



R.C. DETAILS OF CATCHMENT BASIN FROM VIEW C

NOTES

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3. If any discrepancy between this drawing and any contract document is discovered – Please ask.
4. Contractor is to verify all site dimensions.
5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

R.C. DETAILS OF DRAINS, DETAILS OF BLIND DITCH AND CATCHMENT BASIN (CB4)

(THIRD PORTION)

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
S.T.D.O	J.P.E. N.T.
T.D.O	A. DOOKHY

Scale: 1 : 20 | DATE: JAN 2015 | PRINT: 10.08.16

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DRG. No. G433/ST29

Revision

NOTES

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No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS

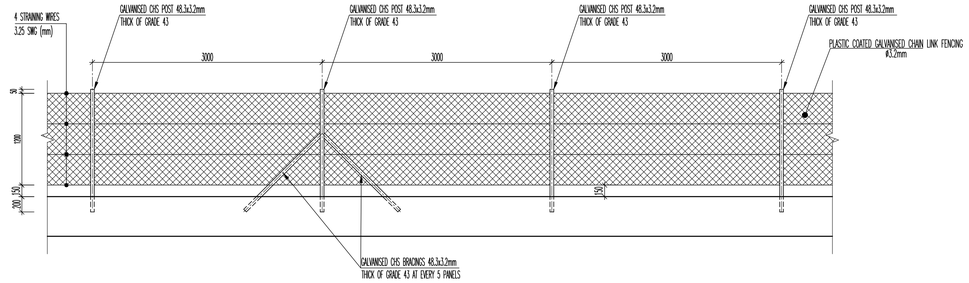
(PHASE II)

Title

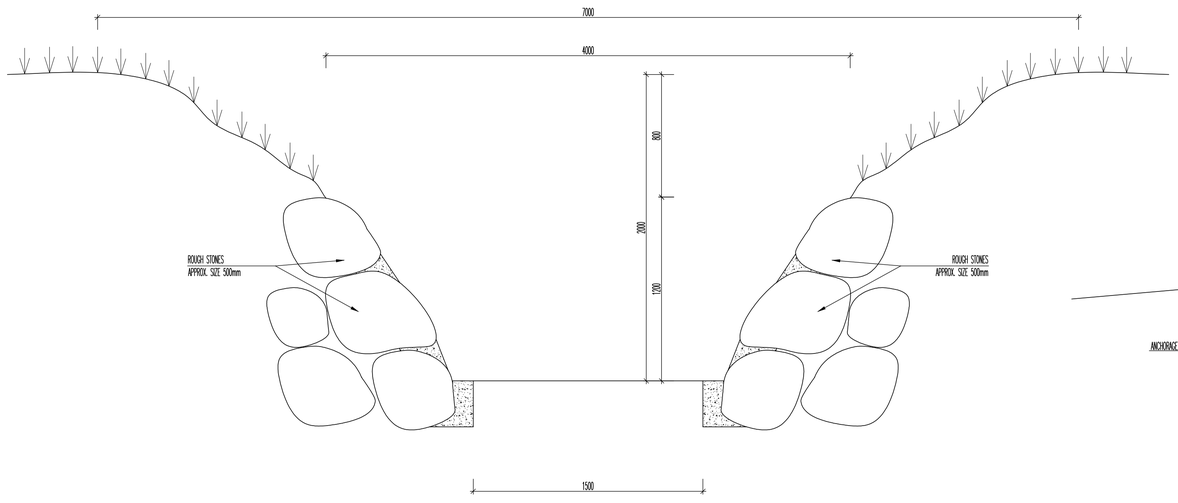
LAYOUT OF NEW CHANNEL, UPGRADING OF EXISTING AFFLUENT LOCATION OF BRIDGE

(FOURTH PORTION)

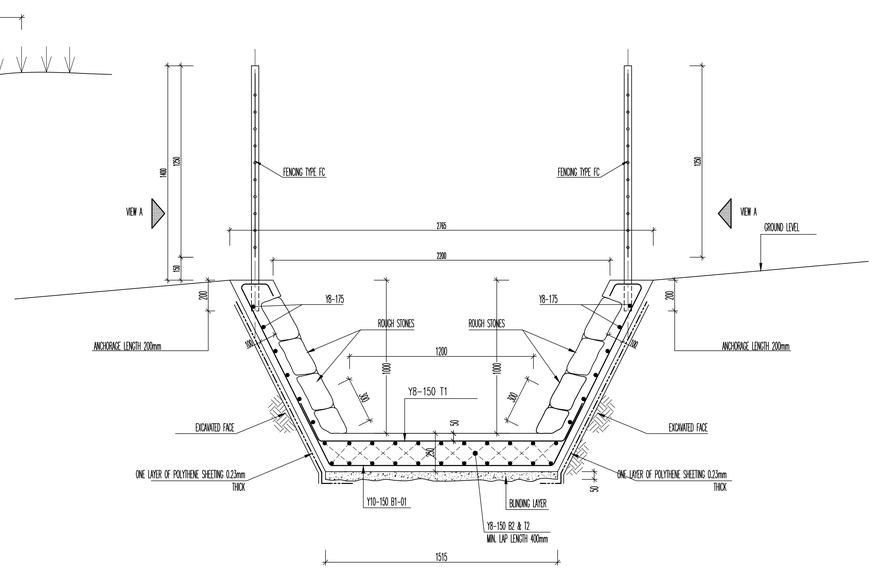
DIRECTOR (C.E)	M.R. JEWON	
LEAD ENGINEER	D. CHINASAMY	
SENIOR ENGINEER / ENGINEER	S. ANADACHEE	
PRINCIPAL TECHNICAL DESIGN OFFICER	V. THOMSON	
SENIOR TECHNICAL DESIGN OFFICER	JPE, N.T.	
TECHNICAL DESIGN OFFICER	A. DOOKHY	
SCALE: 1 : 450	DATE: JAN 2015	PRINT : 10.08.16
MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX		COMP. NO. S
DWG. No. G433/ST30		REVISION



ELEVATION A OF FENCING TYPE FC



UPGRADING OF EXISTING AFFLUENT (50.0m)



SECTION 16-16
R.C. DETAILS OF NEW CHANNEL NCH1 (120m)

NOTES

1. Read this drawing with all Architect's and Engineer's relevant details.
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5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

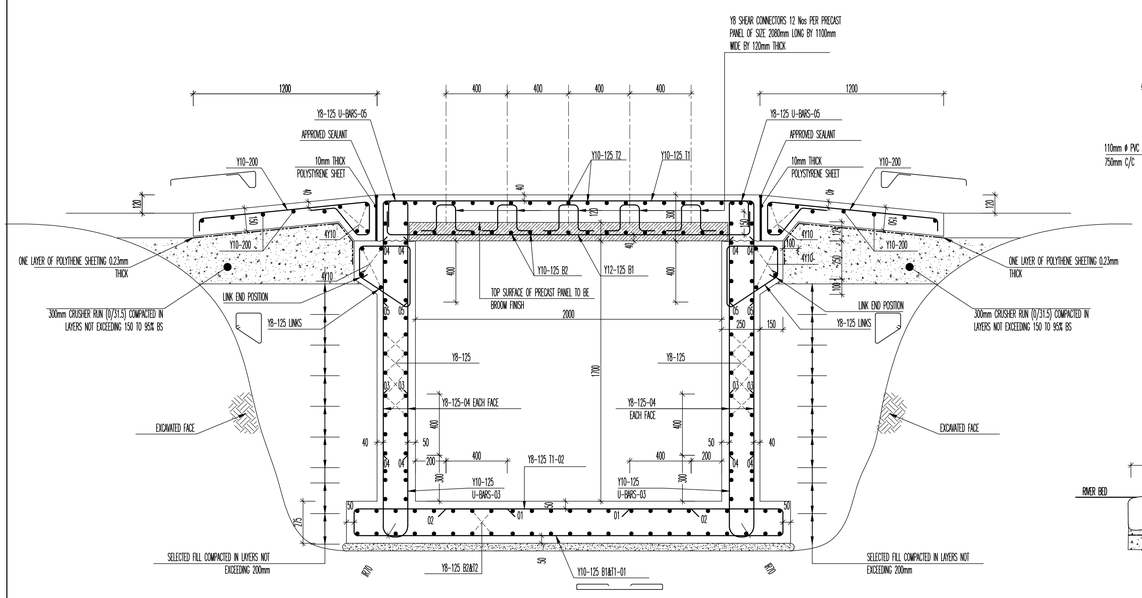
R.C. DETAILS OF NEW CHANNEL
AND
UPGRADING OF EXISTING AFFLUENT

(FOURTH PORTION)

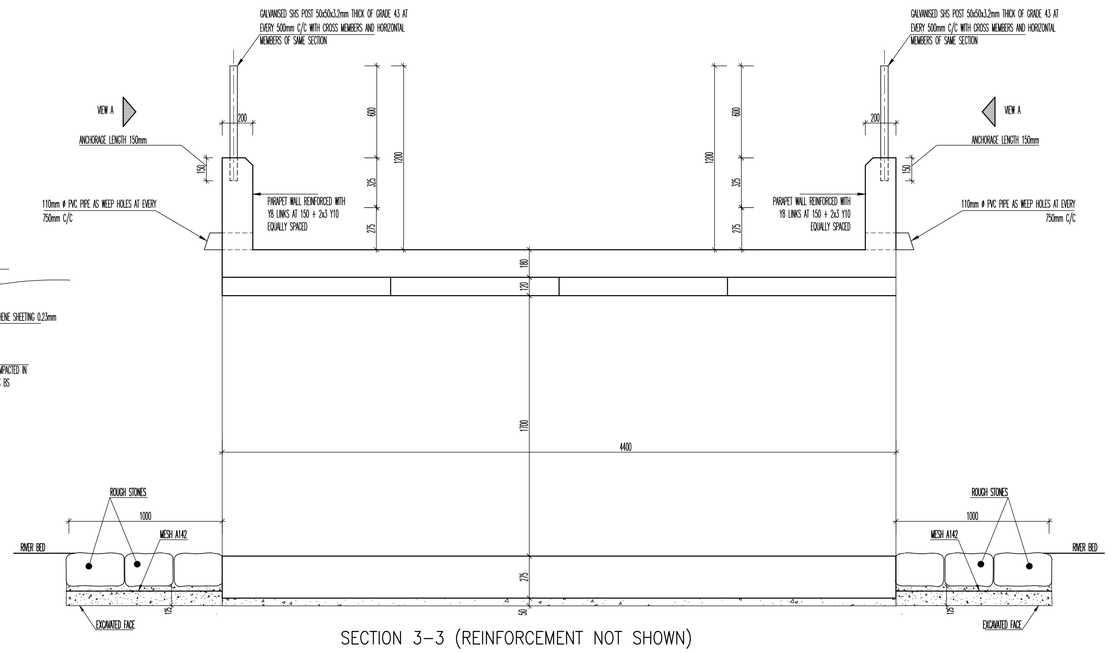
DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
S.T.D.O	J.P.E, N.T.

Scale: 1 : 20	DATE: JAN 2015	PRINT: 10.08.16

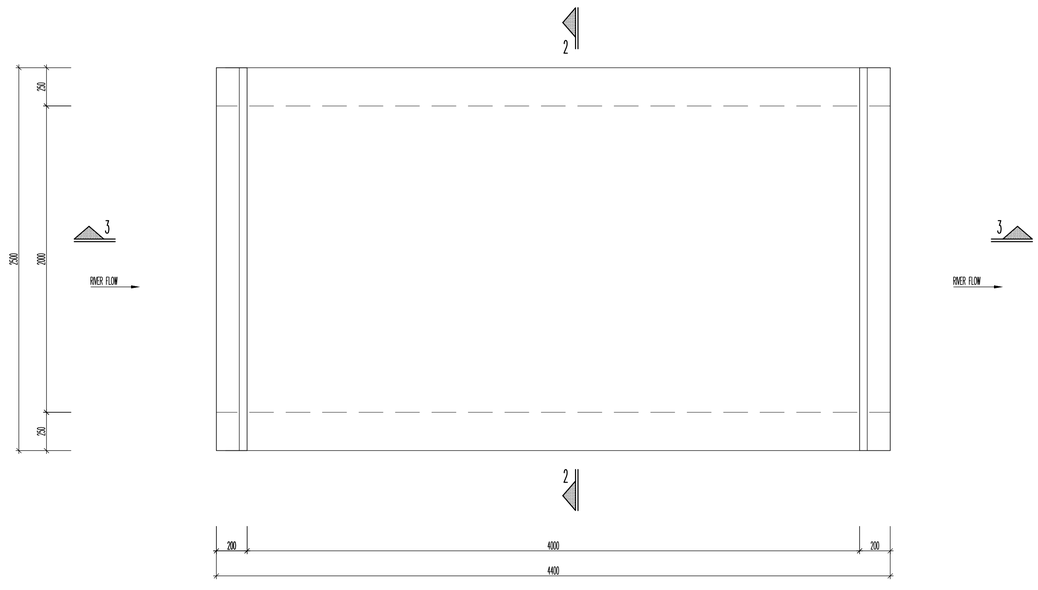
MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX	Comp. No. S
DRG. No. G433/ST31	Revision



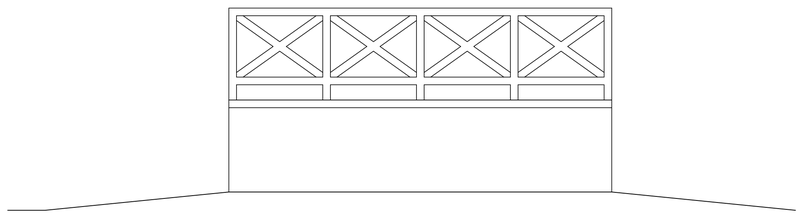
SECTION 2–2



SECTION 3–3 (REINFORCEMENT NOT SHOWN)



PLAN VIEW OF NEW BRIDGE NB1



VIEW A

NOTES

1. Read this drawing with all Architect's and Engineer's relevant details.
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5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT AT CHITRAKOOT COUNTER MEASURE WORKS (PHASE II)

Title

R.C. DETAILS OF NEW BRIDGE NB1

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
S.T.D.O	J.P.E, N.T.

Scale: 1 : 20	DATE: JAN 2015	PRINT: 10.08.16

MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S.
PHOENIX

Comp. No. S

Revision

DRG. No. G433/ST32

GENERAL

1 All structural drawings are to be read in conjuction with all ARCHITECT'S DRAWINGS and specifications and with such other written instruction as may be issued during the course of contract.
All discrepancies shall be referred to the Engineer for decision before proceeding with the works.

2 All dimensions relevant to setting out and off site work shall be checked by the contractor before construction. The drawings shall not be scaled.

3 Workmanship and materials are to be in accordance with the relevant Mauritian Standards or British Standards and local statutory authorities regulations.

4 The contractor shall be responsible for maintaining the structure in a stable condition and ensuring no part shall be overstressed under construction activities.

5 All dimensions are in millimetres unless stated otherwise and all levels are expressed in millimetres.

6 Contractor shall be responsible to submit result of trial mixes for approval by Engineer before start of works.

7 Contractor shall take all necessary precautions so as not to jeopardise the bases of existing building in any way. In case underpinning works are required, Engineers approval shall be sought.

STRUCTURAL CONCRETE

1 All workmanship and materials shall be in accordance with BS 8110 – The Structural Use of concrete.

2 Minimum cover (mm) to all reinforcement unless otherwise shown shall be as follows:–

Element	Cover(mm)
(a) Foundation against earth face	75
(b) Foundation against blinding	50
(c) Wall below ground or against water face	40
(d) Column > 200mm	35
< 200mm	35
(e) Ground beams	35
(f) Beams	35
(g) Slab on fill	30
(h) Slab	30

3 Size of concrete elements do not include thickness of applied finishes.

4 Beam depths are written first and include slab thickness.

5 No holes or embedment of pipes other than those shown on the structural drawings shall be made in concrete members without prior written approval of the Engineer.

6 Construction joints shall be properly constructed as specified and made only where shown or specifically approved by the Engineer.

7 Reinforcement is represented diagrammatically and not necessarily shown in true projection.

8 Welding of reinforcement shall not be permitted without the approval of the Engineer.

9 All reinforcement shall be securely supported in its correct position during concreting by approved bar chairs or spacers.

10 Reinforcement shall be checked by the Engineer and a written approval of the Engineer should be obtained before concreting.

11 Reinforcement symbols

All reinforcement to comply with MS 10 Mauritian standard for steel bars for the reinforcement of concrete.
Y – Hot rolled deformed bar – grade 460 (i.e minimun yield strength 460 N/mm^2)
R – Structural grade mild steel plain round bar – grade 250 N/mm^2.
The number following the bar symbol is the nominal bar diameter in millimetres.

12 Concrete grades shall be as follows unless shown otherwise on drawings:–

Element	Grade of Concrete	Fcu (Mpa)
All structural concrete Unless otherwise specified	35/20	35

13 Beams and slabs to be cast monolithically.

FOUNDATION

1 All materials and workmanship shall be in accordance with BS 8004 Code of Practice for Foundations where not inconsistent with the specification.

2 Pad, Combined and Strip footing shall be founded at depth below ground level shown on the drawings or as instructed on site by Engineer.
Engineer's written approval is required before blinding of any foundation.

CONCRETE BLOCKWORK

1 All workmanship and materials shall be in accordance with BS 5628–
Code of practice for use of masonry.

2 Concrete block shall be manufactured on accordance with BS 6073 –Precast concrete masonry units. They shall be cellular blocks of grade A 3.5 N/mm^2.
Size of concrete block shall be 457 x 203 x 150 or 200 thick unless otherwise specified.

3 The mortar for laying blocks shall consist of 1 part Portland cement : 3 to 4 parts of rock sand and an approved plasticiser unless otherwise specified.

4 Brick reinforcement to masonry shall be as shown on the drawings.

5 Reinforced concrete infill to blockwork where required shall be of 25/10 with reinforcement as specified.

6 All concrete blocks to be laid after concreting of columns and beams unless otherwise specified in drawings.

STEEL:

1. All dimensions are in millimeters.
2. All steel members to be of grade 43 and should be hot dipped galvanised to 85 microns.
3. All plates to be mild steel and should be hot dipped galvanised to 85 microns.
4. All bolts, nuts and washers are of grade 8.8 unless otherwise Specified and should be galvanised to 85 microns.
5. All weld to be 6mm continuous fillet unless otherwise specified.
6. Contractor shall confirm all dimensions of steel works on site prior to fabrication of same.
7. Contractor shall confirm all dimensions of steel works on site prior to fabrication of same.

NOTES

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4 Contractor is to verify all site dimensions.
5 Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE WORKS
(PHASE II)

Title

STRUCTURAL NOTES

DIRECTOR (CE)	R. JEWON
LEAD ENGINEER	D. CHINASAMY
SENIOR ENGINEER/ENGINEER	S. ANADACHEE
P.T.D.O	V. THOMSON
S.T.D.O	J.P.E, N.T.
Scale: 1 : 20	DATE: JAN 2015 PRINT: 10.08.16
MINISTRY OF PUBLIC INFRASTRUCTURE L. T. & S. PHOENIX	Comp. No. S
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LIST OF TREES TO BE FELLED FOR IMPLEMENTATION OF COUNTERMEASURE WORKS

TYPE OF TREES			TRUNK SIZE (cm)	NUMBER
LOCAL NAME	SHAPE	REFERENCE NO.		
MANGO TREE		MG1	30	15
		MG2	40	
		MG3	50	
		MG4	80	
		MG5	50	
		MG6	80	
		MG7	50	
		MG8	60	
		MG9	40	
		MG10	20	
		MG11	80	
		MG12	30	
		MG13	60	
		MG14	40	
		MG15	90	
OLIVE TREE		OL1	15	2
		OL2	50	
LONGANE TREE		LG1	20	1
FRUIT DE CYTHERE TREE		FCT1	40	3
		FCT2	35	
		FCT3	80	
COQUELUCHE TREE		CQ1	60	1
COCONUT TREE		CC1	30	1
LEMON TREE		LT1	10	1
FRUIT A PAIN TREE		FP1	80	2
		FP2	40	
COEUR DE BOEUF TREE		CB1	30	1
TOTAL				27

NOTES

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4. Contractor is to verify all site dimensions.
5. Do not scale – Use figured dimensions.

No.	Revision	Date

Project

LANDSLIDE MANAGEMENT
AT
CHITRAKOOT
COUNTER MEASURE
WORKS
(PHASE II)

Title

LOCATION OF TREES TO BE FELLED FOR THE IMPLEMENTATION OF THE COUNTERMEASURE WORKS

DIRECTOR (C.E)	M.R. JEWON
CHIEF ENGINEER	D.CHINASAMY
SENIOR ENGINEER / ENGINEER	S.P. ANADACHEE
PRINCIPAL TECHNICAL DESIGN OFFICER	V. THOMSON
SENIOR TECHNICAL DESIGN OFFICER	N.T.

SCALE 1 : 600 | DATE :MAY 2016 | PRINT : 23.05.16

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PHOENIX

CONP. NO. S

DWG. No. G433/ST39

REVISION

Appendix 3.1.16

Construction of landslide countermeasures in Valle Pitot

Construction of landslide countermeasures in Valle Pitot

Vallee Pitot was a representative pilot site of a landslide danger area in the previous JICA project. And the geological investigation was carried out by MPI in 2015. Based on the result of the landslide investigation, the surface drainage system had been constructed as the landslide countermeasure by MPI and RDA in 2017, and the effect of that will be expected in the future.

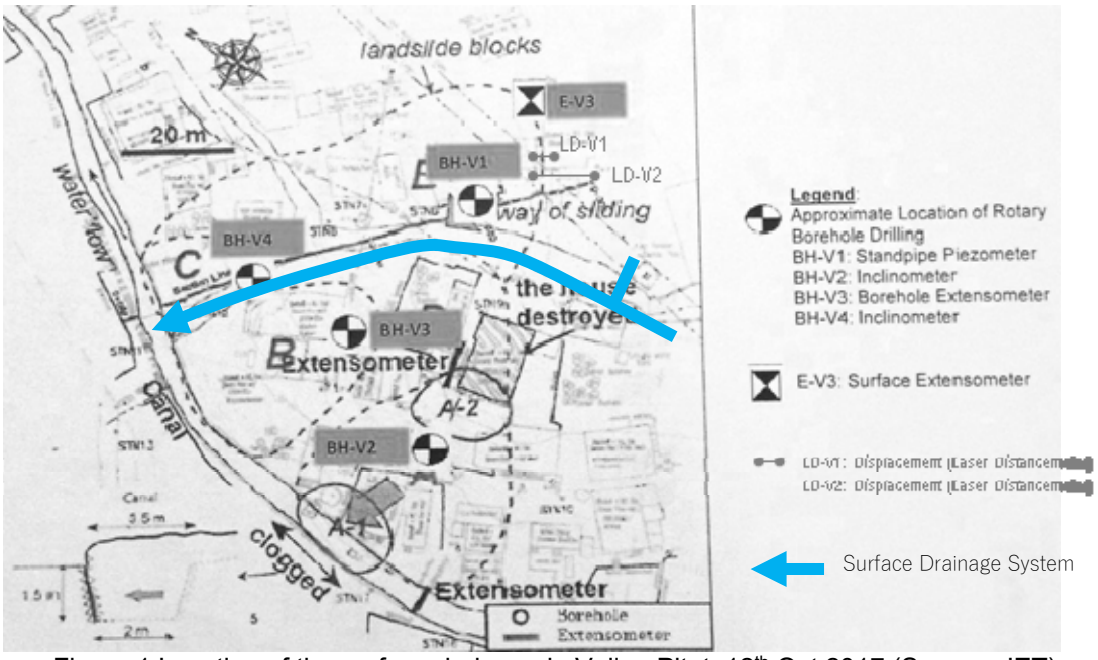


Figure 1 Location of the surface drainage in Vallee Pitot, 12th Oct 2017 (Source: JET)

Figure 2 Surface drainage system in Vallee Pitot, 12th Oct 2017 (Source: JET)

Appendix 3.2.1

Explanation of slope failures, rock falls and debris flows

Explanation of slope failures, rock falls and debris flows

JET explained three types of slope disasters and their mechanisms (landforms, geology, inducing factors, movement of the soil and rocks, etc.) and the difference between the countermeasures.

Furthermore, JET explained not only structural countermeasures but also factors to take into account (short time rainfall and long period rainfall, groundwater conditions, earthquakes, strong winds) in order to plan the monitoring and early warning systems.

From March to July 2016, JET conducted field surveys to investigate the mechanisms of slope failures, rock falls, debris flows and their causes in Mauritius. JET also carried out technical transfer of recommendable measures. In addition, JET held two technical meetings and a workshop about slope disasters.

Table 1 Held technical meetings on slope failures, rock falls and debris flows (Source: JET)

No.	Date	Agenda	Attendants
1	3 March 2016	• Tendency of slope disasters • Cause of slope disasters • Selection of countermeasure works • Low cost countermeasure works • Explanation of crib walls	Mr. Tsukamoto, Mr. Chinasamy, Mr. Anadachee, Mr. Ramdowar, Mr. Mosaheb and Mr. Gobin
2	14 July 2016	• Explanation of rock falls (An example of Signal Mountain) • Structural Countermeasures • About PPG • Rock fall countermeasure works	Mr. Tsukamoto, Dr. Iwasaki, Mr. Sato, Mr. Chinasamy, Mr. Anadachee, Mr. Damonsing, Mr. Mosaheb and Mr. Gobin
3	20 July 2016	• Methods of rock fall countermeasure works • Materials of countermeasure works • Basic design for Maconde and Signal Mountain	Mr. Asai and Mr. Namba (TOKYO ROPE), Dr. Iwasaki, MPI/LMU, RDA, NDRRMC, Contractor (27 participants)

a. First technical meeting (3 March 2016)

JET, Mr. Tsukamoto, explained the results of the field survey that LMU requested and the fundamental part of the countermeasure work plan against slope disasters by showing pictures of the sites and sketches of slope failures. Moreover, JET shared the knowledge about the countermeasure works LMU had made. The participants had a discussion on countermeasures in the latter part of the session.

JET gave an explanation about the tendency of the slope disasters in Mauritius which included the 37 sites dealt with in the Previous Project and the four sites to be dealt with this time in February 2016. JET also explained that surface water was not adequately handled at the slope disaster sites, so it triggered most of the collapse of the soil. LMU referred to the necessity of understanding the water system in the slope areas and studying slope disasters and watery issues comprehensively from the hydrological standpoint.

Participants:

Mr. Tsukamoto, Mr. Chinasamy, Mr. Anadachee, Mr. Ramdowar, Mr. Mosaheb and Mr. Gobin

Photo 1 Lecture by Mr. Tsukamoto (in the front). Attendants of the technical meeting (in the back). (Source: JET)

Photo 2 Attendants of the technical meeting during a lecture by Mr. Tsukamoto (Source: JET)

b. Second technical meeting (14 July 2016)

JET gave their technical review before their departure. JET and LMU gave an hour long explanation about the survey results of the locations LMU requested JET to conduct field surveys in order to hold a discussion. During the session, the fundamental plan of the countermeasure works was also explained. Some LMU members knew the precise situation of the sites. Therefore, a discussion lasting approximately one hour was held to reach common understanding, using pictures of the spots and countermeasure work plans that the MPI had made.

Although measures against the rock falls had been carried out in some parts of Mauritius, JET found out that more measures will be needed, as there were some other sites and roads clearly at risk of rock fall disasters. The contents that were shared about these situations in the technical meeting are expected to be followed by some concrete outcomes during the Project.

Participants in the second session:

JET: Mr. Tsukamoto, Dr. Iwasaki and Mr. Sato

LMU: Mr. Chinasamy, Mr. Anadachee, Mr. Damonsing, Mr. Mosaheb and Mr. Gobin


Photo 3 Technical meeting (Source JET)

c. Workshop on measures against rock falls (20 July 2016)

Together with two engineers from TOKYO ROPE MFG. CO., LTD., a Japanese manufacturer specialised in materials for rock fall countermeasure works, JET held a technical workshop about the measures against rock falls. In total 27 people attended, including MPI/LMU, Road Development Authority (RDA), NDRRMC, a local contractor engineer, JET and the two engineers from TOKYO ROPE MFG. CO., LTD.

In the workshop, a presentation, about 50 minutes, was held regarding cases of measures against rockfalls and the material usually employed, followed by a discussion involving all the attendants. The attendants eagerly discussed not only overall technical issues but also specific methods of construction that MPI/LMU had currently been considering to use against the rock falls in Maconde and Signal Mountain.

Photo 4 MPI's opening address (Source: JET)

Photo 5 Presentation (Source: JET)

On-site instructions for field surveys on slope failures, rock falls and debris flows were often given during the course of the Project. Consequently, the causes and mechanism of each slope failure, rock fall, and debris flow became clear. LMU was to take charge of leading the study to plan the countermeasure works.

Appendix 3.2.2

Slope inventory

Slope inventory

MPI and JET have visited 18 sites of slope failures, rock falls, and debris flows, and surveyed the current conditions of each slope during this project. As a result of the investigation of the 18 sites, slope investigation sheets and a slope inventory were made by MPI and JET.

Figure 1 Location map of 18 sites where slope inspection was carried out in this project
(Source: Google - modified by JET)

Table 1 Slope Inventory for the 18 sites where slope inspection was carried out in this project (Source: JET)

No.	Management No.	Address/Name	Slope Disaster Type		Location		Date of Inspection	Risk Rank	Existing Countermeasure
			Category 1	Category 2	Latitude	Longitude			
1	2016-001	A9 Road at Batelage	SF	CS	-20.514289°	57.518289°	15/02/2016	A	
2	2016-002	Vallée Pitot	SF	FL	-20.171481°	57.516980°	17/02/2016	A	
3	2016-003	Ruisseau de Creoles	RF	DV	-20.496230°	57.385081°	17/02/2016	A	
4	2016-004	Coromandel, land of Mr. H. Phutully	SF&RF	DV	-20.192650°	57.472669°	15/03/2016	B	
5	2016-005	New Police Station at Valle Pitot	SF	DV	-20.168526°	57.516272°	24/03/2016	C	
6	2016-006	Kewal Nagar Belle Rive at Shavala Road	SF	RE	-20.311269°	57.726740°	29/03/2016	A	
7	2016-007	Application for Building and Land Use Permit at Moka	SF	DV	-20.214106°	57.492765°	29/03/2016	B	
8	2016-008	Signal Mountain	RF	CS	-20.175198°	57.492629°	27/06/2016	A	
9	2016-009	Mount Ory	SF	DV	-20.215996°	57.483822°	30/06/2016	B	
10	2016-010	Maconde	RF	CS	-20.490315°	57.371507°	18/07/2016	A	Rock fall protection fence in part of the site
11	2016-011	Dr J.B.DAVID SSS at Bell Village	SF	DV	-20.174980°	57.485506°	22/07/2016	C	
12	2016-012	Landslide Problem at Vallee Pitot	SF	DV	-20.170409°	57.521565°	25/07/2016	C	
13	2016-013	Residential Development at Tamarin	SF	DV	-20.348871°	57.366809°	28/07/2016	C	
14	2016-014	More. Hermitage Coromandel	SF&RF	DV	-20.193755°	57.473624°	02/08/2016	C	
15	2016-015	Quatre Soeurs Refuge Centre	SF	DV	-20.301721°	57.776820°	02/08/2016	C	
16	2016-016	Camp de Masque SSS, Flacq	Dep	DV	-20.230841°	57.680191°	09/08/2016	C	
17	2016-017	Mrs Coolen House, Camp Garreau, Flacq	SF	RE	-20.222923°	57.711991°	09/08/2016	A	
18	2016-018	Hermitarge, Coromandel	SF&RF	DV	-20.194071°	57.471668°	21/10/2016	A	Old retaining wall (Already broken)

<Legend>

Slope Disaster Type	Category 1 (Phenomenon)	SF	Slope failure
		RF	Rock fall
		DF	Debris flow
		Dep	Depression
	Category 2 (Cause)	CS	Cut slope for Road
		DV	Development
		RE	River Bank Erosion
		FL	Filling for Road

In the final report of the Previous Project: 'The Project of Landslide Management in the Republic of Mauritius', the slope disaster hazard areas were divided into three ranks as follows based on the urgency and priority, which was judged by the slope inspection.

A: Need for emergency countermeasures
B: Need for continuous inspections
C: Removal from a list

a. Slope inventory

As for the items described in the slope inventory, not only basic information (the name of the slope, a management number, coordinates and inspection date) but also slope disaster type, degree of risk rank, and the existing countermeasures are described.

a1. Slope disaster type

Two categories (a phenomenon and cause) are considered in order to classify the slope disasters of the 18 sites.

Table エラー! 指定したスタイルは使われていません。.1 Classifications of the slope disaster type in this project (Source: JET)

Category of the classifications	Slope disaster type	Number of sites
Category 1 (Phenomenon)	Slope failure (SF)	14
	Rock fall (RF)	5
	Debris flow (DF)	0
	Depression (Dep)	1
Category 2 (Cause)	Cut slope for Road (CS)	3
	Development (DV)	12
	River Bank Erosion (RE)	2
	Filling for Road (FL)	1

As for Category 1 of the classifications, the slope disasters of the 18 sites are classified in four types of phenomena, slope failure (SF), rock fall (RF), Debris flow (DF), Depression (Dep). Slope failure (14 sites) is the most common type of slope disaster, followed by rock falls, 5 sites, and a few of other disaster types. Therefore, it is important that technique and experience of countermeasure for slope failures/rock falls are provided in Mauritius.

As for Category 2 of the classifications, the slope disasters of the 18 sites are classified in four types of causes, cut slope for road (CS), land development (DV), river bank erosion (RE) and filling for road (FL). Land development (12 sites) is the most common cause of slope disaster, followed by cut slope for road (3 sites), river bank erosion (2 sites), and filling for road (1 site). Based on this, it is demonstrated that there are a many slope disasters that occur due to land development, and suggests the importance of land development regulation.

a2. Risk rank

In the final report of the Previous Project, slope disaster hazard areas are divided into three ranks as follows based on the urgency and priority, which is judged by the slope inspection.

A: Need for emergency countermeasures

B: Need for continuous inspections

C: Removal from the list

Rank A means the slope disaster hazard needs countermeasures as soon as possible, and it is a serious threat to residents and/or infrastructures. The inspections should last until the completion of countermeasure construction and the confirmation of the effectiveness of the

countermeasures.

Rank B means the slope disaster hazard needs countermeasures and has the potential to affect residents and/or infrastructures. However, the priority is lower than Rank A. Therefore, the countermeasures can be implemented after the completion of countermeasure works of Rank A hazard areas. The inspections should last until the completion of countermeasure construction and the confirmation of the effectiveness of the countermeasures.

Rank C means the slope disaster hazard is already completely stabilised and no longer considered a landslide risk. This is confirmed with disaster inspections after the rainy season. The area can be removed from the list after discussions with related organisations.

b. Designation of risk areas

11 sites designated with a risk rank of A or B are shown in the slope inventory by JET and C/P. The lists of the risk areas are as follows.

Table 2 List of the designated risk areas and proposed countermeasures (Source: JET)

Management No.	Address/Name	Slope Disaster Type		Risk Rank	Proposed countermeasures by JET and C/P
		Category 1	Category 2		
2016-001	A9 Road at Batelage	SF	CS	A	Crib wall & concrete spraying
2016-002	Valle Pitot	SF	FL	A	Retaining wall
2016-003	Ruisseau de Creoles	RF	DV	A	Rock removal & stabilisation
2016-004	Coromandel, land of Mr. H. Phutully	SF&RF	DV	B	Retaining wall
2016-006	Kewal Nagar Belle Rive at Shavala Road	SF	RE	A	River bank protection wall such as a gabion
2016-007	Application for Building and Land Use Permit at Moka	SF	DV	B	Reforming, re-cutting
2016-008	Signal Mountain	RF	CS	A	Rock removal, stabilization, rock fence and rock fall protection net
2016-009	Mount Ory	SF	DV	B	Reforming, re-cutting
2016-010	Maconde	RF	CS	A	Rock fall protection net
2016-017	Mrs Coolen House, Camp Garreau, Flacq	SF	RE	A	River bank protection wall such as a gabion
2016-018	Hermitage, Coromandel	SF&RF	DV	A	Retaining wall

<Legend>

SF	Slope failure
RF	Rock fall
DF	Debris flow
Dep	Depression
CS	Cut slope for Road
DV	Development
RE	River Bank Erosion
FL	Filling for Road

Appendix 3.2.3

Slope inspection sheet

Slope inspection sheet

The results of the site inspection are recorded in slope inspection sheets, including the disaster attention points, its location, scale, on-site photographs, and description of the site.

Slope inspection sheets consist of a general information sheet, an evaluation sheet, and a photograph sheet. The contents of each sheet are as follows;

General information sheet: the general information sheet includes the address, the position coordinates, a schematic sketch, and a location map (Scale: 1:25,000).

Evaluation sheet: the evaluation sheet includes the disaster attention points and a description of the site.

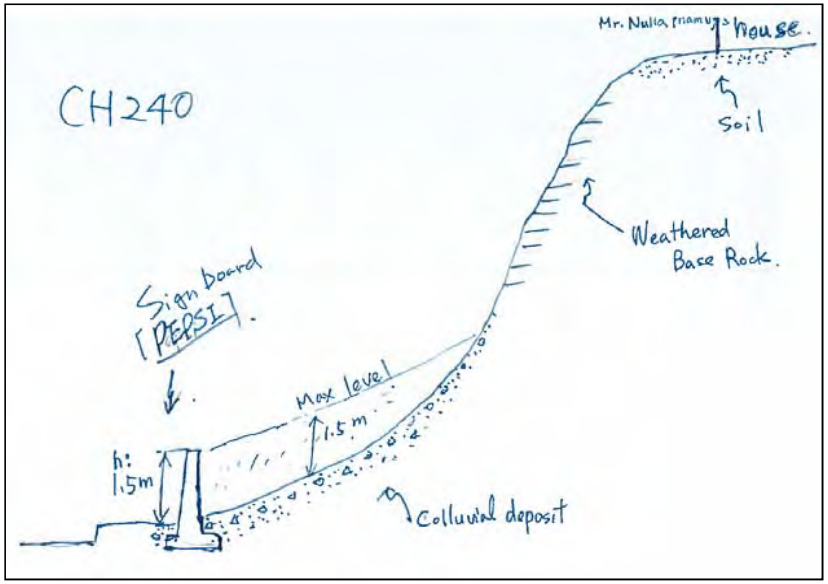
Photo sheet: the photo sheet includes photographs of the damage situation and the landform.

The slope inspection sheets of the 18 sites are attached as an appendix at the end of the report (Appendix 3).

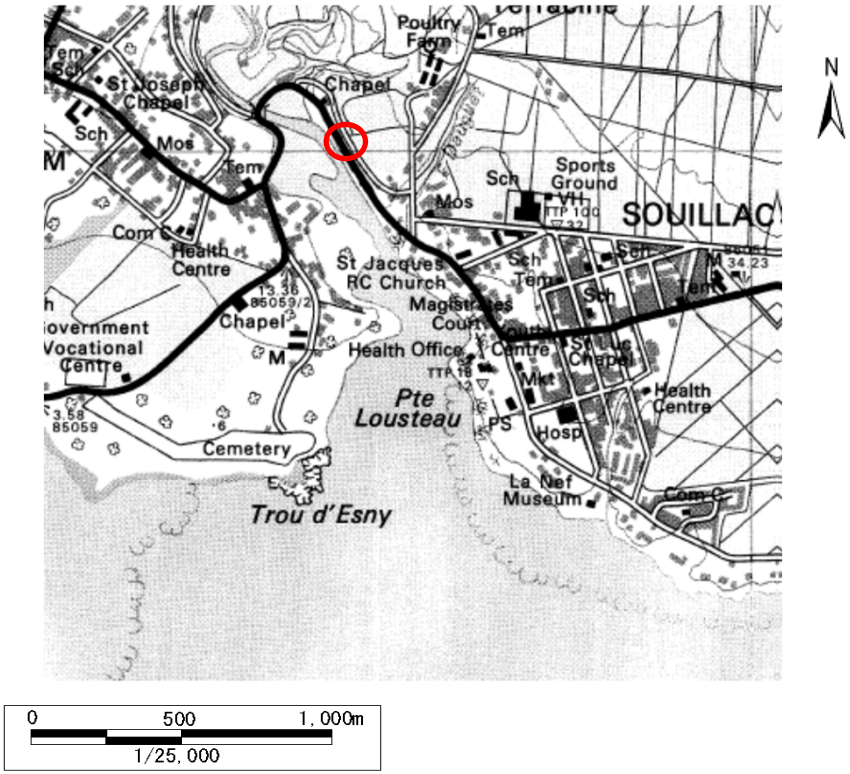
General Information Sheet (Slope)

Management number	0 0 2 0 1 6 - 0 0 1	Reporter's name:	Satoru TSUKAMOTO	Date of report :	February 15, 2016
Address	A9 Road at Batelage	Type*	Cut slope failures	Latitude	-20.305337	Longitude	57.310624

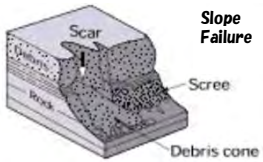
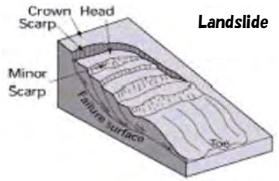
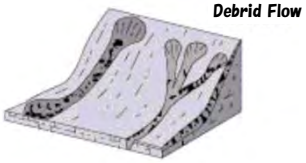
Schematic sketch



Location map （Scale: 1:25,000 ）



*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks.Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Mangement number	0	0	2	0	1	6	-	0	0	1

Evaluation sheet

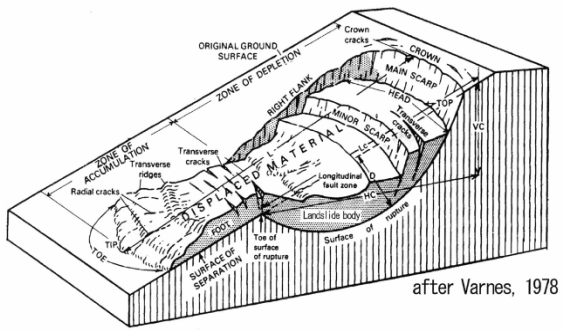
Reporter's name :	Satoru TSUKAMOTO

[Check Point]

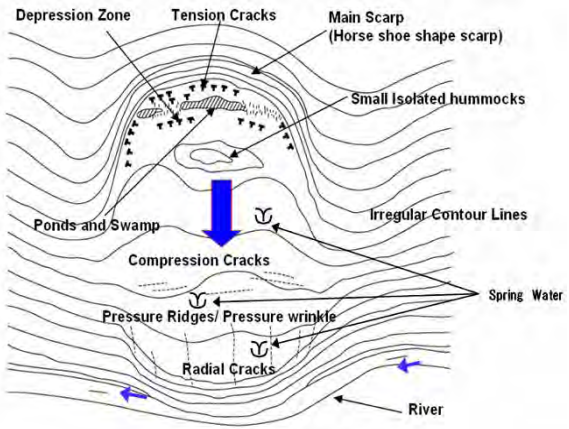
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			✓
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Eembankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Road slope colapses)	✓
		Slight	(number :)	
		None		
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious	(, 2011)	✓
		Slight		
		None		
Countermeasure	There is no Countermeasure			
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		✓
		High effect		

[Description]

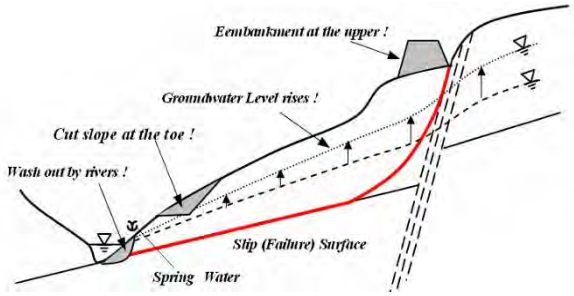
The cut slope along the road are prone to slide. Geology of the slopes are weathered pyroclastic rock and colluvial deposit, surface soil
CH145: slope collapsed from the top of the slope and buried one lane of the road. The cause of the collapse was that the roots of trees shook by strong wind.
CH330 : Left part of the slope is weathered rock. This part is prone to rock fall.
Right part is covered by loose soil. This part is prone to slope failure



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	1

Photo sheet

Date	February 15, 2016

Photo-1 Full view. Scarps of the slope failure. After discussion between LMU and JET, structural slope protection were designed.

Photo-2 LMU commented the recent slope failure occureed by shaking of big tree by storm.

Photo-3 One another cause of the landslide is improper water treetmwent from the houses on the top of the slope.

Photo-4 Old cinema hall building wall.

Photo-5 Some houses stand on the edge of the slope.

Photo-6 Opposite side of the road is facing to the inlet and river.

Survey on Structural/Non-structural Measures

Management number	0	0	2	0	1	6	-	0	0	1

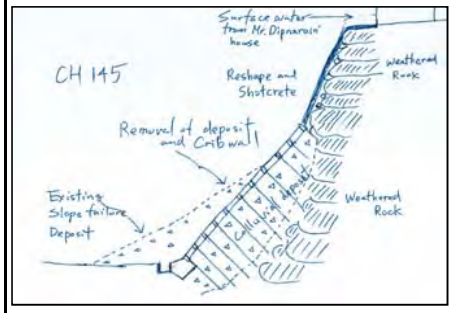
Reporter's name:	Satoru TSUKAMOTO	Date of report :	February 15, 2016

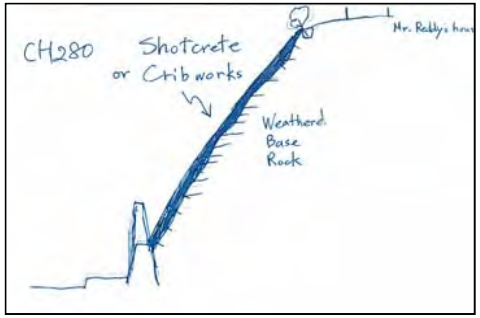
Structural Measures (Hard-Component)

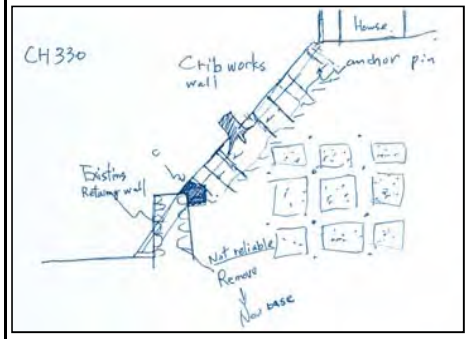
Existing landslide countermeasures

The kinds of landslide countermeasure	Number
Retainig wall on the foot of the cut slope	

[The illustration of countermeasure]







[Description]
The cut slope along the road is not stable. For the safety of the traffic, structural countermeasures are needed. The type and method of countermeasure depend on the slope condition. For the rock surface, shotcrete is suitable methods, and crib wall with soil naiis is suitable for weathered soil slope.

Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment

The kinds of Landslide Monitoring / Spec	Number

Warning Threshold

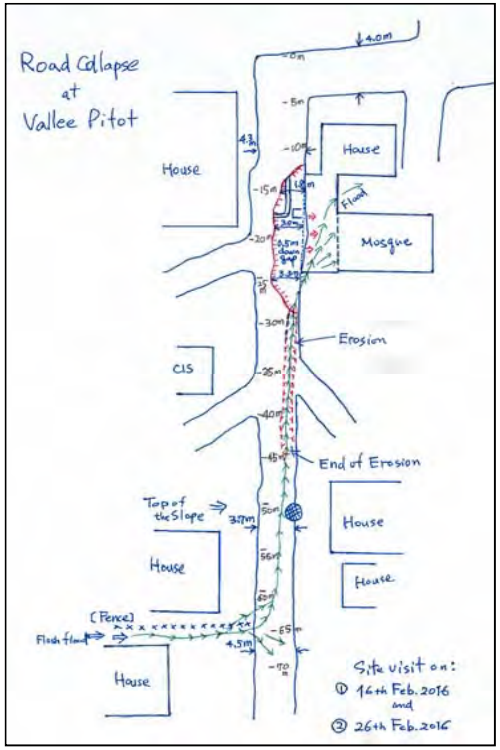
Rainfall	
Movement/displacement	
communication means	
evacuation support	One way traffic and detour

[The Photo of Monitoring Equipment]

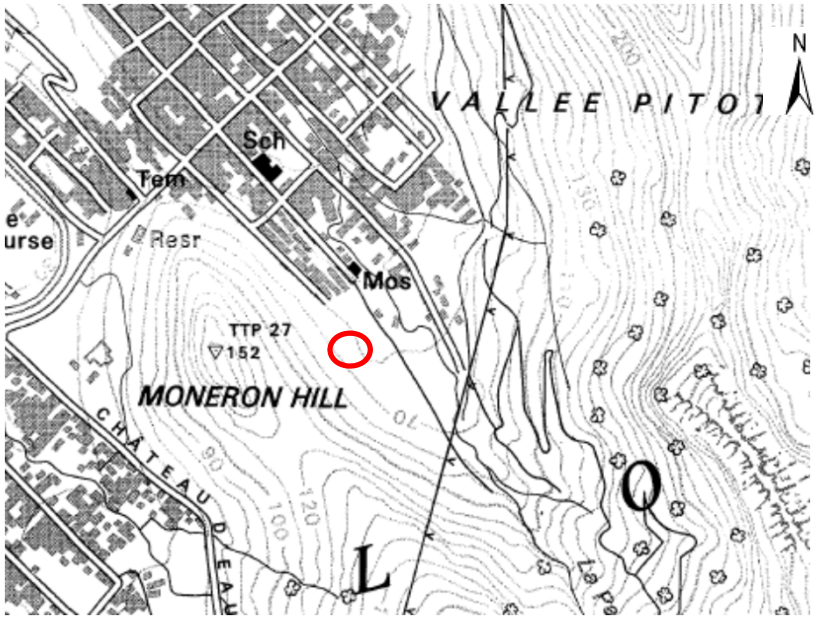
General Information Sheet (Slope)

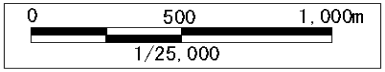
Management number	0 0 2 0 1 6 - 0 0 2	Reporter's name:	Satoru TSUKAMOTO	Date of report :	February 17, 2016
Address	Valle Pitot	Type*	Fill slope failure	Latitude	-20.102697	Longitude	57.311496

Schematic sketch

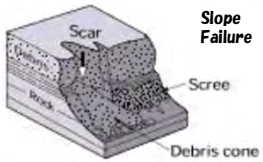
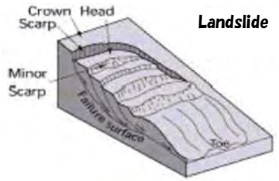


Location map （Scale: 1:25,000 ）





*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks.Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Mangement number	0	0	2	0	1	6	-	0	0	2

Evaluation sheet

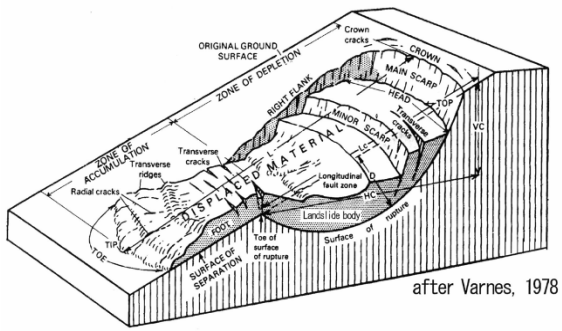
Reporter's name:	Satoru TSUKAMOTO

[Check Point]

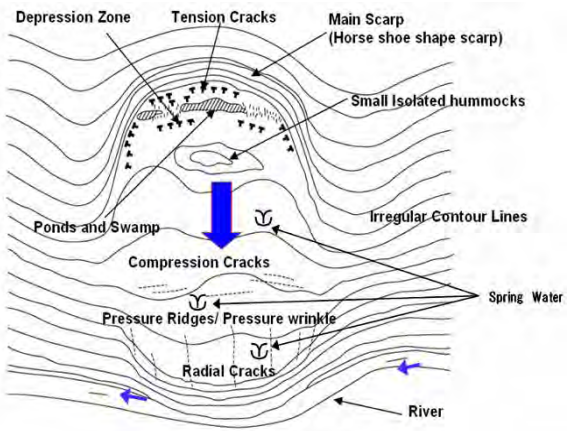
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Eembankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			✓
	Damage on construction and houses	Obvious	(Community road and fill slope colapses)	✓
		Slight	(number :)	
		None		
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious	(, 2011)	
		Slight		
		None		
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		✓
		High effect		

[Description]

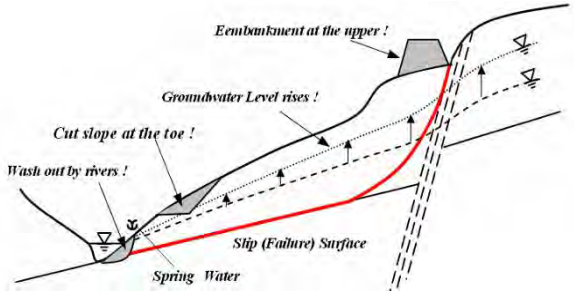
Conditions of disaster and assumed causes:
Following the rain of 9 February 2016, heavy rain again began to fall from around 2 p.m. 14 February 2016. About one hour later a flash flood of 30 cm deep occurred near a house and caused collapse of earth fill on an untarred access road. Upon receiving the request for survey, the LMU conducted on the joint survey with JICA Expert Team (JET) in the morning of 16 February 2016.
The major damage was the collapse of a block wall acting as a retaining wall and the subsidence of the access road.
The emergency was caused by the rain water gushing down from the slope behind the residential area. Water infiltrated into the nearby houses and soaked into the poorly maintained untarred access road, and hence caused an increase in earth pressure onto the simple block wall. The latter acted as a retaining wall which also formed the boundary between a small mosque and the untarred access road downstream of the site.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	2

Photo sheet

Date	February 17, 2016

Photo-1 Full view. Long term rain water infiltrated through the road surface and the earth fill was saturated. The flash flood did not flow into the damaged part. That indicates after flash flood, the wall and road were collapsed.
No leakage was observed from the sewage pipe.

Photo-2 17m long,3m wide and 0.5m deep collapse of the road

Photo-3 Damage of the concrete block wall of the mosque. The wall was inclined by lack of strength. The base of the wall was pushed up.

Photo-4 Trace of flash flood on the floor of the mosque. Drainage water system is not well developed in surrounding area.

Photo-5 Some houses stand on the edge of the slope.Trace of flash flood on the floor of the mosque. Drainage water system is not well developed in surrounding area.

Photo-6 Opposite side of the road is facing to the inlet and river.Flash flood from the slope behind the house, which flowed down to the yard and to the road.

Survey on Structural/Non-structural Measures

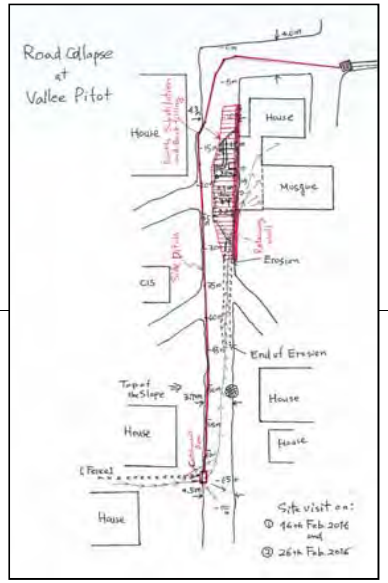
Management number	0	0	2	0	1	6	-	0	0	2

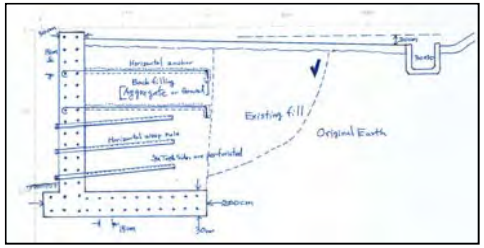
Reporter's name:	Satoru TSUKAMOTO	Date of report :	February 17, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Side ditch along the community road	
	Retainig wall on the collapsed slope	
	Watershed management	

[The illustration of countermeasure]





Recommendation for Countermeasure works
Based on the discussion with MPI on 16 February 2016 at the site, detail survey in the affected areas and discussion on the countermeasure works were conducted on 26 February.
As for countermeasure works, JET propose those written below. The whole region of Vallée Pitot has underlying problem of how to cope with rain water from the slope area behind the residential area. Therefore MPI and JICA Expert Team confirmed the necessity of overall investigation of waterways on the slope and its watershed areas and rearrangement of plans concerning river system as a long-term challenge.

Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]

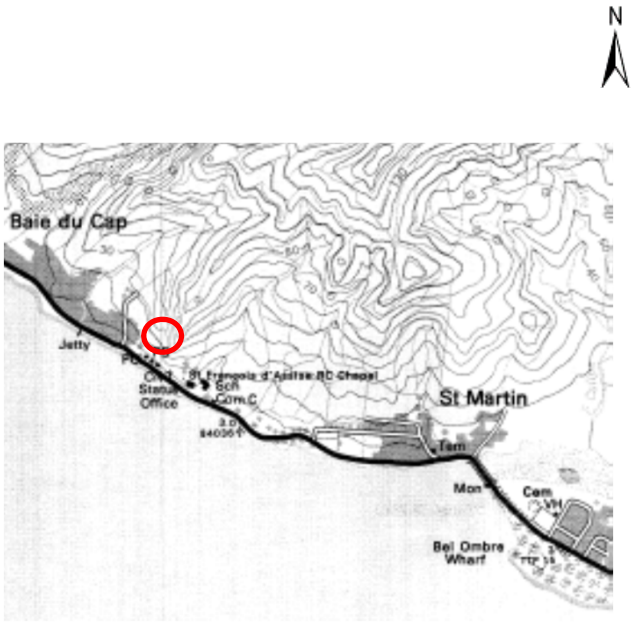
In the short/medium term, the following countermeasure works are being proposed by the JICA Expert:
・Drainage at the foot of the slope for houses near upper reaches
・Catchment boxes
・Ditch (Drainage channel) on the mountain side of the road
・Reinforced concrete retaining wall in integral structure(or masonry retaining wall for its superior workability)
・Reinforcing earth fill and groundwater removal

General Information Sheet (Slope)

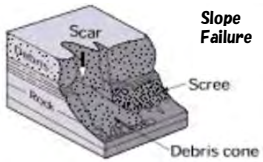
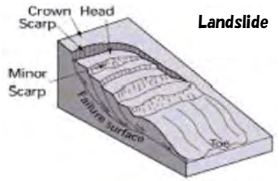
Management number	0 0 2 0 1 6 - 0 0 3	Reporter's name:	Satoru TSUKAMOTO	Date of report :	February 17, 2016
Address	Ruisseau de Creoles	Type*	Rock fall	Latitude	-20.294679	Longitude	57.230449

Schematic sketch

Location map （Scale: 1:25,000 ）



*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks.Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Mangement number	0	0	2	0	1	6	-	0	0	3

Evaluation sheet

Reporter's name :	Satoru TSUKAMOTO

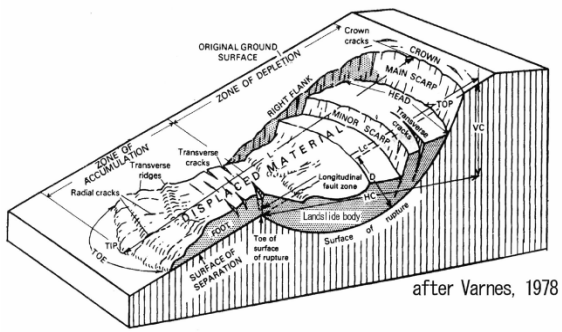
[Check Point]

	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Eembankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope colapses)	
		Slight	(number :)	✓
		None		
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious	(, 2011)	
		Slight		
		None		
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

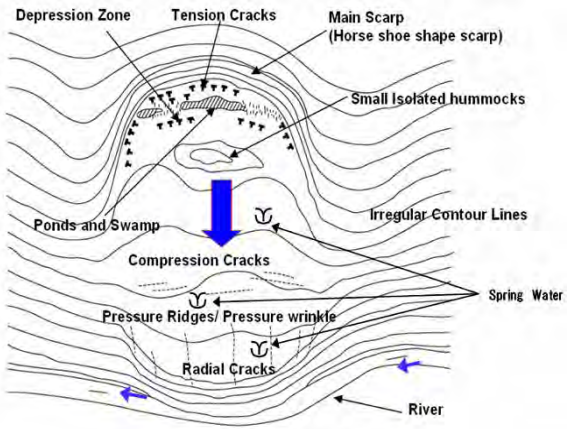
[Description]

This site is located on the south coast. The slope which is covered by forest is facing to the several houses in the village of Ruisseau de Creoles. Rocks are fallen in the back yard of the houses and many rocks in the mountain slopes. The origin of the rocks are from the sugar farmland and existed rock in the forest slope.

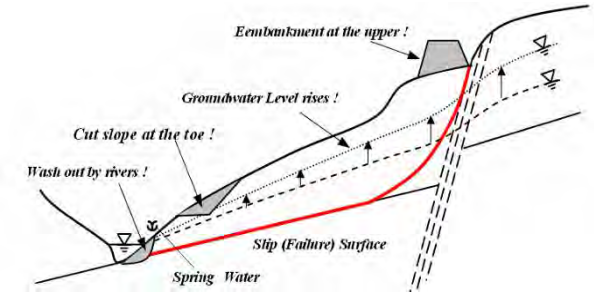
The rock fall caused by soil erosion type. By the gradual soil erosion, base of the buried rocks is exposed and become weak and finally the rock fall. The slope angle is 15 to 20 degree, so the distance of the rock fall will not be long.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	3

Photo sheet

Date	February 17, 2016

Photo-1 Rock exposed behind the houses in Ruisseau de Creoles.

Photo-2 1m to 1.5m diameter rock are observed on the slope

Photo-3 Cut slope become unstable.

Blue paint: Stablization

Red paint: Removal

Survey on Structural/Non-structural Measures

Management number	0	0	2	0	1	6	-	0	0	3

Reporter's name:	Satoru TSUKAMOTO	Date of report :	February 17, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Rock removal and stabilization	

[The illustration of countermeasure]

Major countermeasures are as below;
1 Removal of unstable rocks(Large rocks shall be broken)
2 Unmovable rock shall be stabilized.
3 Dangerous houses need to relocate.
4 No cutting trees on the slope.

Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

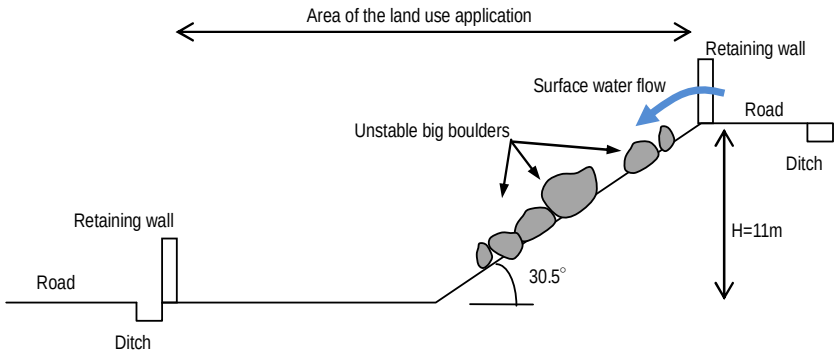
Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]

General Information Sheet (Slope)

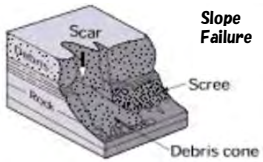
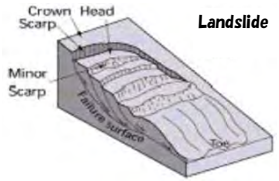
Management number	0 0 2 0 1 6 - 0 0 4			Reporter's name:	Tomoharu IWASAKI	Date of report :	March 15, 2016
Address	Coromandel, land of Mr. H. Phutully	Type*	Slope failure and Rock Fall	Latitude	20°11'33.54"S	Longitude	57°28'21.61"E

Schematic sketch



Location map （Scale: 1:25,000)

*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	0	4

Evaluation sheet

Reporter's name :	Tomoharu IWASAKI

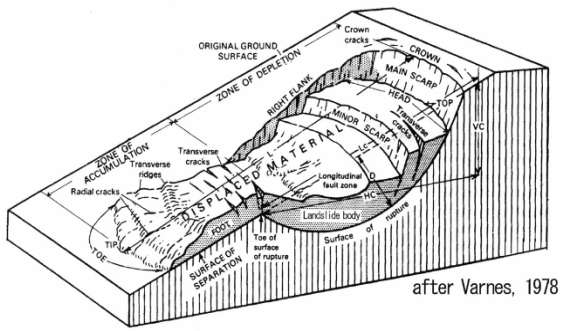
[Check Point]

	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

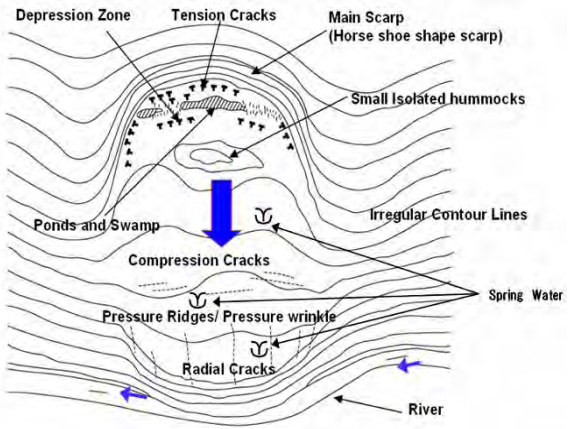
[Description]

Because an application for building and land use permit was submitted by Mr. H. Phutully, JICA Expert & MPI/LMU conducted site observation on 15th March 2016 for the land use of Mr. H. Phutully, at Coromandel. The observations are as follows:-

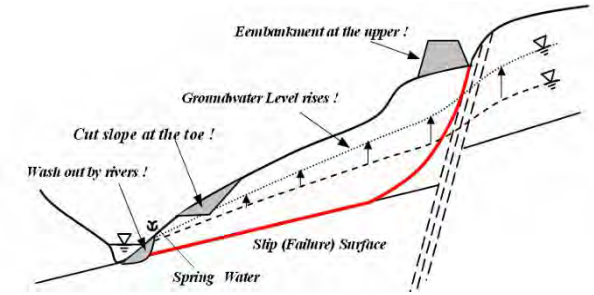
> This site is near to the river, and it is included a steep slope located to the river terrace cliff in this site.
> This land consist of a steep slope (more than 30 degrees) and a plane area.
> There are many unstable big boulders in the steep slope. It is expected that damage due to destructive rockfall may occur in the future.
> During rainfalls, it is known that some surface water flows into this land from an upper road.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	4

Photo sheet

Date	March 15, 2016

Full view of the site

Unstable big boulders in the steep slope

The view of the upper road

Survey on Structural/Non-structural Measures

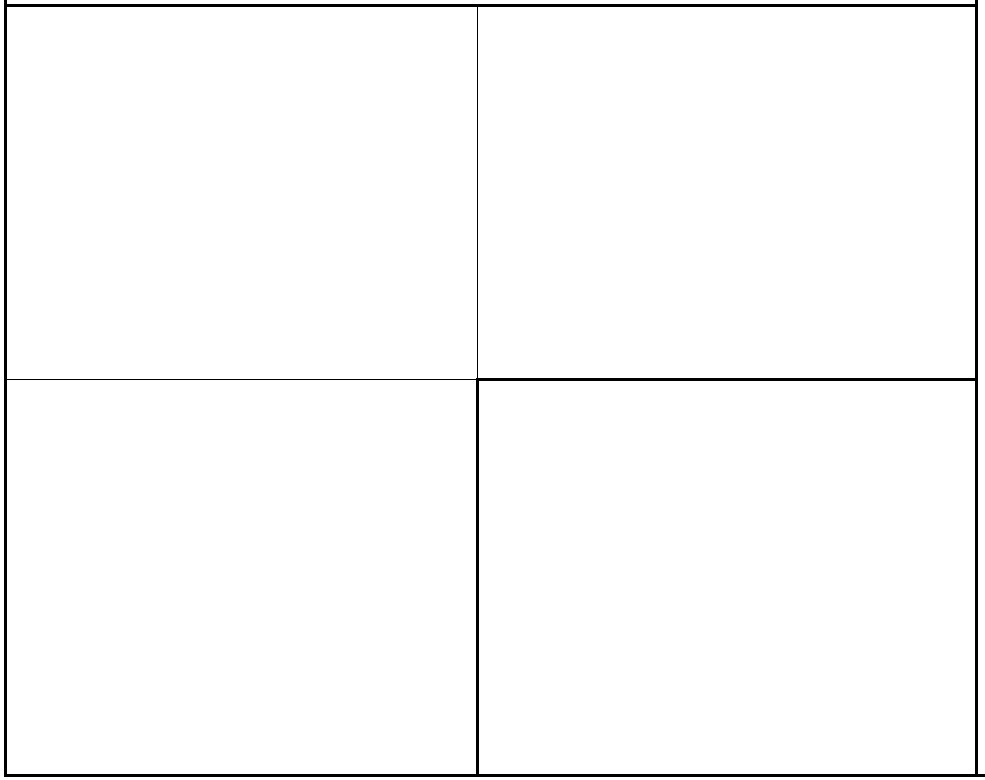
Management number	0	0	2	0	1	6	-	0	0	4

Reporter's name:	Tomoharu IWASAKI	Date of report :	March 15, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

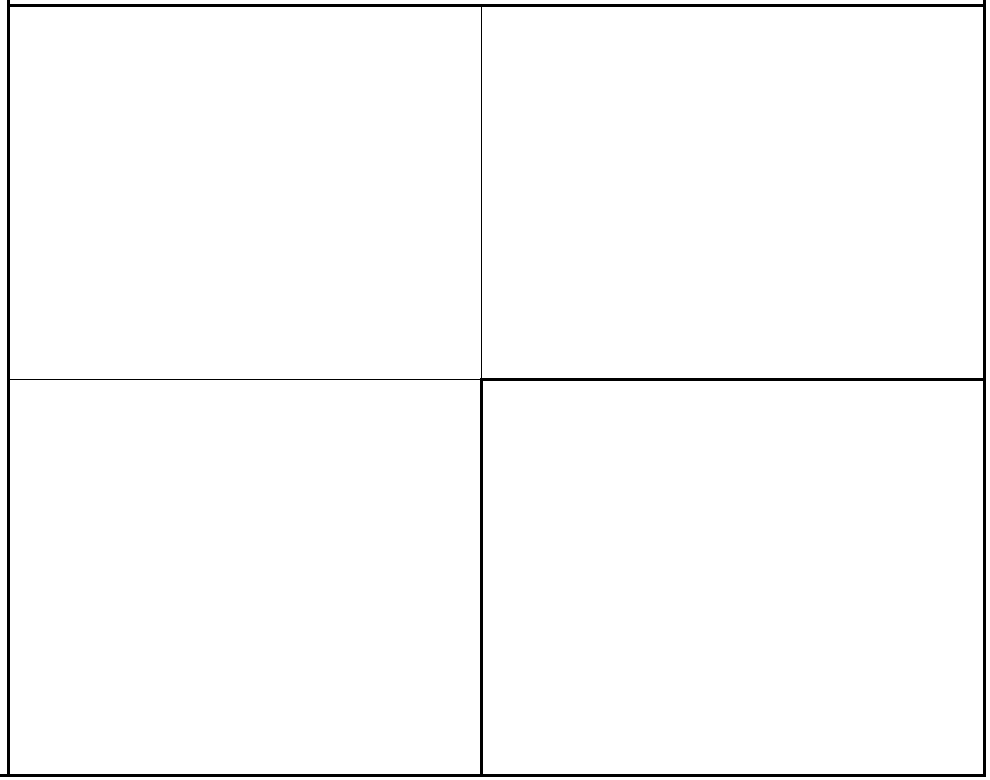


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

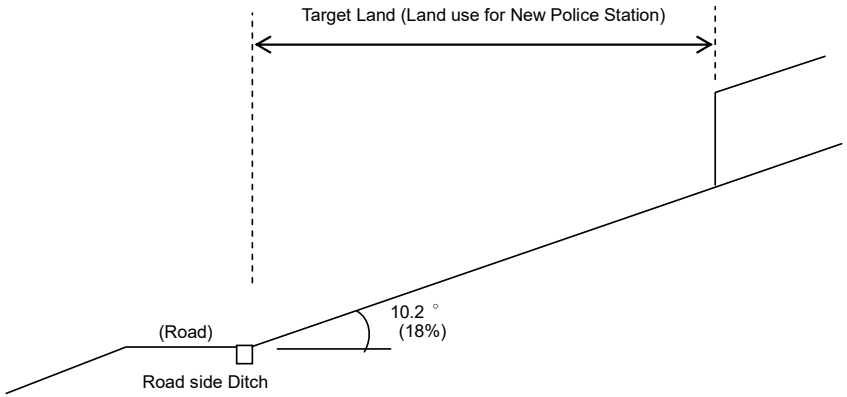
[The Photo of Monitoring Equipment]



General Information Sheet (Slope)

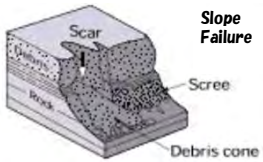
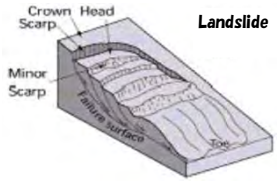
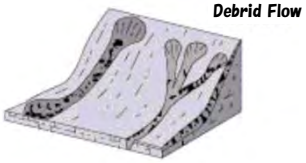
Management number	0 0 2 0 1 6 - 0 0 5			Reporter's name:	Tomoharu IWASAKI	Date of report :	March 24, 2016
Address	New Police Station at Valle Pitot	Type*	Slope failure and debris flow	Latitude	-20.168526°	Longitude	'57.516272°

Schematic sketch



Location map （Scale: 1:25,000)

*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	0	5

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

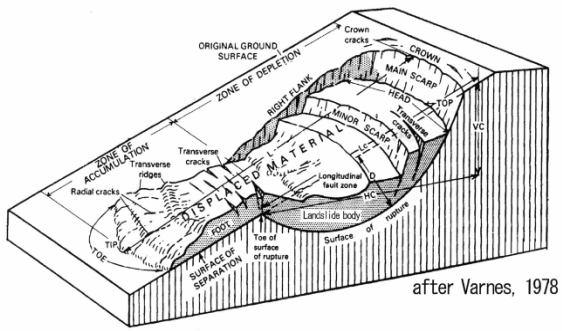
[Check Point]

Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)		
	Transverse Cracks (Tension or Compression)		
	Pond and Swamp		
	Spring Water		
	Topography with the Step		
	Embankment at the upper		
	Cut Slope at the toe		
	Wash out by rivers		
	Damage on construction and houses	Obvious (Community road and fill slope collapses)	
		Slight (number :)	
		None	✓
	Monitoring Equipment	There is it (name:)	
		There is it (name: , number:)	
		none	✓
History	Existing record of Landslide (documents or patrimony)	Obvious	
		Slight	
		None	✓
Countermeasure	There is no Countermeasure		✓
	Effectiveness of Countermeasure	No effect	
		Some effect (Retaining wall)	
		High effect	

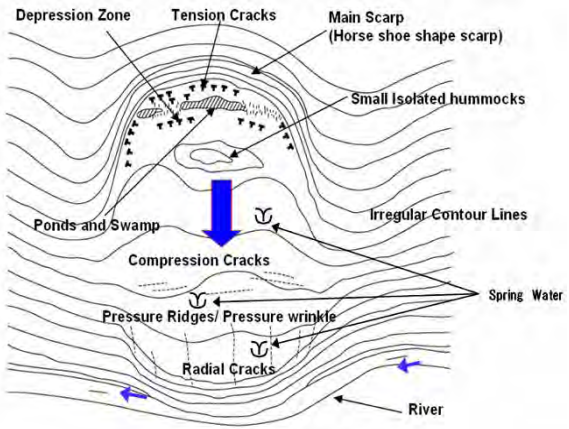
[Description]

Because the Police plans New Police Station at Valle Pitot, MPI and JICA Expart conducted a site visit on24th March 2016. The observations are as follows:-

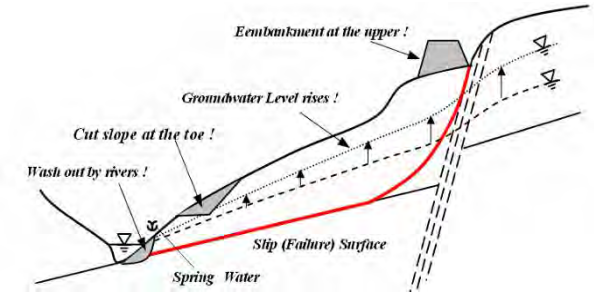
> The geological feature of the surface is colluvium, and the surface angle is gentle.
> The damage by the landslide is not found on a house and a road surface around this land. This land does not seem to be included in the landslide area.
> The surface angle of this land is 10.2 degrees (18%).



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	5

Photo sheet

Date	March 24, 2016

Full view of the site

Existing Drainage of Road Side
No damage by landslide is found on the existing open drains.

The damage by the landslide is not found on open drain behind a school.

Survey on Structural/Non-structural Measures

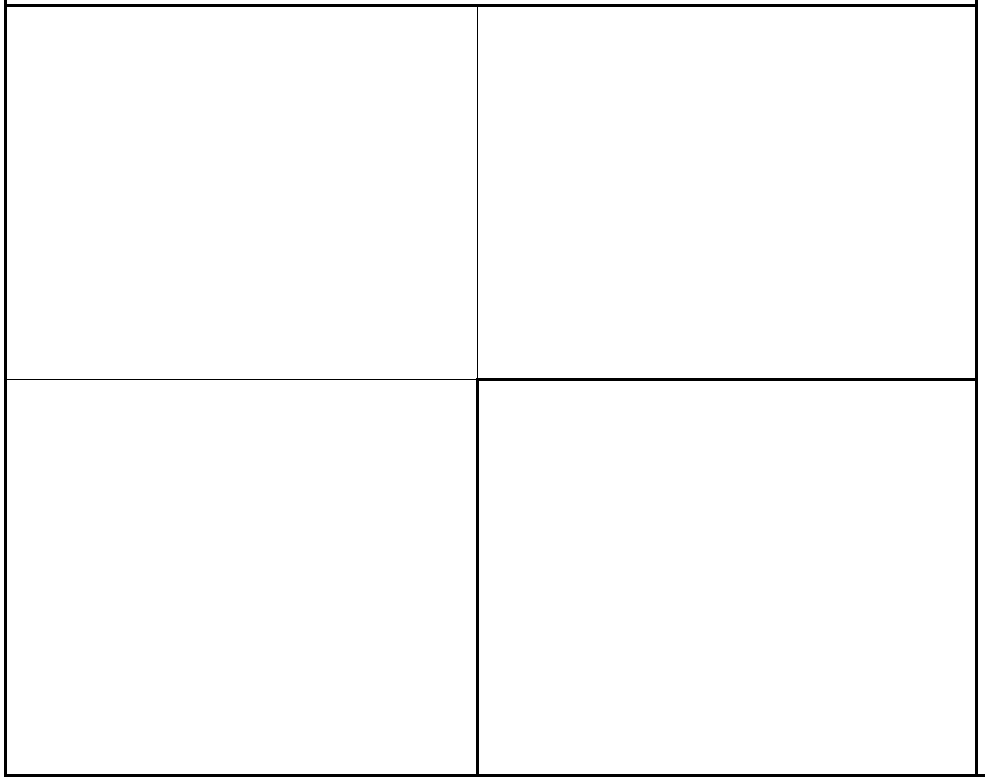
Management number	0	0	2	0	1	6	-	0	0	5

Reporter's name:	Tomoharu IWASAKI	Date of report :	March 24, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

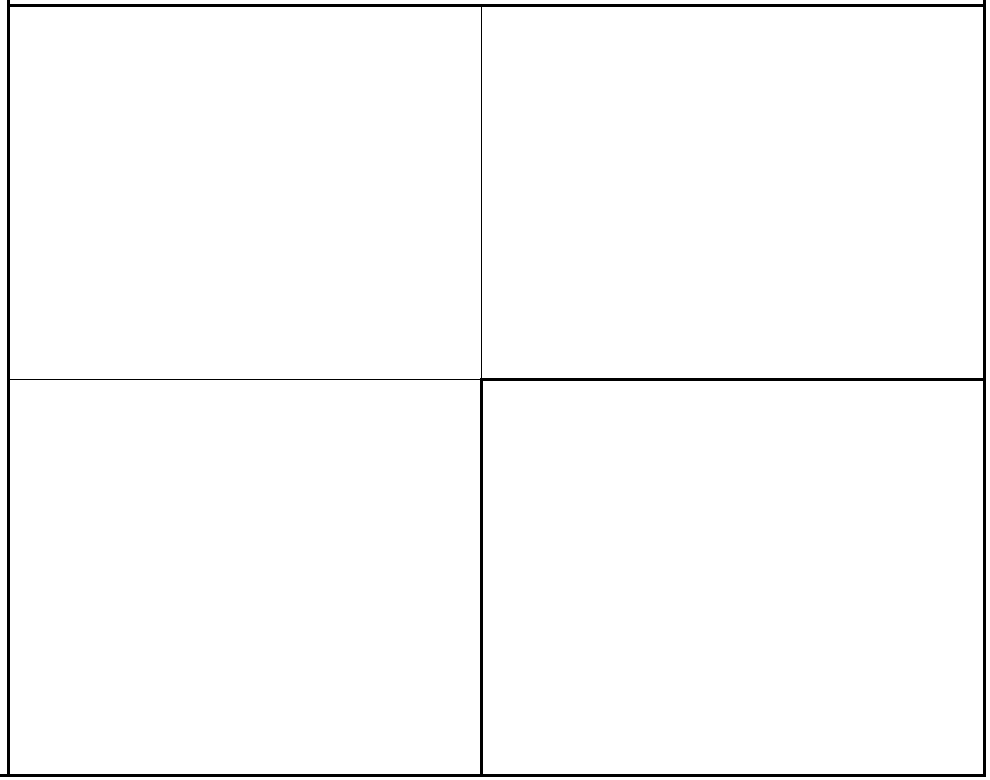


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

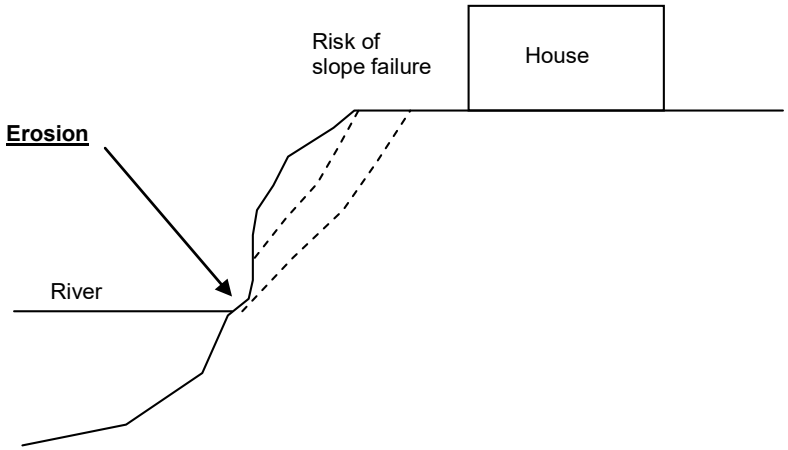
[The Photo of Monitoring Equipment]



General Information Sheet (Slope)

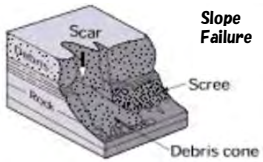
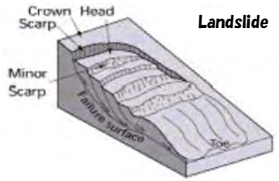
Management number	0 0 2 0 1 6 - 0 0 6			Reporter's name:	Tomoharu IWASAKI	Date of report :	March 29, 2016
Address	Kewal Nagar Belle Rive at Shavala Road	Type*	Slope failure of the river banks	Latitude	-20.311269°	Longitude	57.726740°

Schematic sketch



Location map （Scale: 1:25,000)

*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	0	6

Evaluation sheet

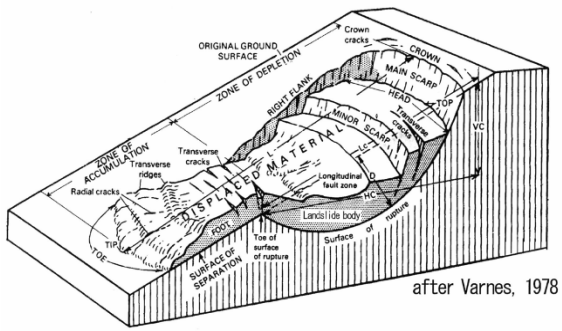
Reporter's name:	Tomoharu IWASAKI

[Check Point]

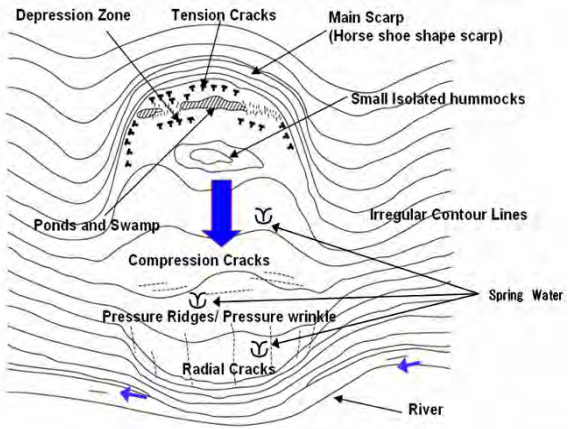
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			✓
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			✓
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

[Description]

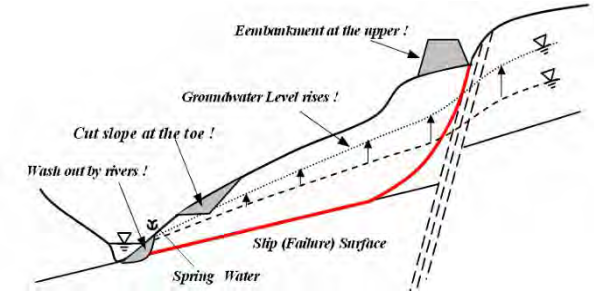
Because the slope failure behind the house was informed by inhabitants, JICA Expert & MPI/LMU conducted site observation on 29th March 2016. The observations are as follows:
> There is a river behind a house, and the phenomenon of this site is slope failure of the river banks.
> Erosion at the bottom on the slope behind the house has been progressed so that it will affect the houses along the riverside.
> We would like to conclude that there is still risk of erosions by the river so that countermeasures are needed in the area.
> In order to prevent the further erosion of the slope and collapse of the houses in the area, the gabions should be installed along the riverside.
> The detailed investigation in the area should be needed to decide the width and length of the countermeasures.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

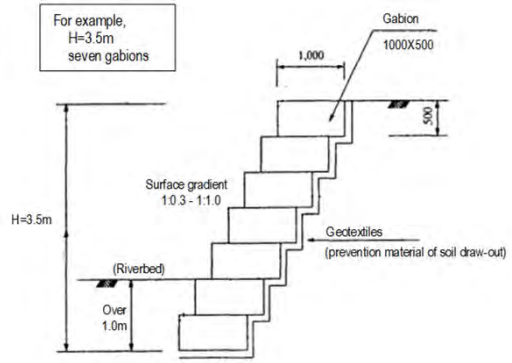
Management Number	0	0	2	0	1	6	-	0	0	6

Photo sheet

Date	March 29, 2016

Full view of the site

Unstable river bank slope behaind a house



Example of countermeasure, gabion according to a Japanese standard

Survey on Structural/Non-structural Measures

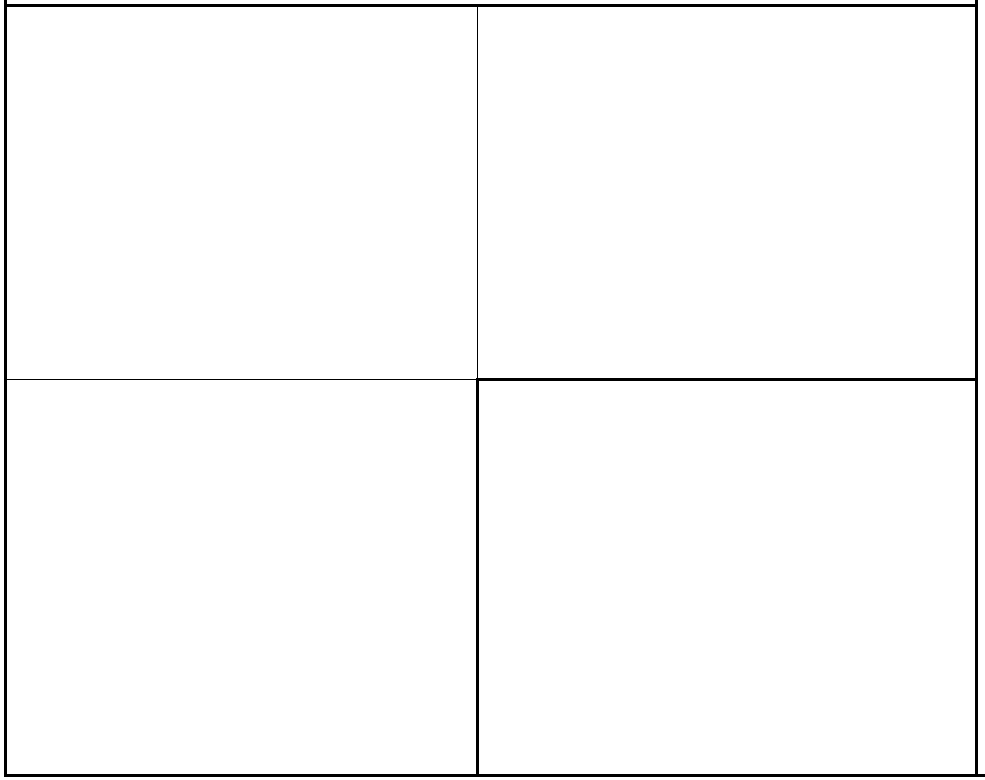
Management number	0	0	2	0	1	6	-	0	0	6

Reporter's name:	Tomoharu IWASAKI	Date of report :	March 29, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

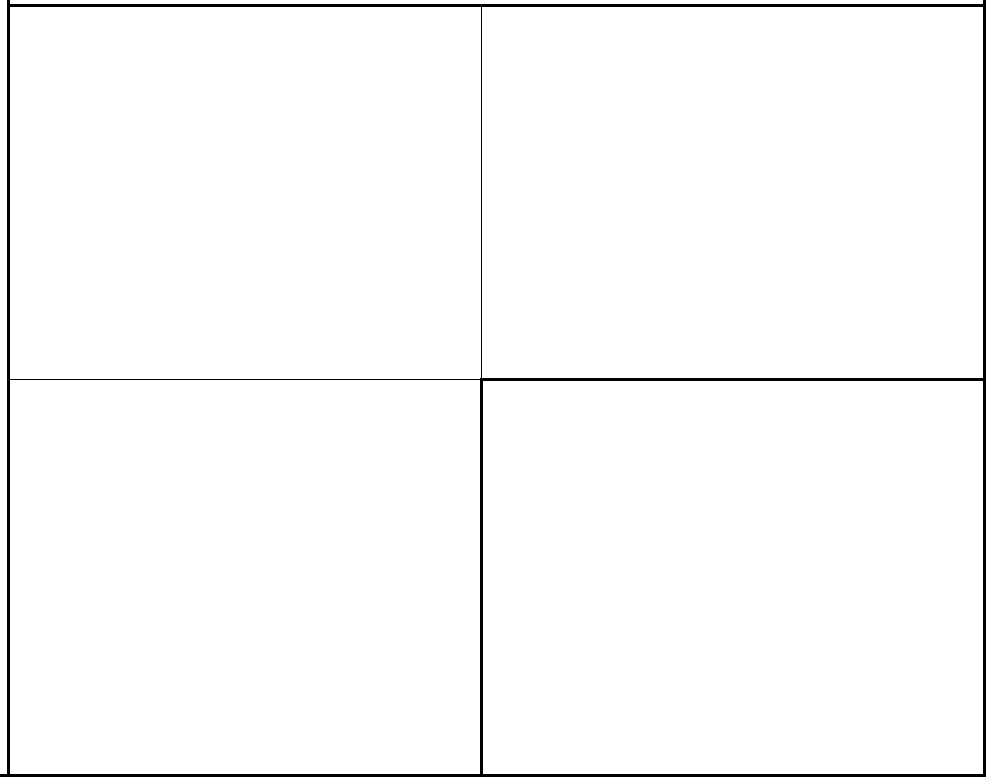


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

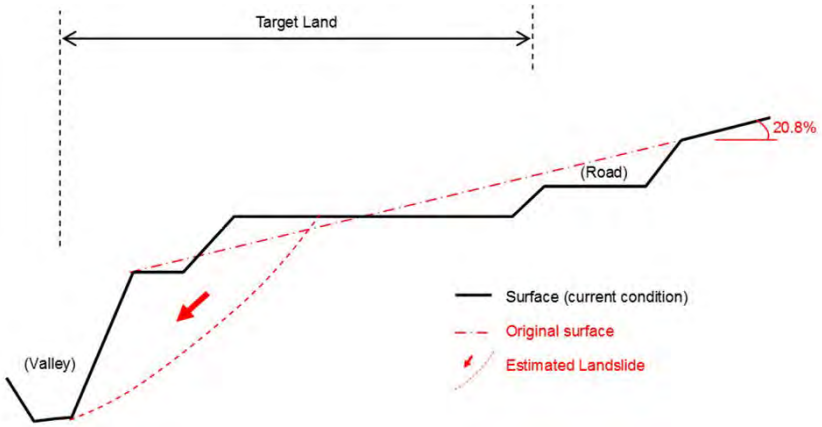
[The Photo of Monitoring Equipment]



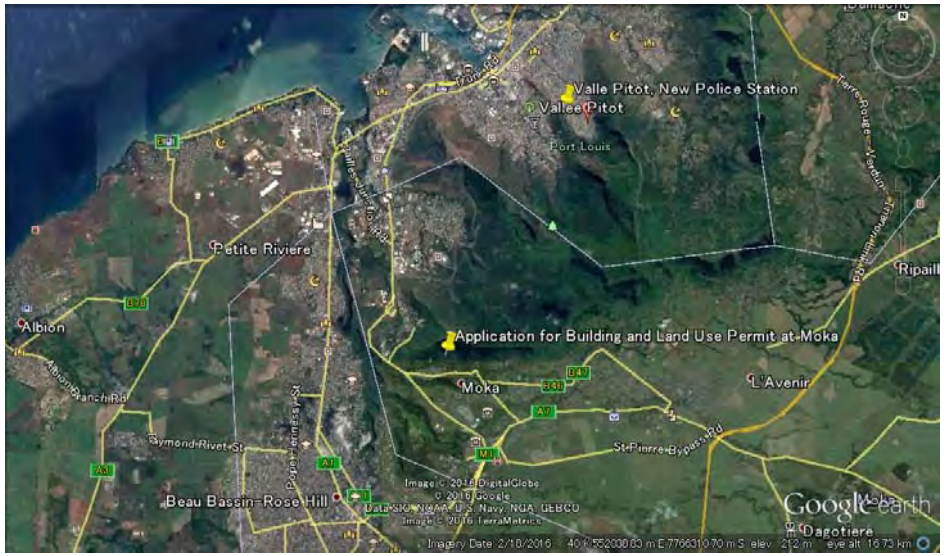
General Information Sheet (Slope)

Management number	0 0 2 0 1 6 - 0 0 7			Reporter's name:	Tomoharu IWASAKI	Date of report :	March 29, 2016
Address	Application for Building and Land Use Permit at Moka	Type*	Slope failure and RockFall	Latitude	-20.214106°	Longitude	57.492765°

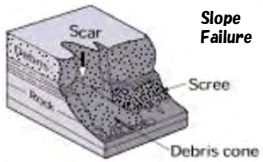
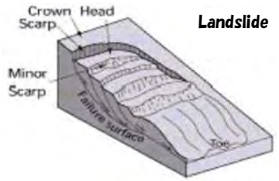
Schematic sketch



Location map （Scale: 1:25,000)



*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	0	7

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

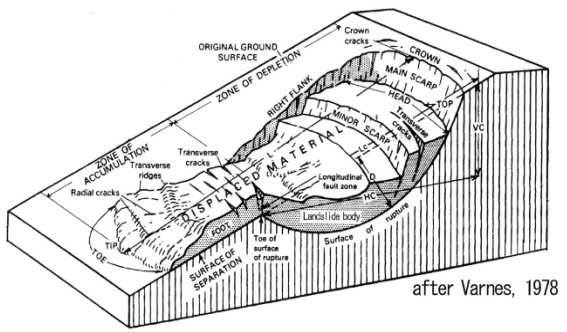
[Check Point]

Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)		
	Transverse Cracks (Tension or Compression)		
	Pond and Swamp		
	Spring Water		
	Topography with the Step		
	Embankment at the upper		
	Cut Slope at the toe		
	Wash out by rivers		
	Damage on construction and houses	Obvious (Community road and fill slope collapses)	
		Slight (number :)	
		None	✓
	Monitoring Equipment	There is it (name:)	
		There is it (name: , number:)	
		none	✓
History	Existing record of Landslide (documents or patrimony)	Obvious	
		Slight	
		None	✓
Countermeasure	There is no Countermeasure		✓
	Effectiveness of Countermeasure	No effect	
		Some effect (Retaining wall)	
		High effect	

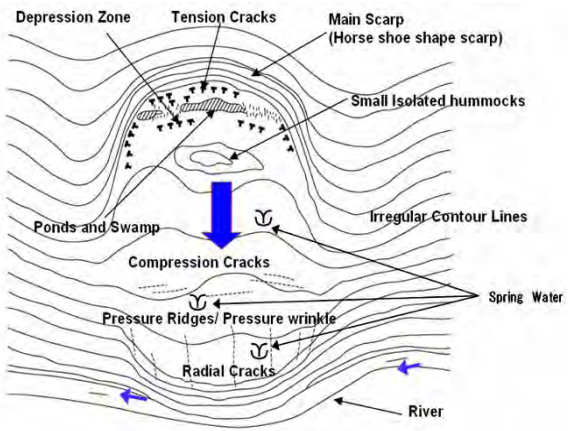
[Description]

Because an application for building and land use permit was submitted at Moka, JICA Expert & MPI/LMU conducted site observation on 29th March 2016. The observations are as follows:-

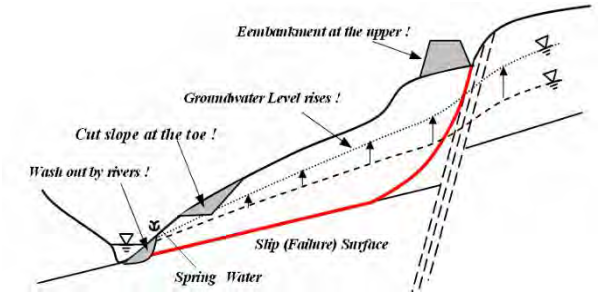
> The geological feature of the surface is colluvium, and the original surface angle of this land is over 20%.
> The activity of a new landslide is estimated on the valley side of this land.
> The very steep mountain slope is very near to this land, and there is the risk of the rock fall disaster.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	7

Photo sheet

Date	March 29, 2016

Full view of the site

The damage by the landslide is not found on open drain behind a school.

Survey on Structural/Non-structural Measures

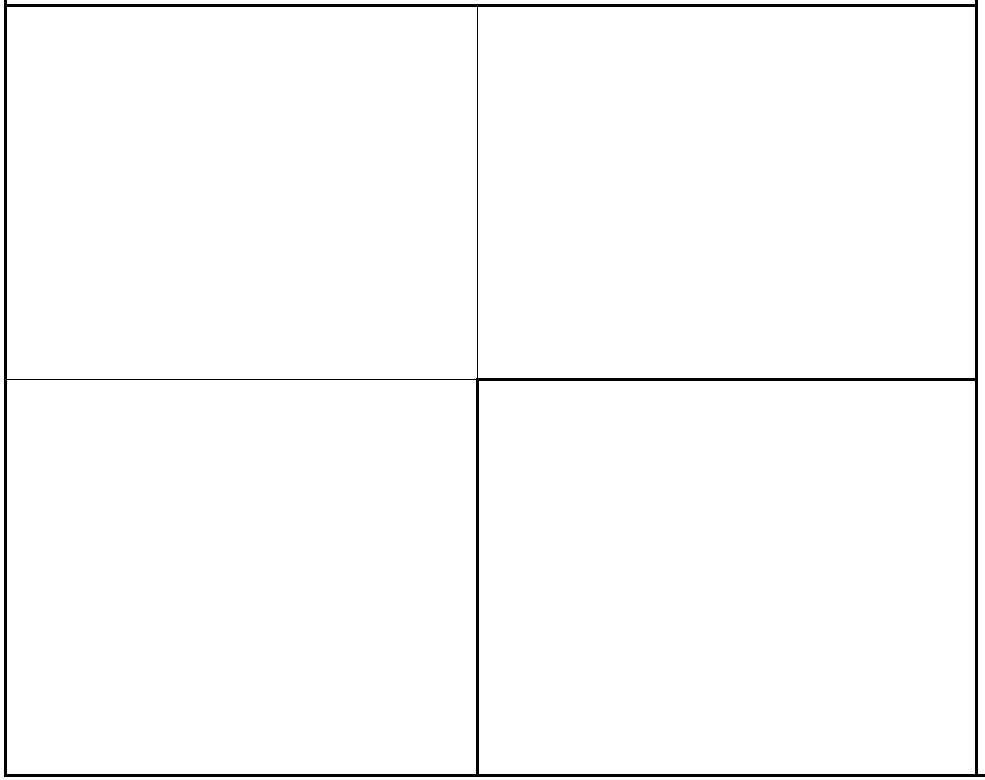
Management number	0	0	2	0	1	6	-	0	0	7

Reporter's name:	Tomoharu IWASAKI	Date of report :	March 29, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

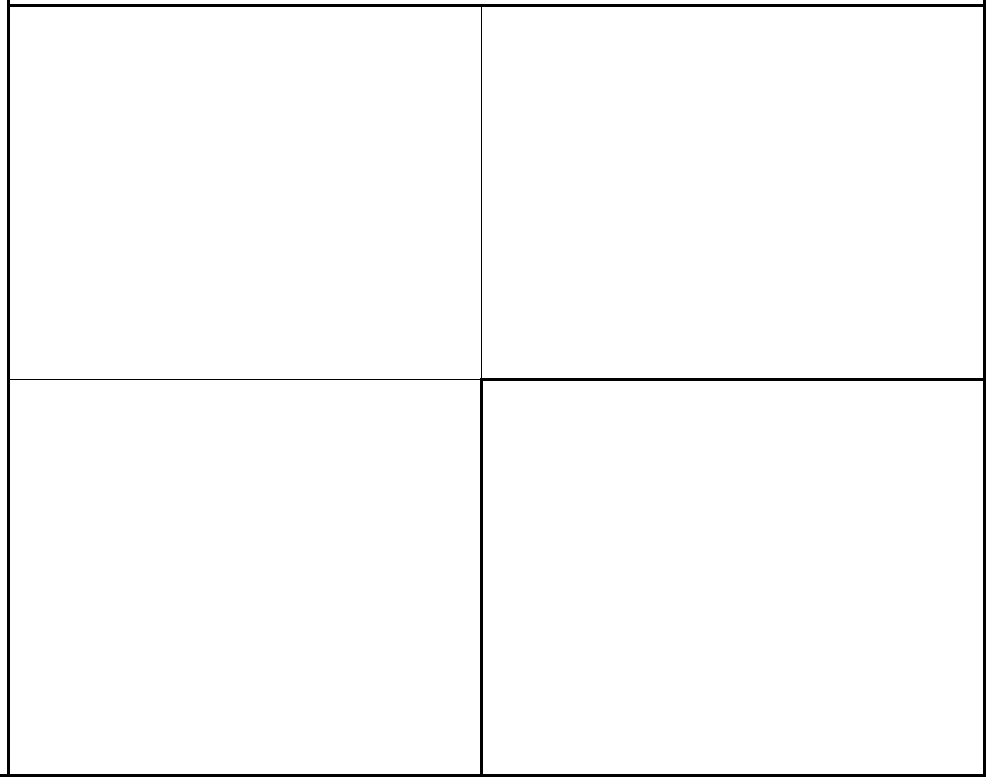


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]

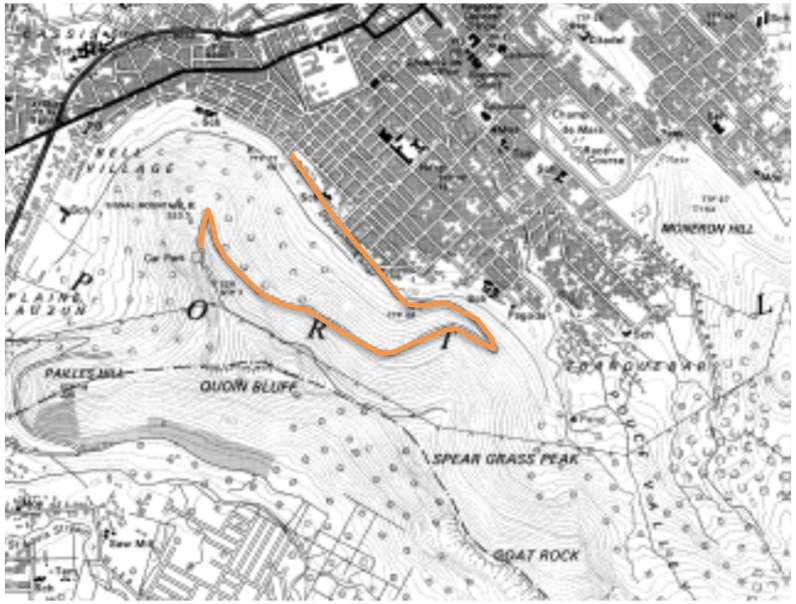


General Information Sheet (Slope)

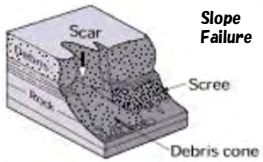
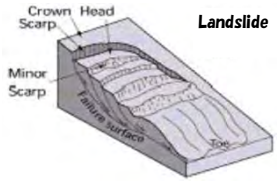
Management number	0 0 2 0 1 6 - 0 0 8	Reporter's name:	Satoru TSUKAMOTO	Date of report :	June 27, 2016
Address	Signal Mountain	Type*	Rock fall	Latitude	-20.102697	Longitude	57.311496

Schematic sketch

Location map （Scale: 1:25,000)



*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	0	8

Evaluation sheet

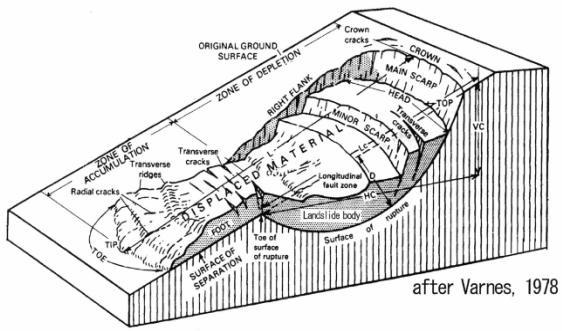
Reporter's name :	Satoru TSUKAMOTO

[Check Point]

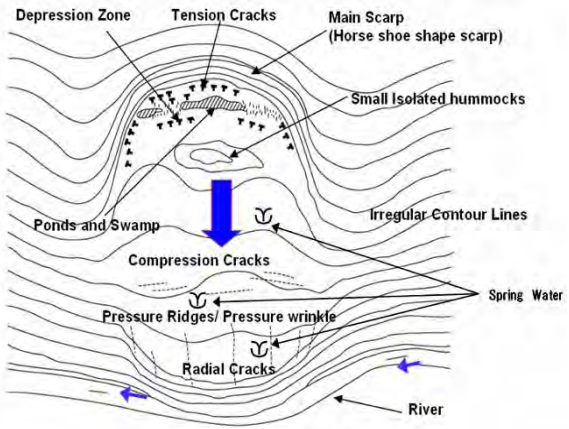
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	✓
		Slight	(number :)	
		None		
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		✓
		Slight		
		None		
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		✓
		High effect		

[Description]

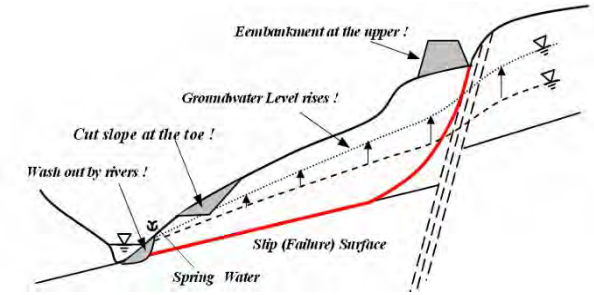
Signal Mountain(323m) is located in the south west of Port Luis.This road is managed by the Ministry of Environment, for the use of hiking and running for citizens and maintenance vehicles for communication and telephone service, ordinary use for vehicles are restricted.
Road is prone to rock falls, subsidence of road surface and debris flow. Ministry of Environment requested to LMU to investigate the situation of road and its facilities and slope problems. MPI/LMU requested to JET to investigate in detail and discuss on the countermeasure works. The length of road section for investigation is approximately 3km, and almost all section are dangerous for rock fall and debris flow. After the wildfire in early June 2016, many unstable rocks were exposed and prone to occur debris flow at the time of rain.
Some shoulder parts of road were damaged by subsidence. And three culverts were damaged by erosion.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	8

Photo sheet

Date	June 27, 2016

Photo-1 Full view from lowest part.All section of the road is on the slope. Wide area is burned by wild fire.

Photo-2 Full view from the road end.All section of the road is on the slope. Wide area is burned by wild fire.

Photo-3 Slightly cut slope. Many unstable rocks can be seen. No barrier exists on the slope to the road.

Photo-4 Base of the culvert was eroded and culvert is hanging. LTU and JET proposed to be replaced by strong one unit calvert and filling sufficient concrete base.

Photo-5 Cut slope with overhang. Middle part of the cut slope is cracky basalt. That part has been eroded selectively, and consequently, slope become over hang. The slope is planed to protect by fixing concrete.

Photo-6 Rolling stones are fell into the drainage.

Survey on Structural/Non-structural Measures

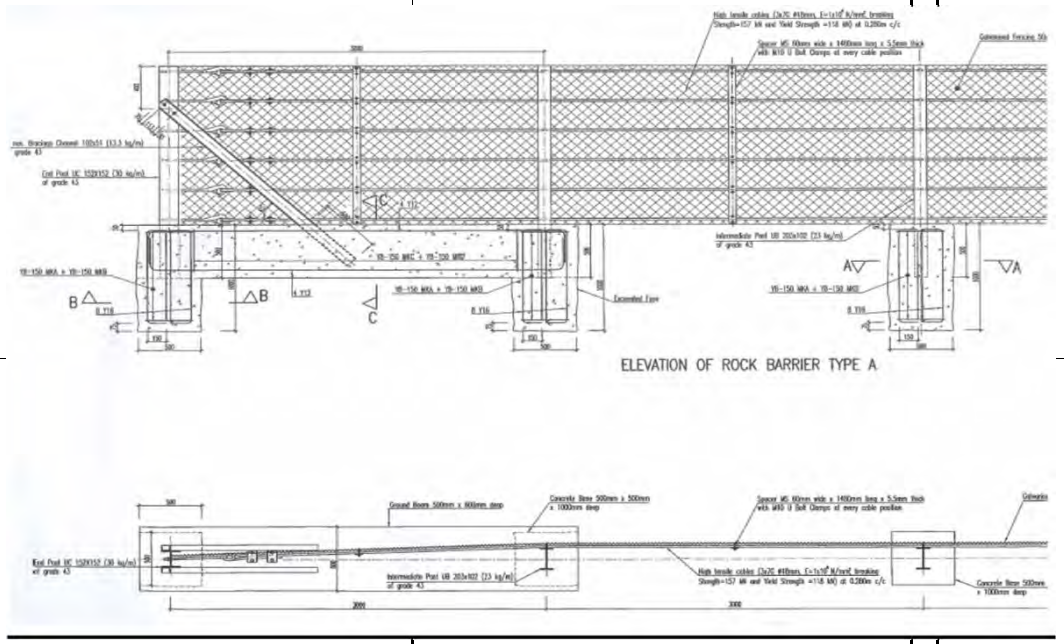
Management number	0	0	2	0	1	6	-	0	0	8

Reporter's name:	Satoru TSUKAMOTO	Date of report :	June 27, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]



Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

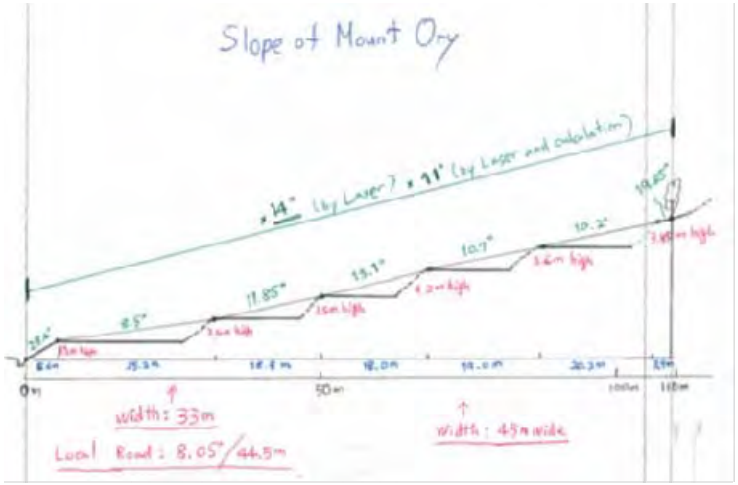
Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]

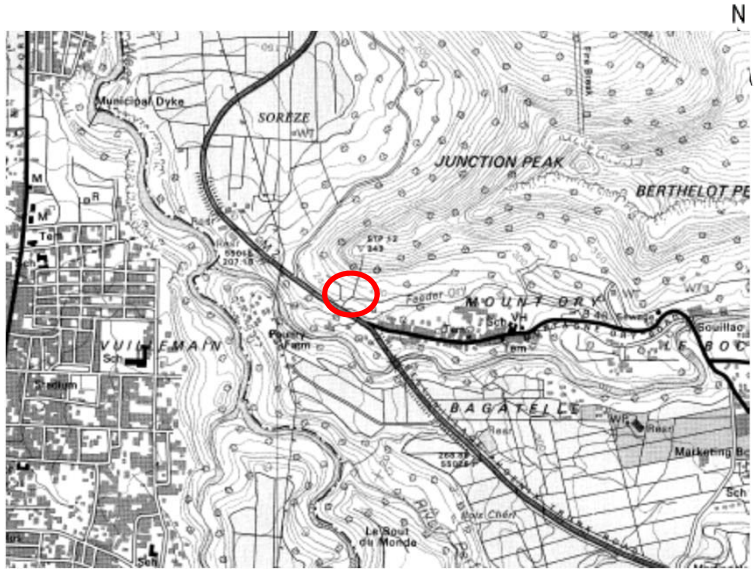
General Information Sheet (Slope)

Management number	0 0 2 0 1 6 - 0 0 9			Reporter's name:	Satoru TSUKAMOTO	Date of report :	June 30, 2016
Address	Mount Ory	Type*	Slope failure and debris flow	Latitude	-20.125869	Longitude	57.290177

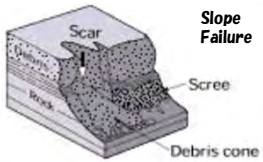
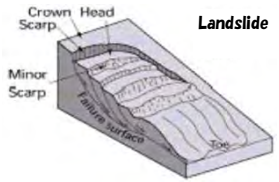
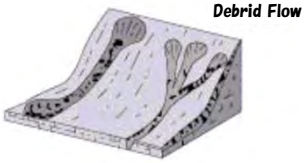
Schematic sketch



Location map （Scale: 1:25,000 ）



*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	0	9

Evaluation sheet

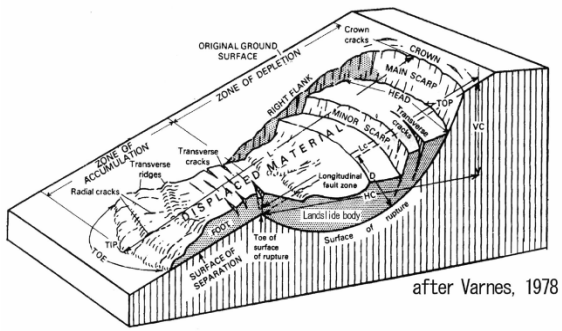
Reporter's name :	Satoru TSUKAMOTO

[Check Point]

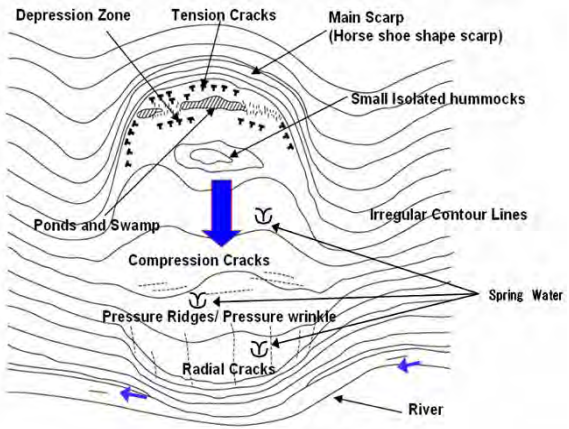
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

[Description]

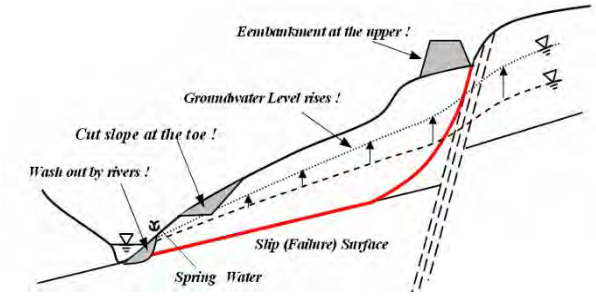
This slope is facing to the Motorway 1(M1) between Port Luis-Phoenix. This slope have been developed without permission by the District Office of Moka. This slope is talus with colluvial deposit from the Mount Ory. The materials on the land is the soil of clayey matrix with boulders. This development area is approximately 150m long and 50m wide and the area is terraced of 5 stages. The gradient of the slope is about 20%(The date of the initial survey, 30th June 2016), The land development is underway by heavy machine. In case of heavy rain, surface materials would be eroded and mud flow would occure. The distance between the land and M1 is very close to reach the mud flow.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	0	9

Photo sheet

Date	June 30, 2016

Photo-1 Upper slope of development area. Trees are all cut and muddy surface is exposed.

Photo-2 Middle of the development area is flattened.

Photo-3 Lower part of the development area. Drainage of the road and slope are buried by debris.

Photo-4 Development area is very close to the M1.

Survey on Structural/Non-structural Measures

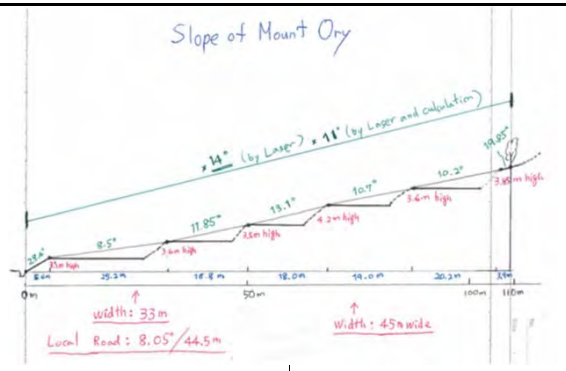
Management number	0	0	2	0	1	6	-	0	0	9

Reporter's name:	Satoru TSUKAMOTO	Date of report :	June 30, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]



Development is controled by PPG, detail survey should be carried out by authorised surveyer to confirm the slope gradient .

Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

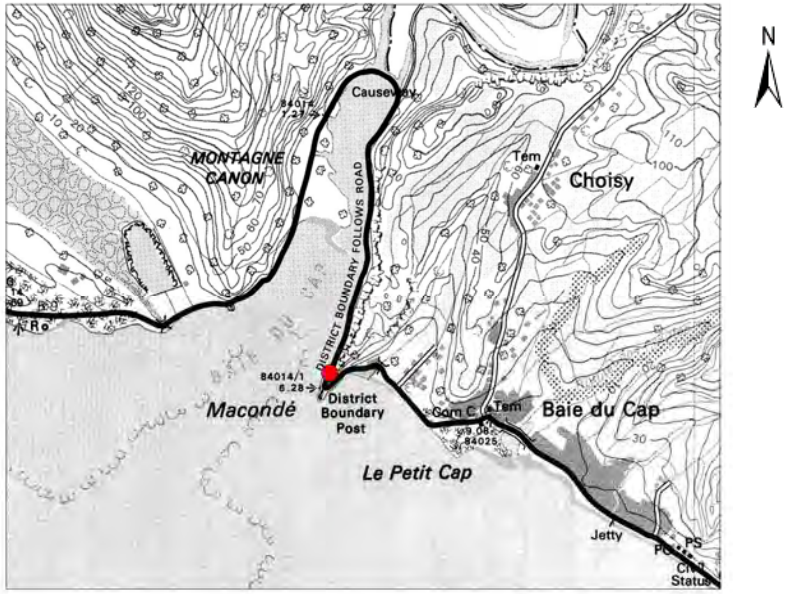
[The Photo of Monitoring Equipment]

General Information Sheet (Slope)

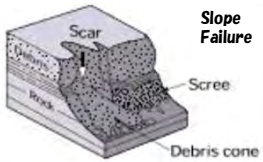
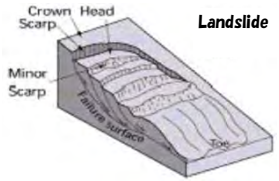
Management number	0 0 2 0 1 6 - 0 1 0	Reporter's name :	Satoru TSUKAMOTO	Date of report :	July 18, 2016
Address	Maconde	Type*	Rock fall	Latitude	-20.292679	Longitude	57.221680

Schematic sketch

Location map （Scale: 1:25,000 ）



* **Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	0

Evaluation sheet

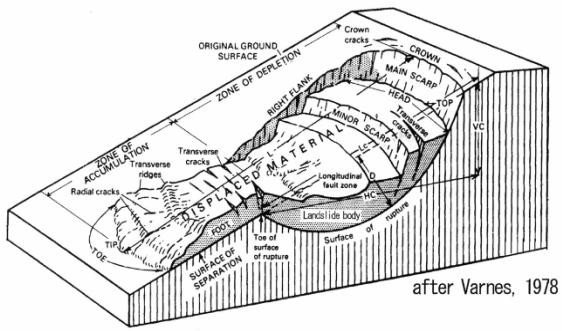
Reporter's name :	Satoru TSUKAMOTO

[Check Point]

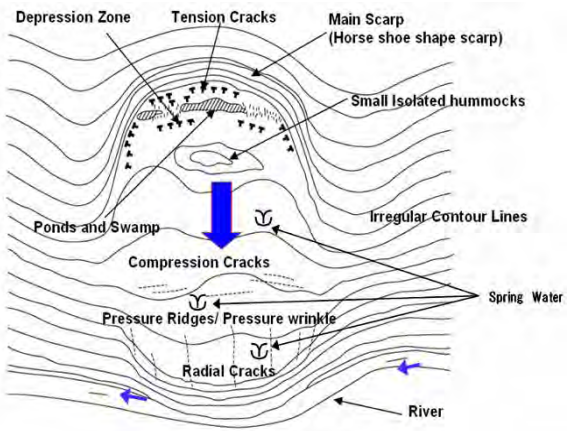
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

[Description]

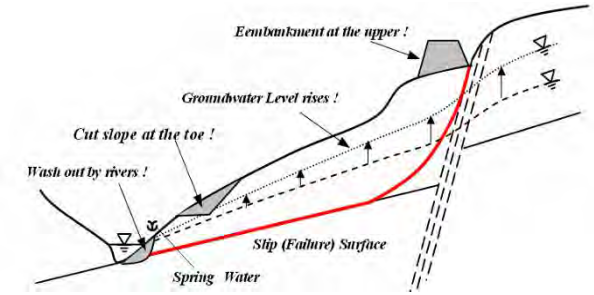
This slope is located at the cape of Mocande on the south coast of the island.
The slope(cliff) consist of hard basalt lava and the layers of crinker. Many cracks develop on the surface of the hard lava layers. Most of the rock fall were from the basalt part cliff. In July and August 2014, RDA carried out the work of rock removal which were unstable and close to the road. A new road(shift of alignment) was built to reduce the damage from rock falls. However, rock falls and small rock failures are also a frequent occurrence along the new road. The rocks are weathered, and there is a high possibility of rock fall in future.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	0

Photo sheet

Date	July 18, 2016

Photo-1 Total view of the Cape Mocande.

Photo-2 West site of the cliff

Photo-3 East side of the cliff. Road alignment was shifted away from the cliff

Photo-4 Rock fall fence and warnig sign

Photo-5 JICA visited the site on 11th Feb.2016

Photo-6 Tokyo Rope visited the site and surveyed about countermeasures on 18th Jul.2016.

Survey on Structural/Non-structural Measures

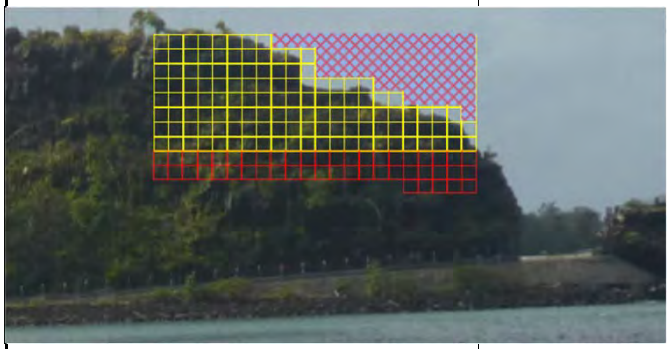
Management number	0	0	2	0	1	6	-	0	1	0

Reporter's name:	Satoru TSUKAMOTO	Date of report :	July 18, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Rock Netting	
	Rock Fencing	

[The illustration of countermeasure]



Covering the cliff by rock net and protect the road by rock fence

Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number
	Sign board for traffic	

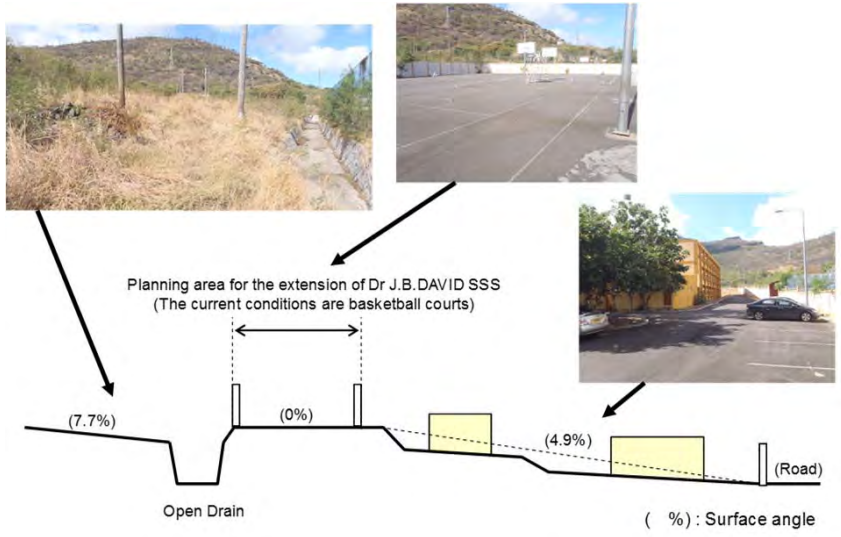
Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]

General Information Sheet (Slope)

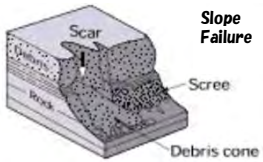
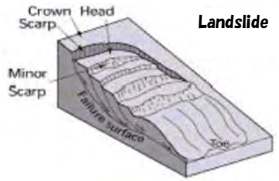
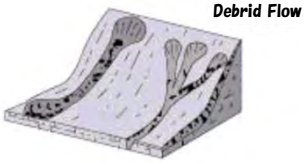
Management number	0 0 2 0 1 6 - 0 1 1			Reporter's name:	Tomoharu IWASAKI	Date of report :	July 22, 2016
Address	Dr J.B.DAVID SSS at Bell Village	Type*	Slope failure	Latitude	20°10'30.86"S	Longitude	57°29'4.75"E

Schematic sketch



Location map （Scale: 1:25,000)

* **Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	1

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

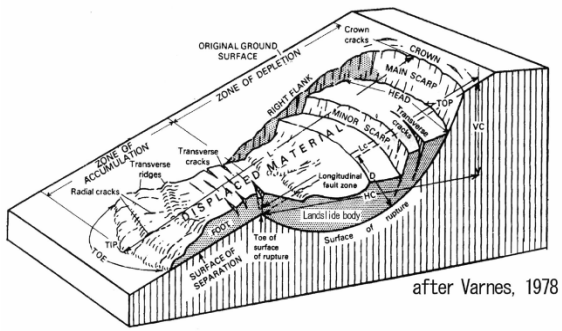
[Check Point]

	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

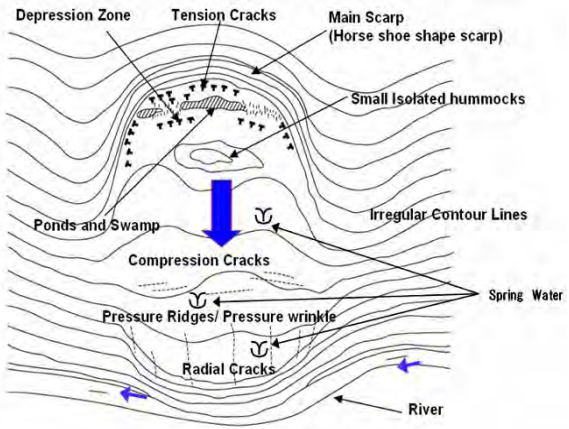
[Description]

Because the Ministry of Education plans expansion of SSS, MPI and JICA Expart conducted a site visit on 22nd July 2016. The observations are as follows:-

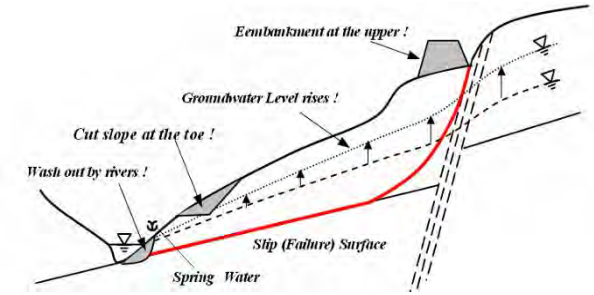
> This site is located the west of the signal mountain, Port Louis. The geological feature of the surface is colluvium, and the surface angle is gentle.
> The surface angle around this land is 4.9% to 7.7%.
> The damage by the landslide is not found on this land, which is currently occupied by basketball courts, and an open drain.
> This land is not located in a landslide area.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	1

Photo sheet

Date	July 22, 2016

Full view of the site

Planning area for the extension of Dr J.B.DAVID SSS
(The current conditions are basketball courts)

The damage by the landslide is not found on open drain behind a school.

Survey on Structural/Non-structural Measures

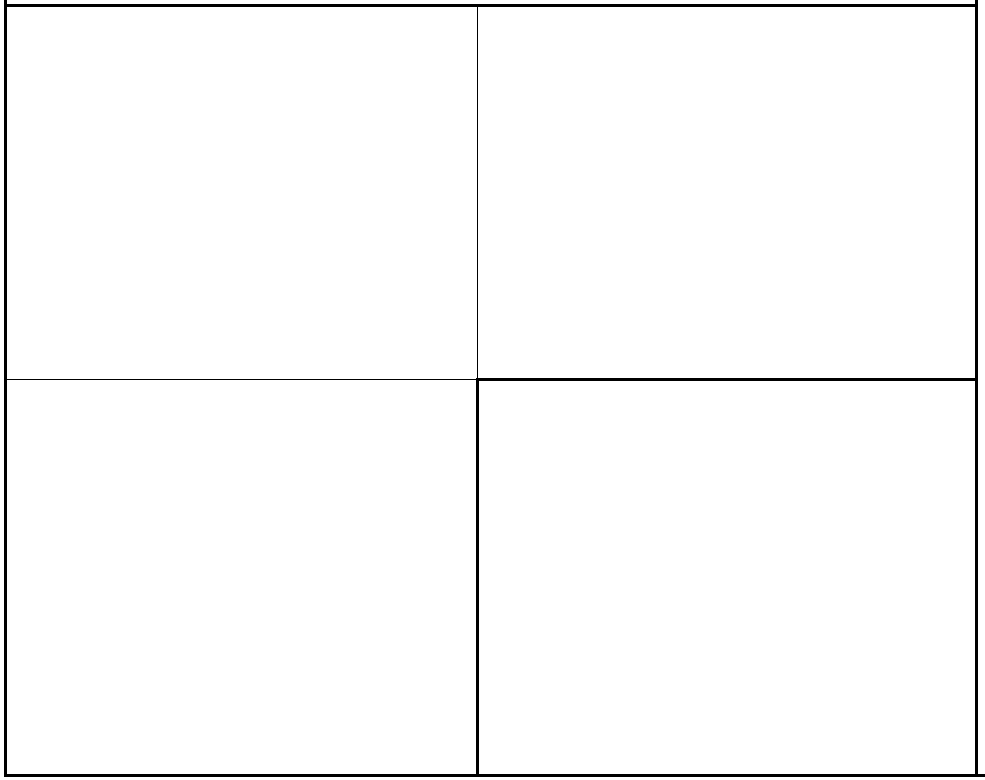
Management number	0	0	2	0	1	6	-	0	1	1

Reporter's name:	Tomoharu IWASAKI	Date of report :	July 22, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

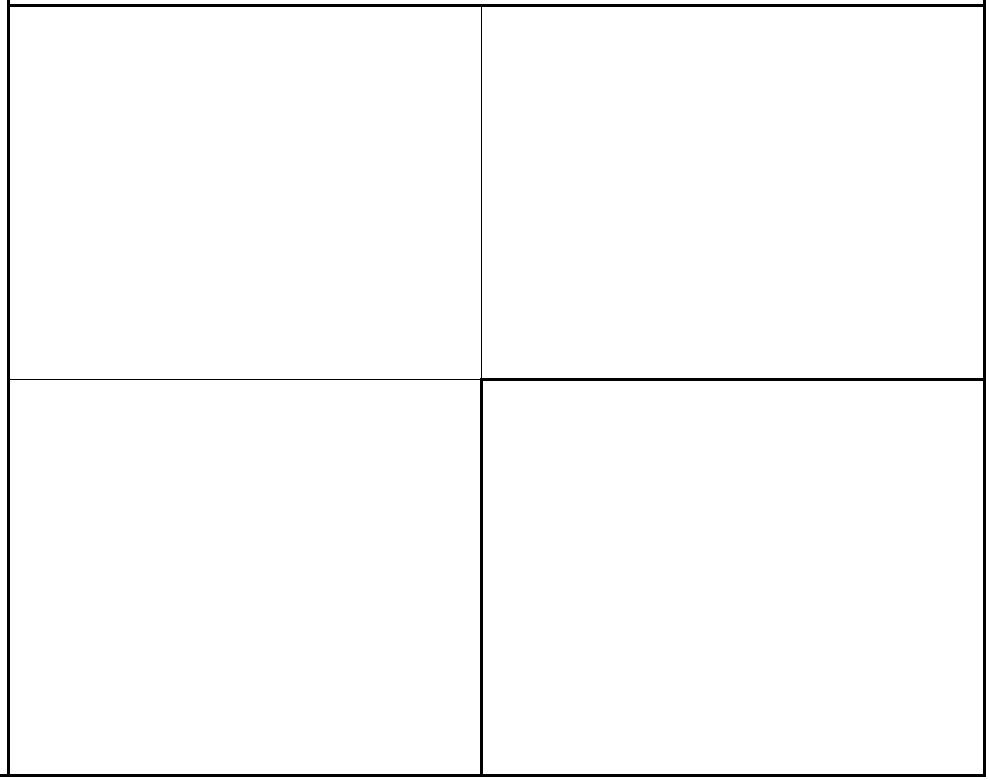


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

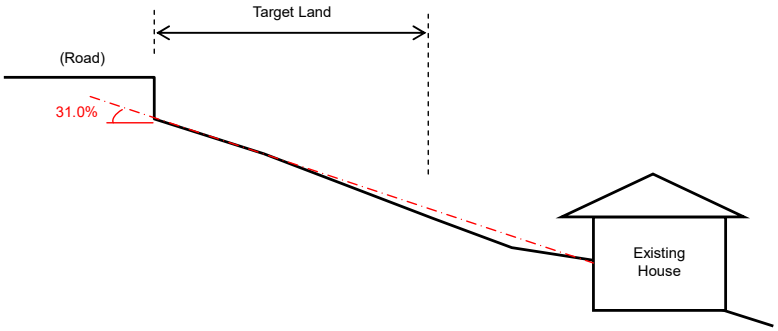
[The Photo of Monitoring Equipment]



General Information Sheet (Slope)

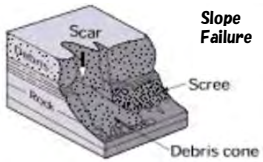
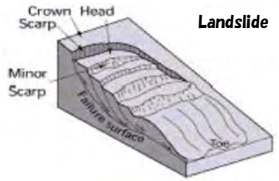
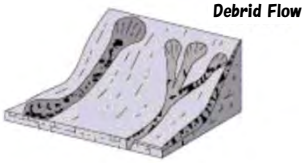
Management number	0 0 2 0 1 6 - 0 1 2	Reporter's name:	Tomoharu IWASAKI	Date of report :	July 25, 2016
Address	Landslide Problem at Vallee Pitot	Type*	Slope Filure	Latitude	-20.170409°	Longitude	57.521565°

Schematic sketch



Location map （Scale: 1:25,000)

* **Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	2

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

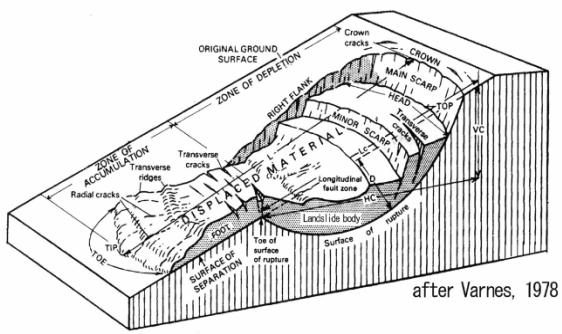
[Check Point]

Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)		✓
	Transverse Cracks (Tension or Compression)		✓
	Pond and Swamp		
	Spring Water		
	Topography with the Step		✓
	Embankment at the upper		
	Cut Slope at the toe		
	Wash out by rivers		
	Damage on construction and houses	Obvious (Community road and fill slope collapses)	✓
		Slight (number :)	
		None	✓
	Monitoring Equipment	There is it (name:)	
		There is it (name: , number:)	
		none	
History	Existing record of Landslide (documents or patrimony)	Obvious	✓
		Slight	
		None	
Countermeasure	There is no Countermeasure		✓
	Effectiveness of Countermeasure	No effect	
		Some effect (Retaining wall)	
		High effect	

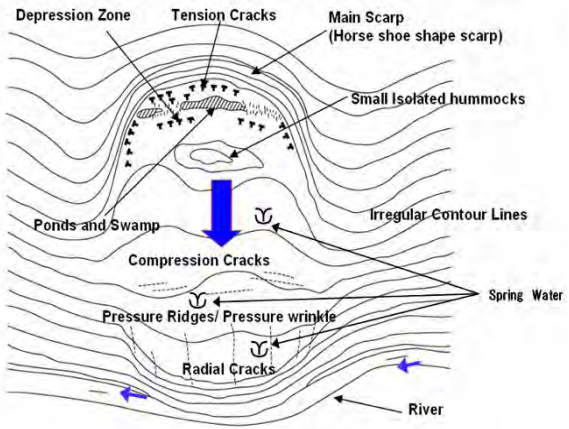
[Description]

Because an residential development was proposed at Valle Pitot, JICA Expert & MPI/LMU conducted site observation on 25th July 2016. The observations are as follows:-

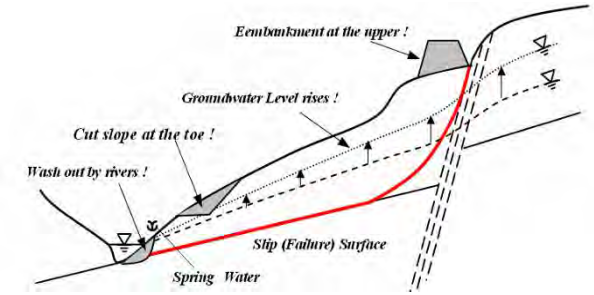
> The actual surface angle of this land is 31.0%.
> This land consists of weak colluvium.
> An existing active landslide block is located next to this land.
> This land falls within the yellow zone, Landslide Hazard Zone, as per PPG(2016).



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	2

Photo sheet

Date	July 25, 2016

Full view of the site

Full view of the site

Survey on Structural/Non-structural Measures

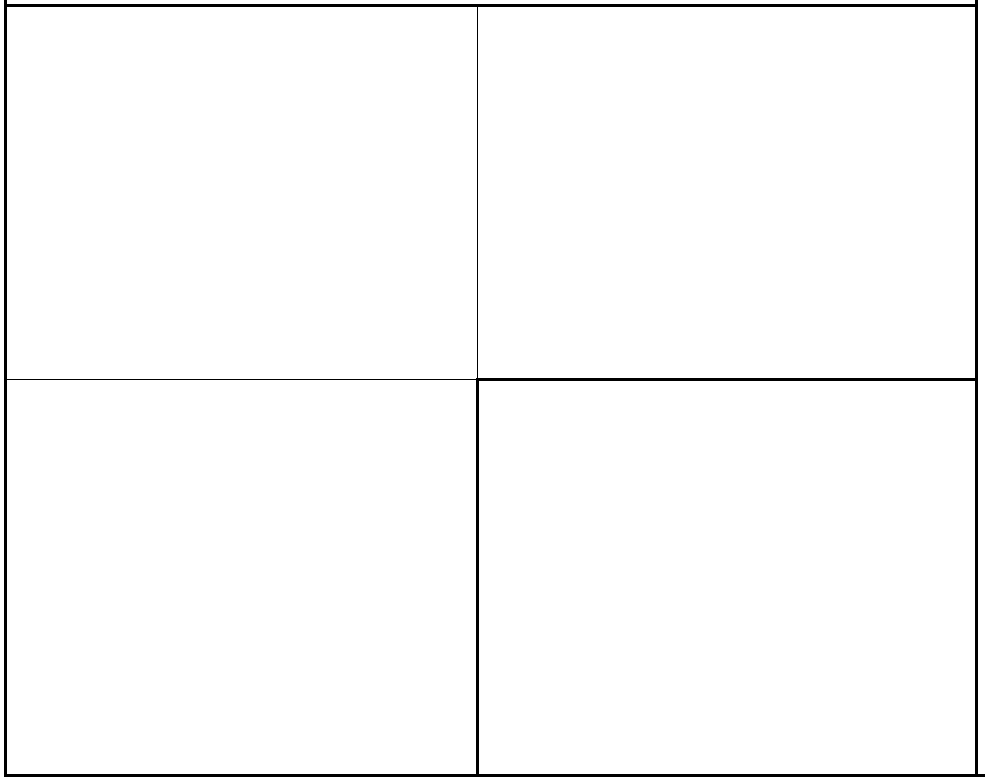
Management number	0	0	2	0	1	6	-	0	1	2

Reporter's name:	Tomoharu IWASAKI	Date of report :	July 25, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

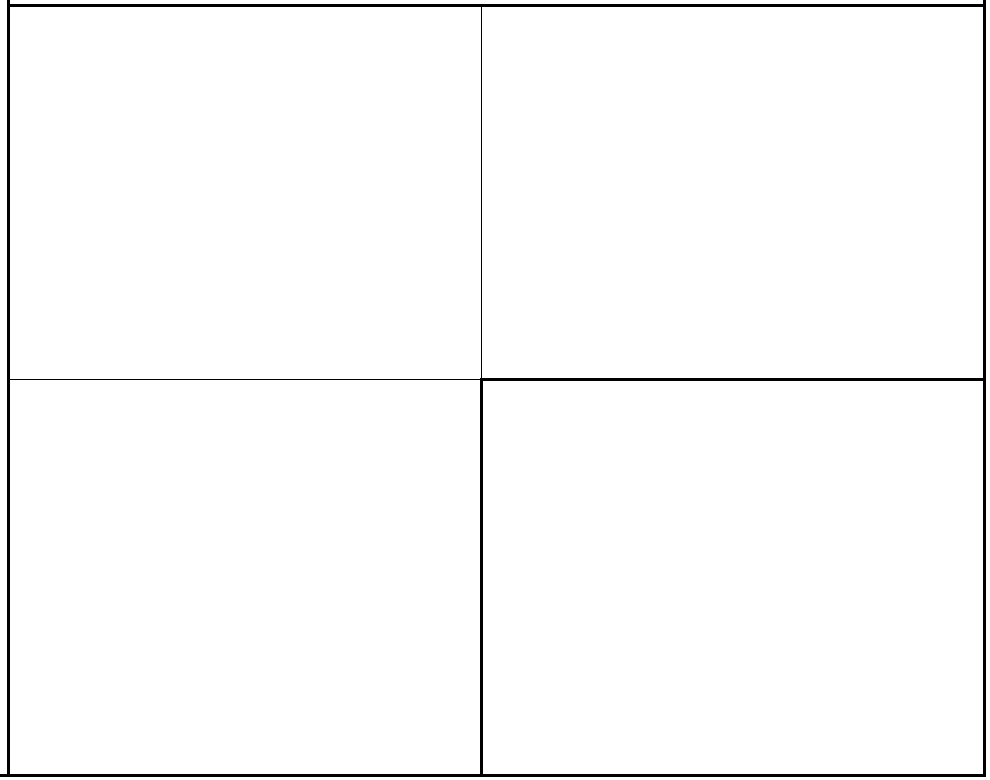


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

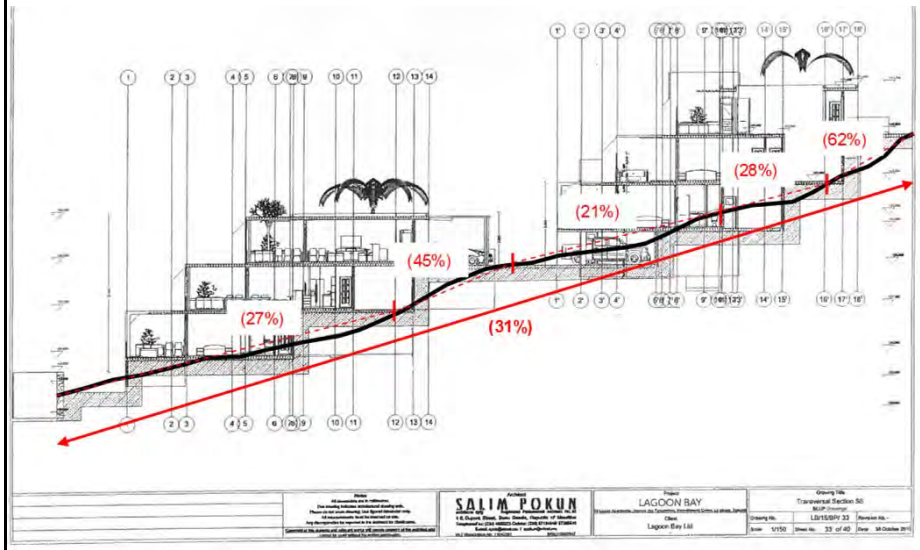
[The Photo of Monitoring Equipment]



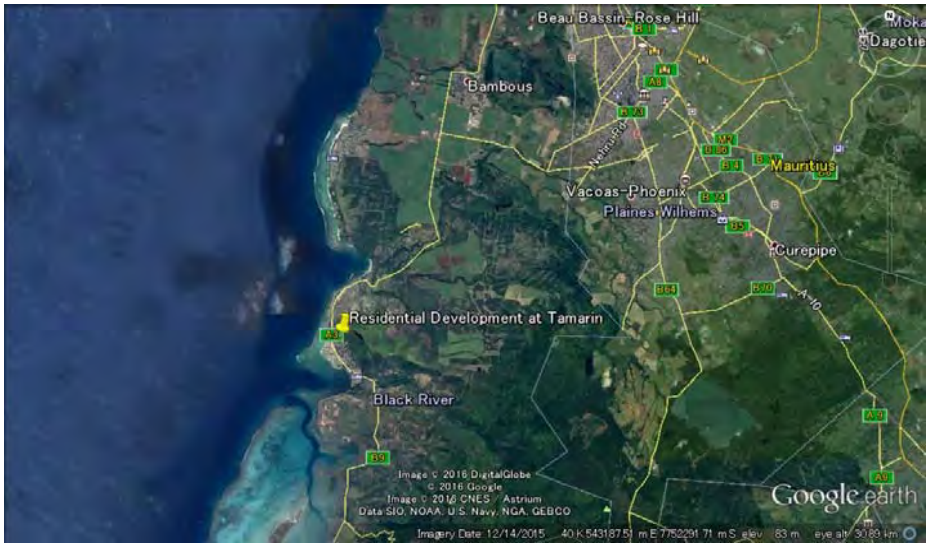
General Information Sheet (Slope)

Management number	0 0 2 0 1 6 - 0 1 3	Reporter's name:	Tomoharu IWASAKI	Date of report :	July 28, 2016
Address	Residential Development at Tamarin	Type*	Slope failure	Latitude	-20.348871°	Longitude	57.366809°

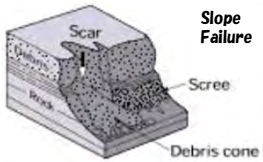
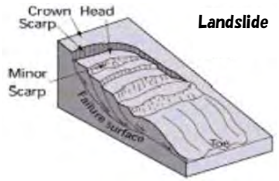
Schematic sketch



Location map （Scale: 1:25,000)



*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	3

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

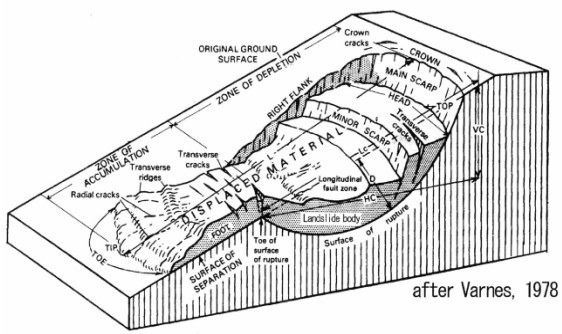
[Check Point]

	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

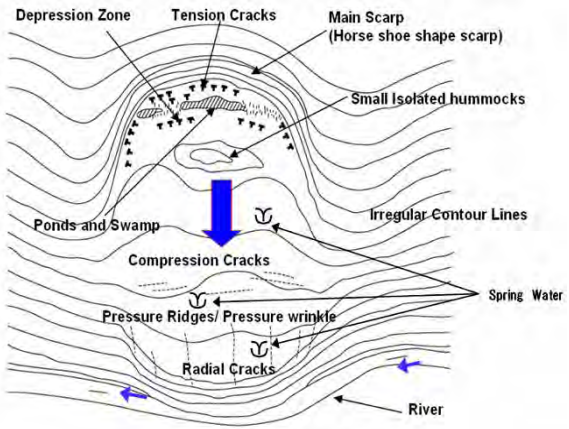
[Description]

Because an residential development was proposed at Tamarin, JICA Expert & MPI/LMU conducted site observation on 28th July 2016. The observations are as follows:-

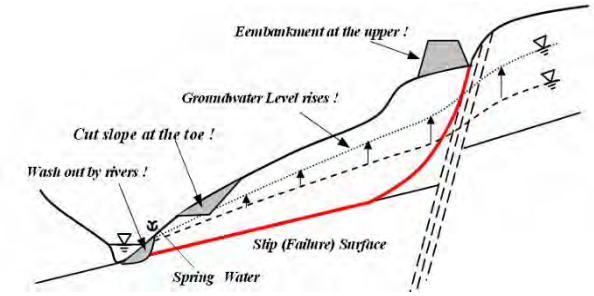
> The actual surface angle of this land is from 21% to 62%.
> This land surface consists of weak colluvium.
> No existing landslide activity is found at this site.
> Therefore, the recommendation of the PPG should be followed.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	3

Photo sheet

Date	July 28, 2016

Full view of the site

Full view of the site

Excising House
Damage by landslide is not found on the existing building.

Excising Drainage
The existing drainage need to be repaired.

Survey on Structural/Non-structural Measures

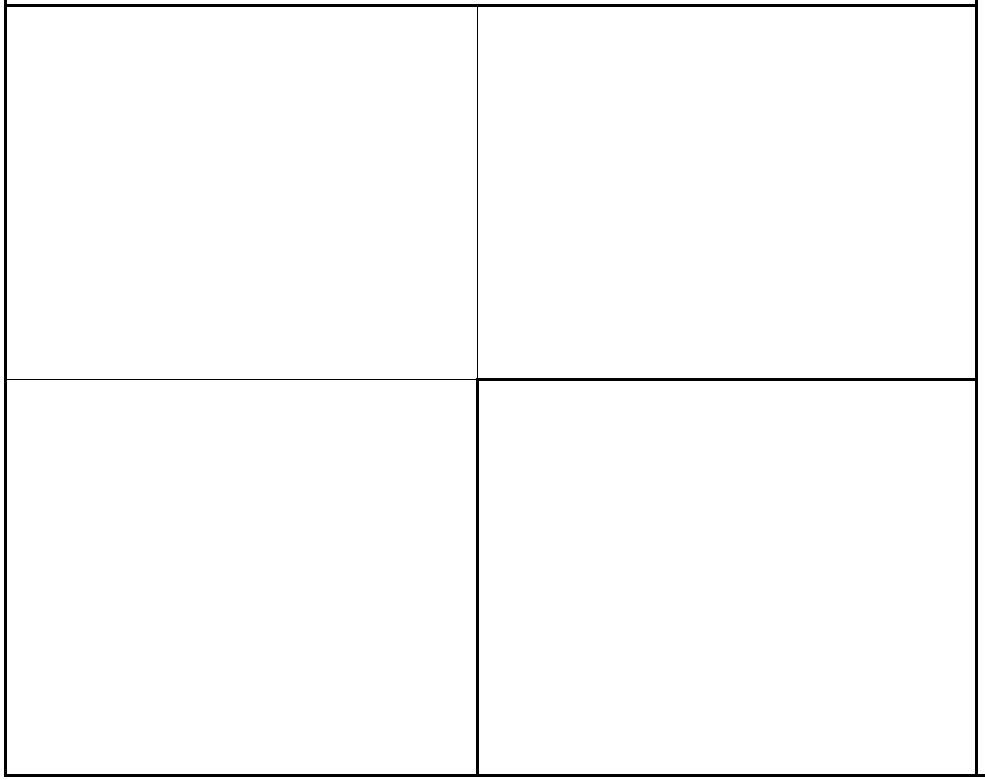
Management number	0	0	2	0	1	6	-	0	1	3

Reporter's name:	Tomoharu IWASAKI	Date of report :	July 28, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

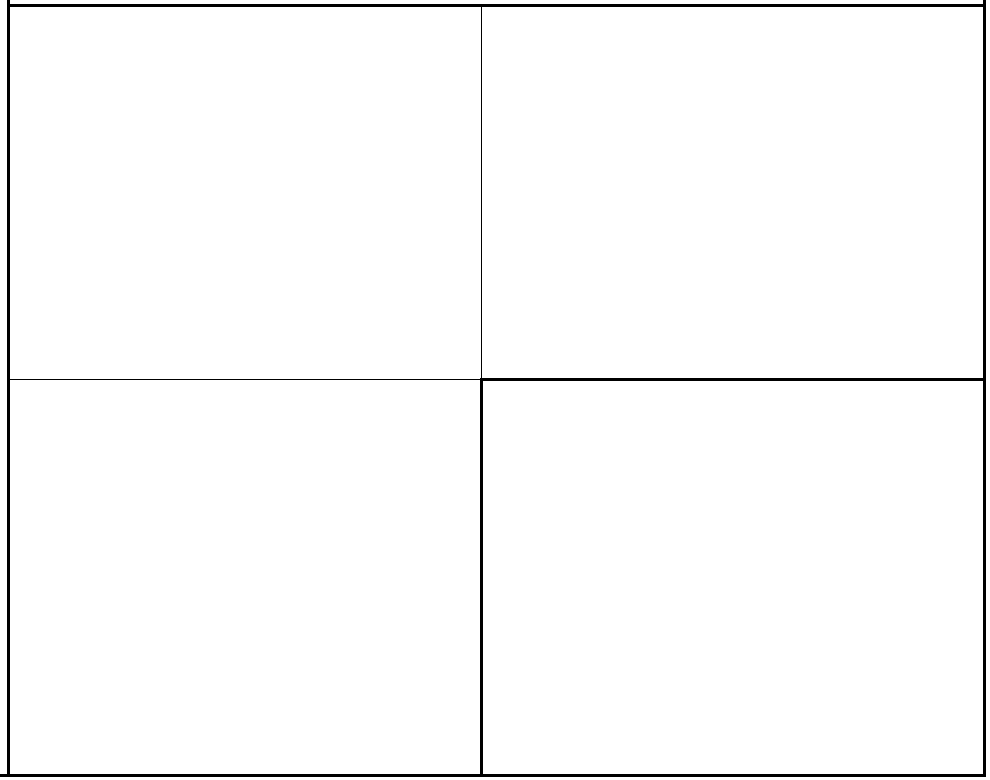


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

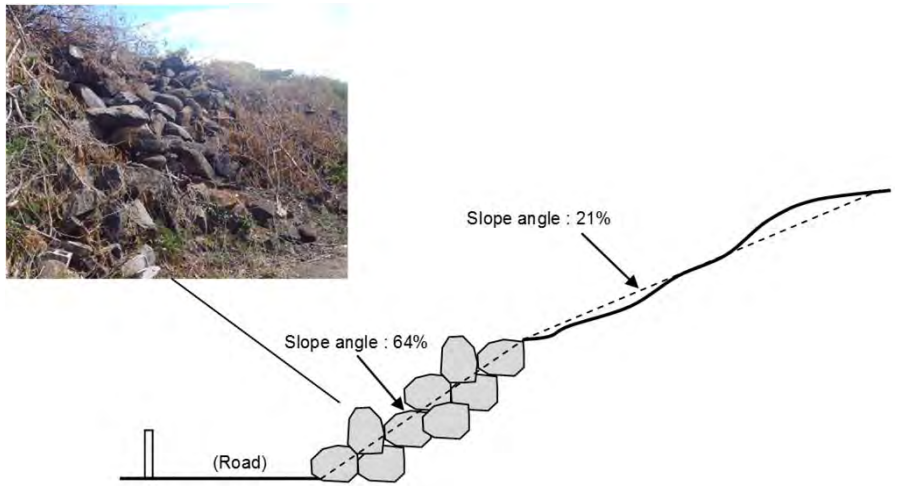
[The Photo of Monitoring Equipment]



General Information Sheet (Slope)

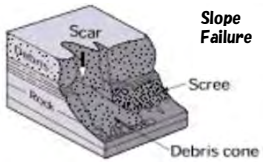
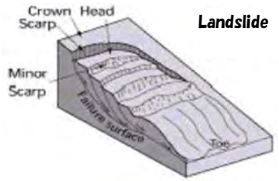
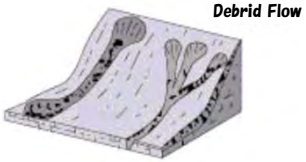
Management number	0 0 2 0 1 6 - 0 1 4			Reporter's name:	Tomoharu IWASAKI	Date of report :	August 2, 2016
Address	More. Hermitage Coromandel	Type*	Slope failure and debris flow	Latitude	20°11'35.26"S	Longitude	57°28'24.66"E

Schematic sketch



Location map （Scale: 1:25,000)

*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	4

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

[Check Point]

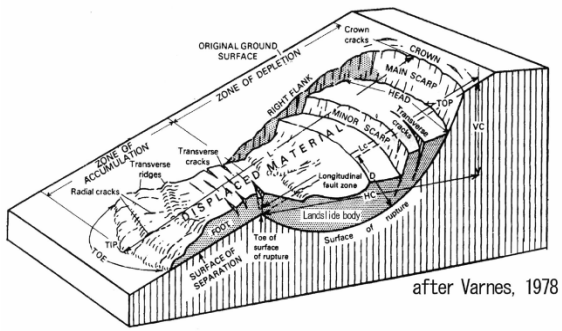
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

[Description]

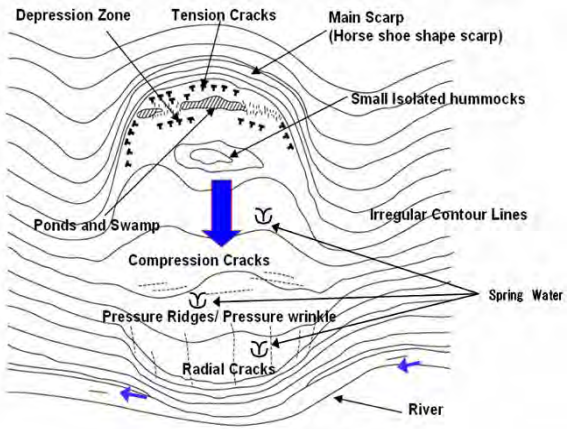
JICA Expert & MPI/LMU conducted site observation on 15th March 2016 for the land use of this land. The observations are as follows:-

> This site is near to the river,and it is included a steep slope located to the river terrace cliff in this site.
> The actual surface angle of this land is from 21% to 64%.
> This land consists of weak colluvium.
> There are many unstable rocks on a slope, and the risk of the slope disaster is very high.

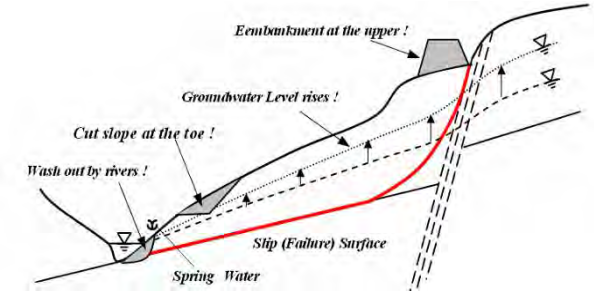
Therefore, according to PPG (2016), the construction activities are not recommended at this location.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	4

Photo sheet

Date	August 2, 2016

Full view of the site

Unstable big boulders at toe of the slope

View of the top part of the slope

Survey on Structural/Non-structural Measures

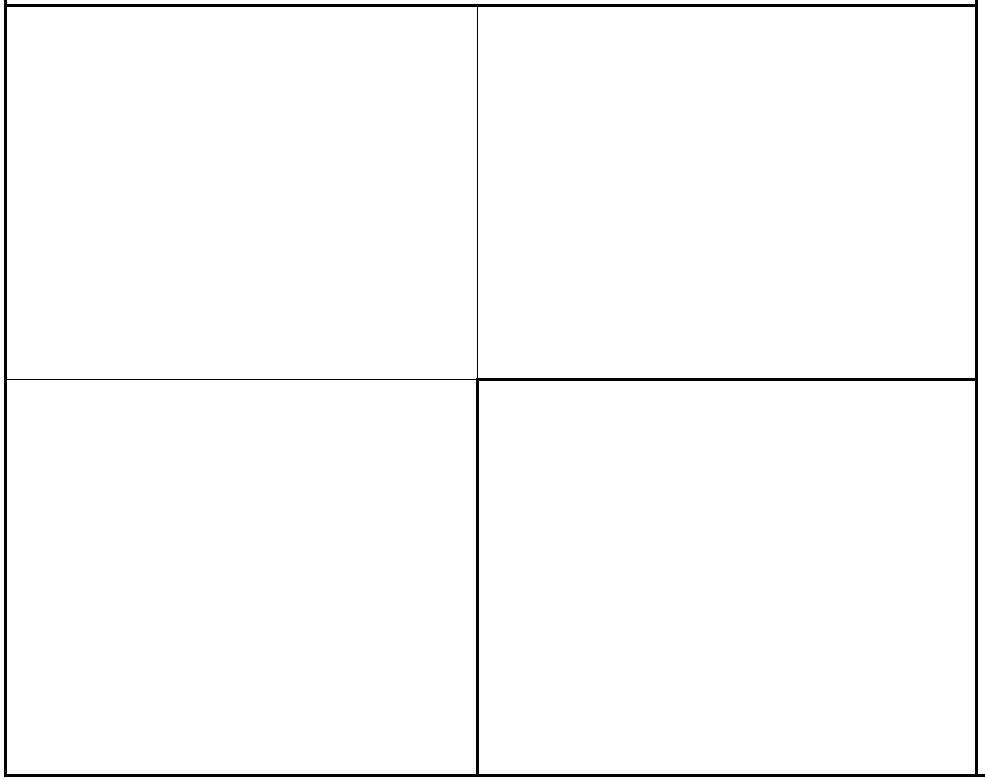
Management number	0	0	2	0	1	6	-	0	1	4

Reporter's name:	Tomoharu IWASAKI	Date of report :	August 2, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

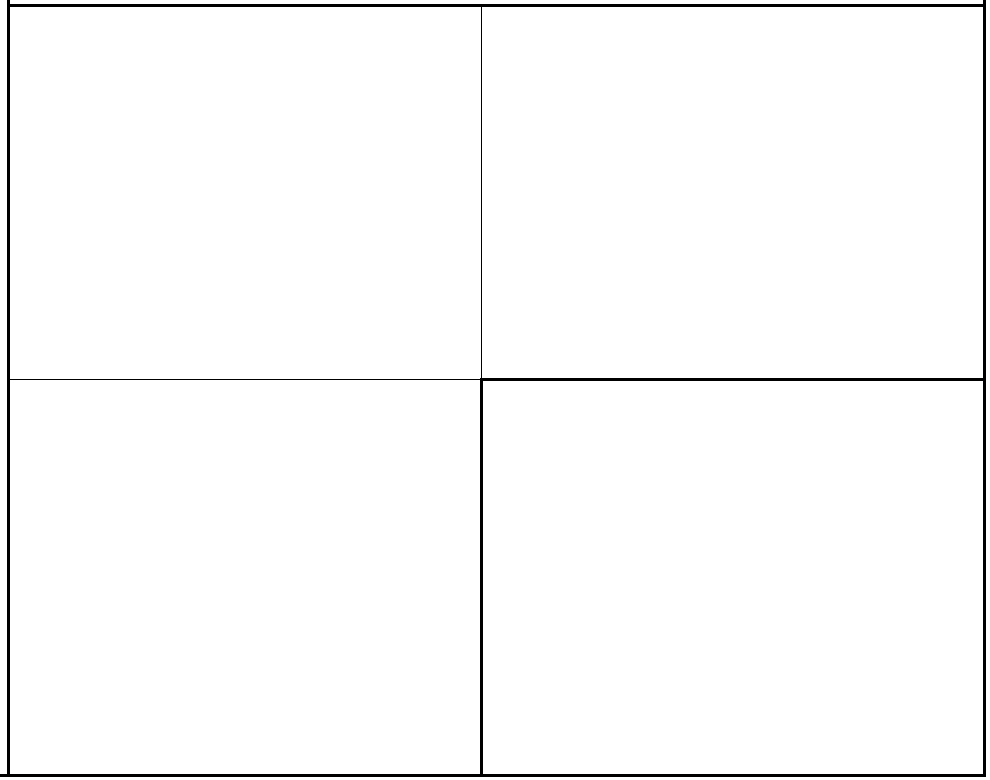


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

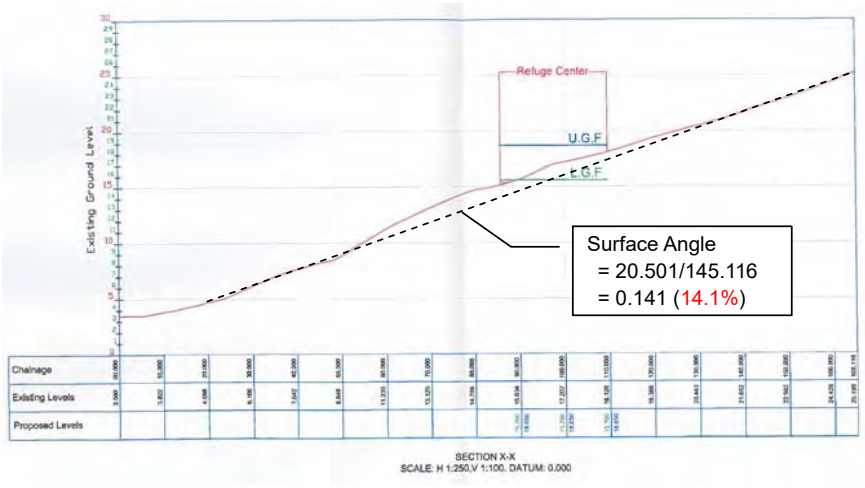
[The Photo of Monitoring Equipment]



General Information Sheet (Slope)

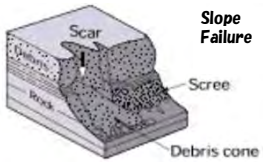
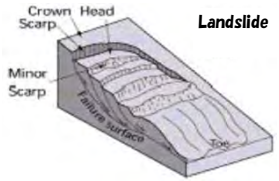
Management number	0 0 2 0 1 6 - 0 1 5			Reporter's name:	Tomoharu IWASAKI	Date of report :	August 2, 2016
Address	Quatre Soeurs Refuge Centre	Type*	Slope failure and debris flow	Latitude	-20.301721°	Longitude	57.776820°

Schematic sketch



Location map （Scale: 1:25,000)

*** Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	5

Evaluation sheet

Reporter's name:	Tomoharu IWASAKI

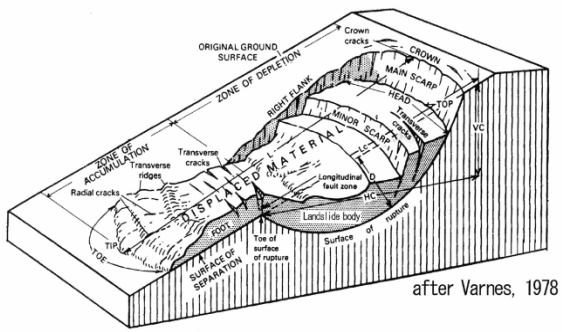
[Check Point]

	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

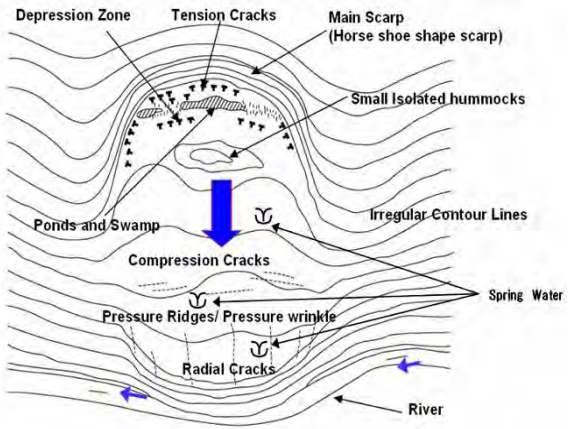
[Description]

Because the MoESD plans Refuge Centre at Quatre Soeurs, MPI and JICA Expart conducted a site visit on 2nd August 2016. The observations are as follows:-

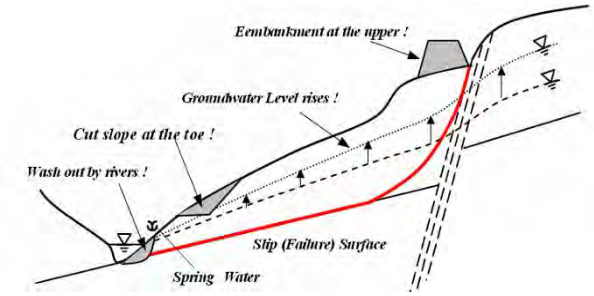
> The geological feature of the surface is colluvium, and the surface angle is gentle.
> The surface angle around this land is 14.1%.
> No damage by landslide is found on this land, on the existing building (church) as well as on the existing open drain.
> This land is not located in a landslide area.



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	5

Photo sheet

Date	August 2, 2016

Full view of the site
No damage by landslide is found on the road surface & road side ditch

Full view of the site
No damage by landslide is found on the road surface & road side ditch

Excising Building (Church)
No damage by landslide is found on this land, on the existing building (church).

Existing Drainage of Road Side & Around Church
No damage by landslide is found on the existing open drains.

Survey on Structural/Non-structural Measures

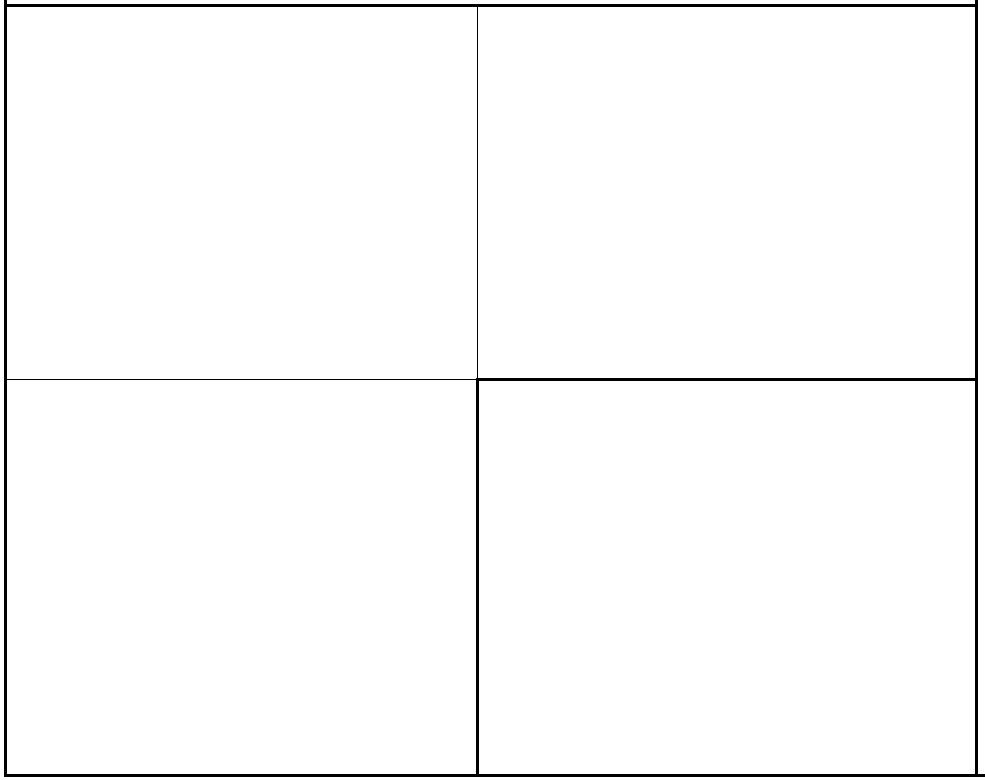
Management number	0	0	2	0	1	6	-	0	1	5

Reporter's name:	Tomoharu IWASAKI	Date of report :	August 2, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

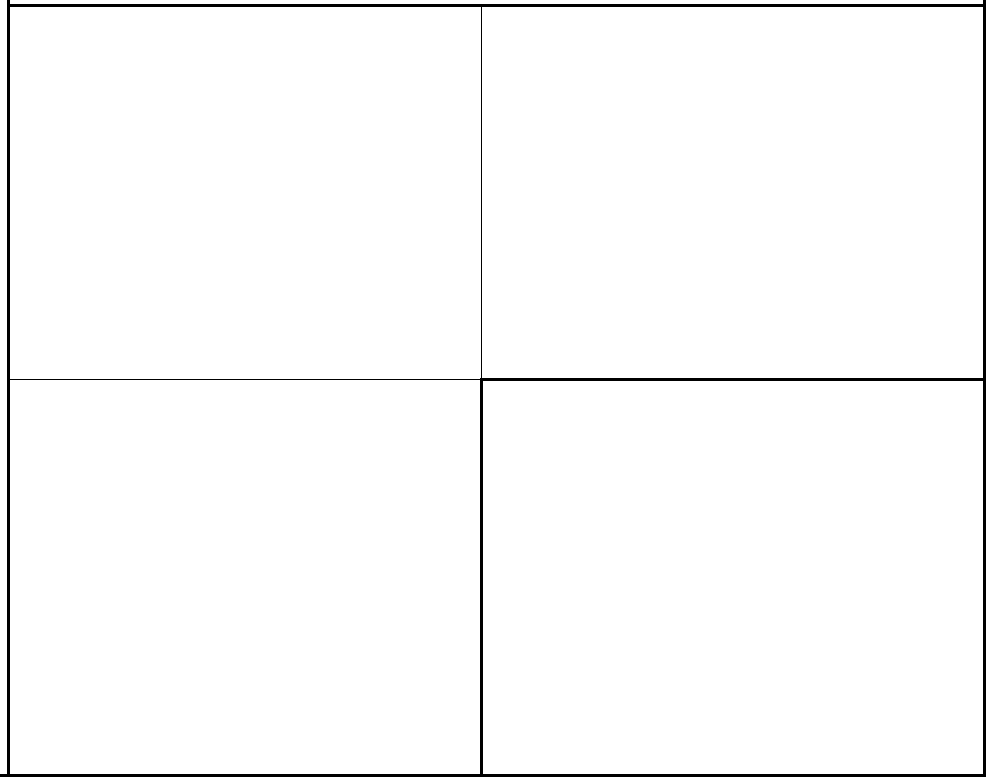


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

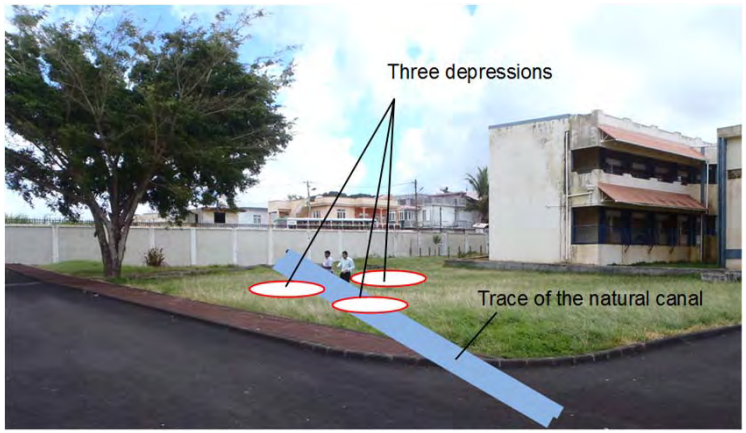
[The Photo of Monitoring Equipment]

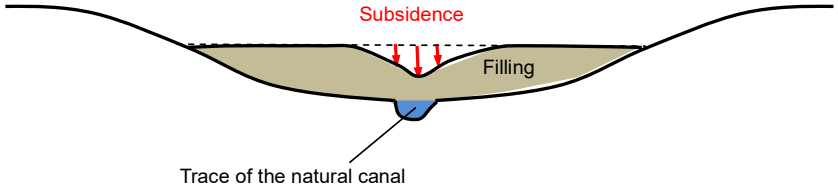


General Information Sheet (Slope)

Management number	0 0 2 0 1 6 - 0 1 6	Reporter's name:	Tomoharu IWASAKI	Date of report :	August 9, 2016
Address	Camp de Masque SSS, Flacq	Type*	Depression	Latitude	20°13'19.35"S	Longitude	57°42'40.70"E

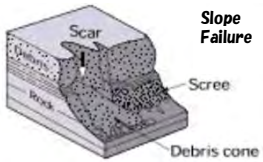
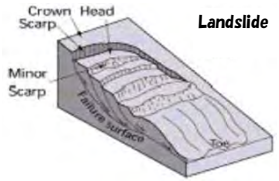
Schematic sketch





Location map （Scale: 1:25,000)

* **Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	6

Evaluation sheet

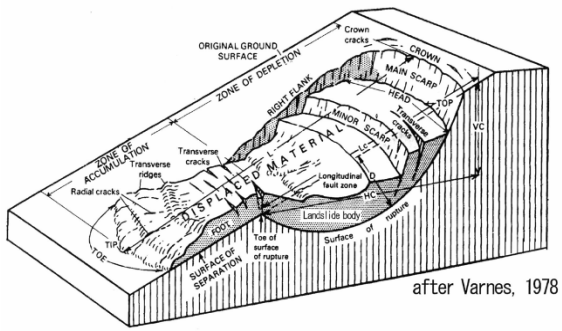
Reporter's name:	Tomoharu IWASAKI

[Check Point]

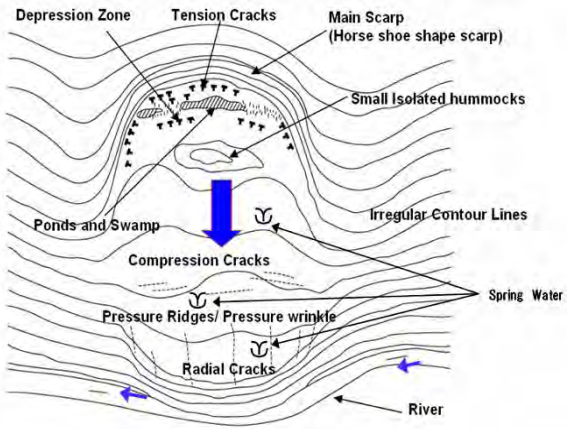
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

[Description]

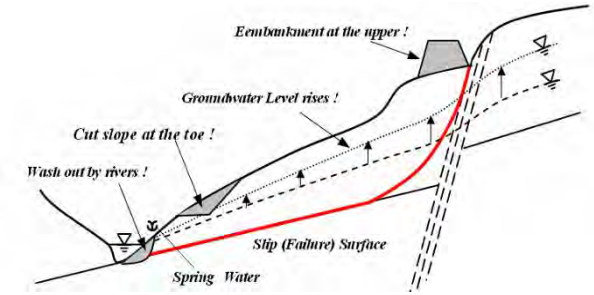
Because the ` Three depressions on the green area of Camp de Masque SSS was informed by school, JICA Expert & MPI/LMU conducted site observation on 9th August 2016. The observations are as follows:
> Three depressions appear on the green area of the site, and are located at the bottom of the dale.
> The natural canal located at the bottom of the dale was present even before the school was constructed.
> The green area was built on a dale and a natural canal by a filling-work.
> From the fact mentioned above, it is estimated that the three depressions were caused by subsidence of the filling. The subsidence may be due to lack of compaction of the filling at the time of the construction. It may also be caused by sand of the filling being washed away by groundwater which flows along the original surface (dale) under the ground.
> It is recommended that three depressions should be filled by gravel, not sand, and enough



Structure of a landslide



Schematic diagram of landslide landforms

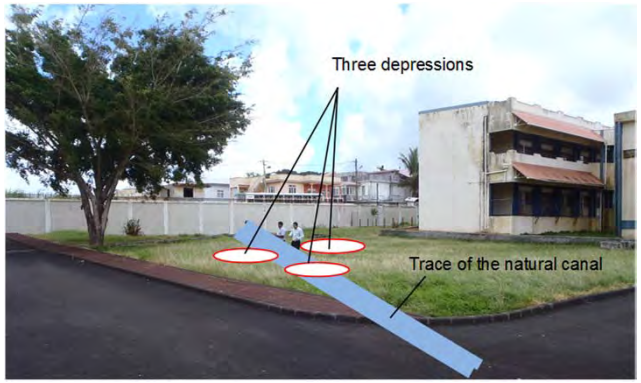


Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	6

Photo sheet

Date	August 9, 2016



Full view of the site

Current condition of three depressions in the green area

Three depressions are located at the bottom of the dale.

Survey on Structural/Non-structural Measures

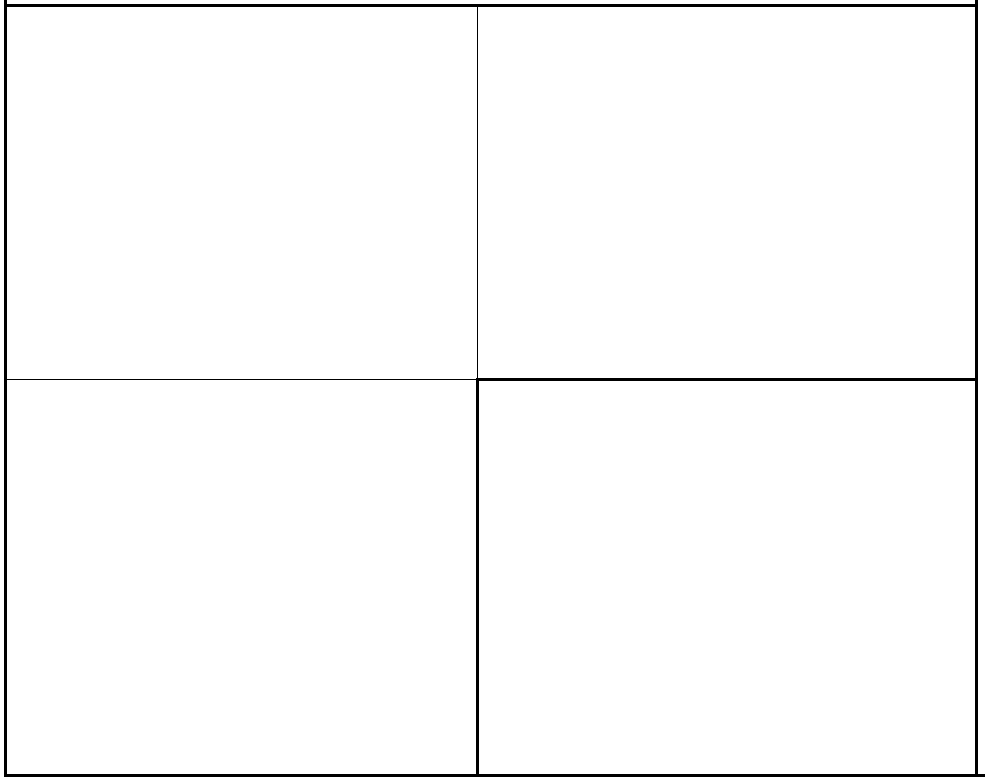
Management number	0	0	2	0	1	6	-	0	1	6

Reporter's name:	Tomoharu IWASAKI	Date of report :	August 9, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

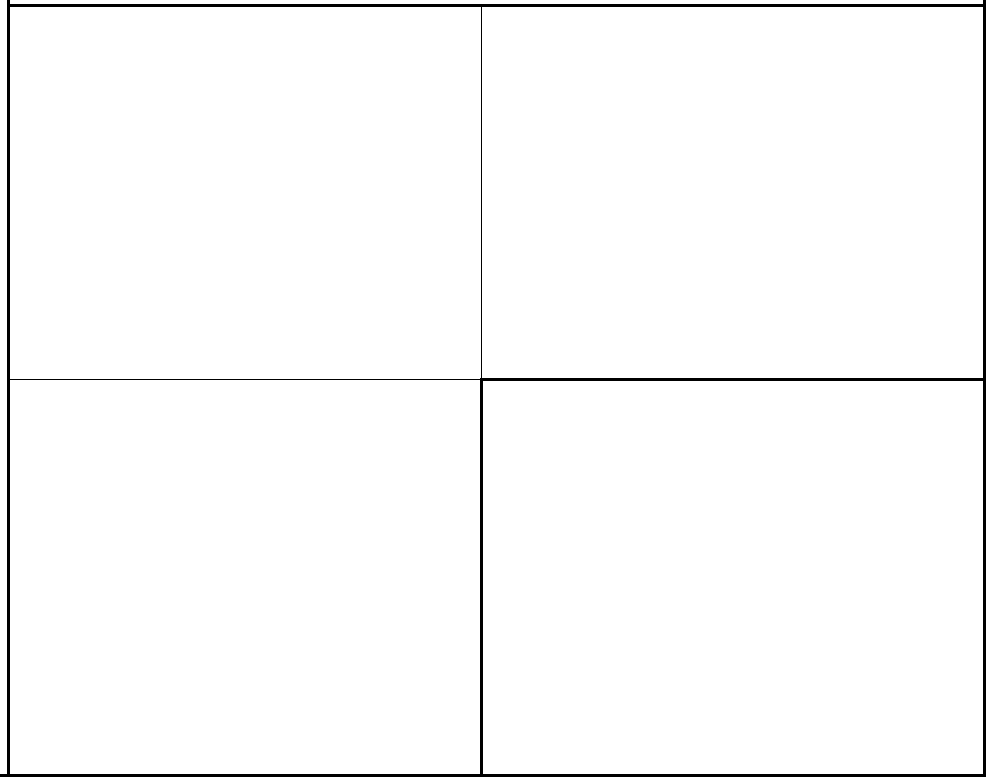


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

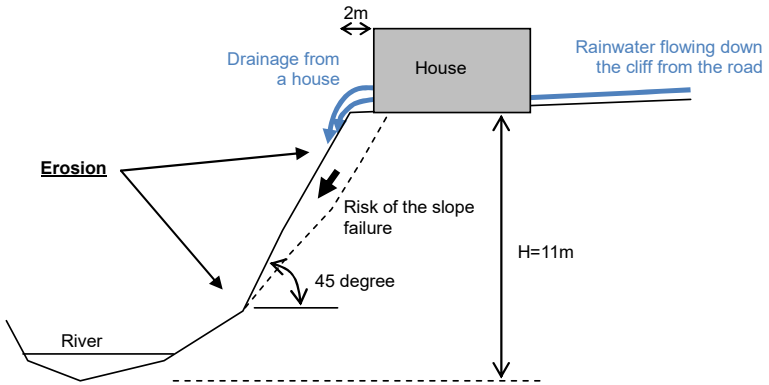
[The Photo of Monitoring Equipment]



General Information Sheet (Slope)

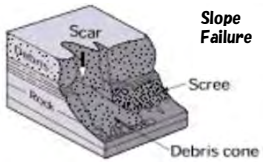
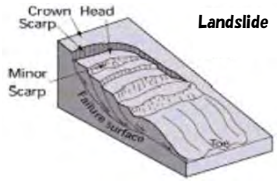
Management number	0 0 2 0 1 6 - 0 1 7			Reporter's name:	Tomoharu IWASAKI	Date of report :	August 9, 2016
Address	Mrs Coolen House, Camp Garreau, Flacq	Type*	Slope failure of the river banks	Latitude	20°13'19.35"S	Longitude	57°42'40.70"E

Schematic sketch



Location map （Scale: 1:25,000)

* **Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

Management number	0	0	2	0	1	6	-	0	1	7

Evaluation sheet

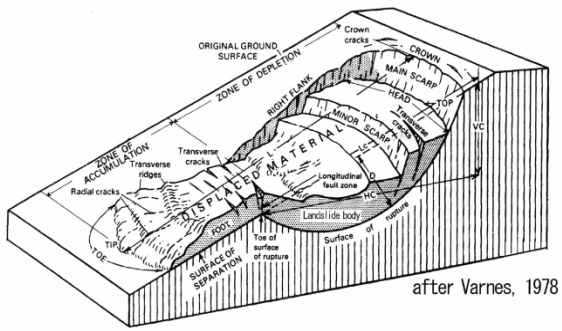
Reporter's name:	Tomoharu IWASAKI

[Check Point]

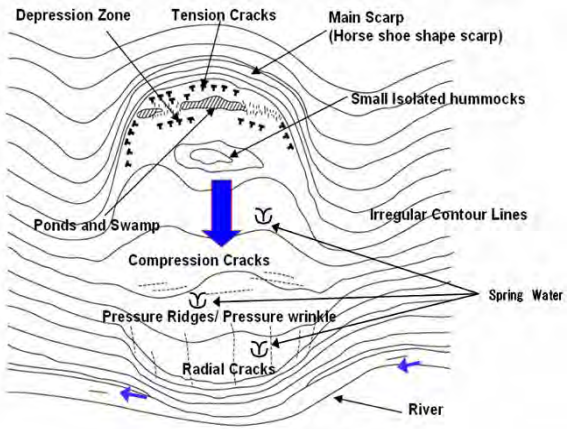
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			✓
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			
	Wash out by rivers			✓
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	
		Slight	(number :)	
		None		✓
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		
		Slight		
		None		✓
Countermeasure	There is no Countermeasure			✓
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		
		High effect		

[Description]

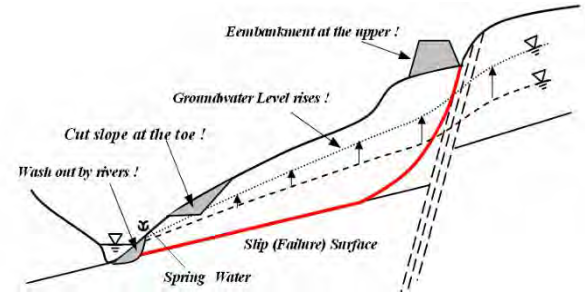
Because the slope failure behind the house was informed by inhabitants, JICA Expert & MPI/LMU conducted site observation on 9th August 2016. The observations are as follows:
> There is a river behind a house, and the phenomenon of this site is slope failure of the river banks.
> Erosion at the bottom of the slope behind the house has progressed and is likely to affect the houses along the riverside.
> In addition, the drainage from the houses and the rainwater flowing down the cliff from the road accelerates erosion of the cliff.
> The two houses are situated close to the cliff, and the distance from a house to the cliff is only 2m.
> The two houses are at high-risk of disaster caused by the erosion of the cliff in the area.
> It is recommended that a countermeasure, such as the relocation of the inhabitants of the two



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

Management Number	0	0	2	0	1	6	-	0	1	7

Photo sheet

Date	August 9, 2016

Full view of the site

Unstable river bank slope behaind a house

Drainage from a house accelerates erosion of the cliff

Drainage from a house accelerates erosion of the cliff

Rainwater flowing down the cliff from the road accelerates erosion of the cliff.

Rainwater flowing down the cliff from the road accelerates erosion of the cliff.

Survey on Structural/Non-structural Measures

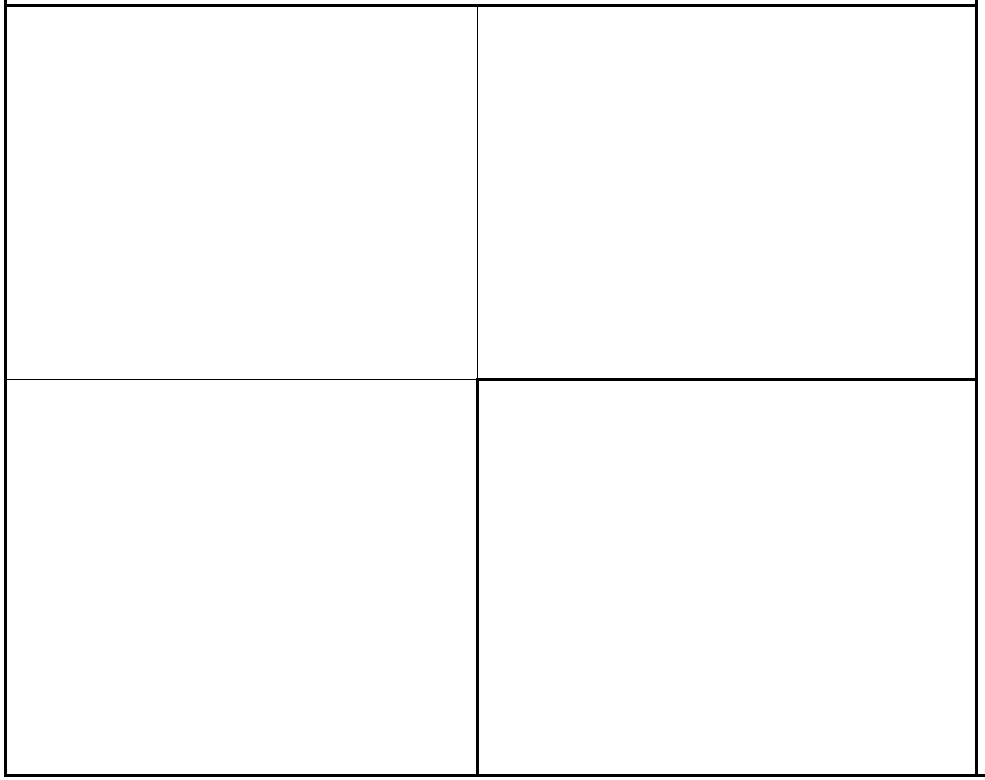
Management number	0	0	2	0	1	6	-	0	1	7

Reporter's name:	Tomoharu IWASAKI	Date of report :	August 9, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	

[The illustration of countermeasure]

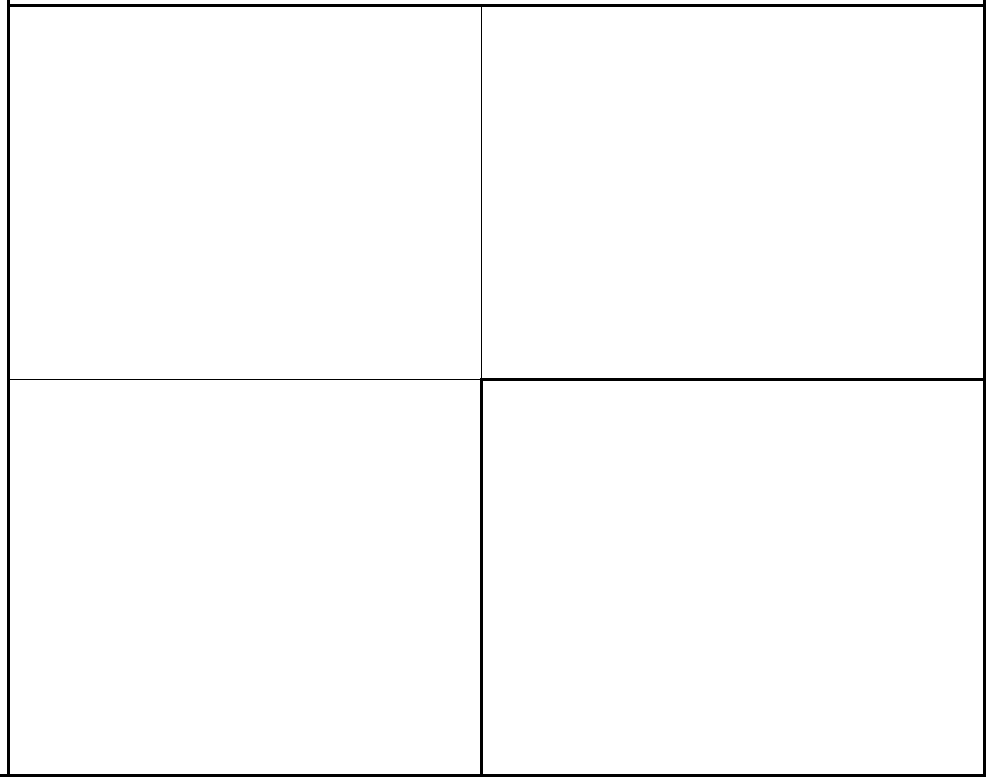


Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]

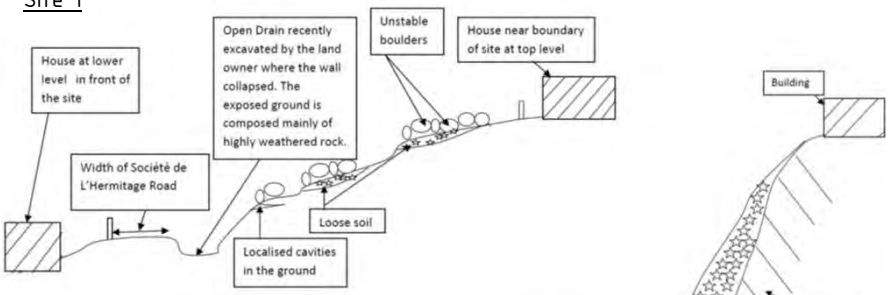


General Information Sheet (Slope)

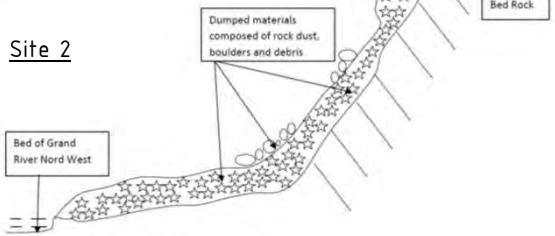
Management number	0 0 2 0 1 6 - 0 1 8			Reporter's name:	Tomoharu IWASAKI	Date of report :	October 21, 2016
Address	Hermitarge, Coromandel	Type*	Slope failure, Rock fall	Latitude	-20.194142°	Longitude	57.471713°

Schematic sketch

Site 1

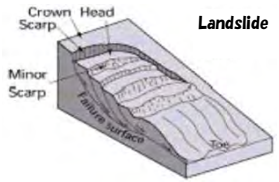


Site 2



Location map （Scale: 1:25,000)

* **Description of "Type"**

Rock fall	Slope failure	Landslide	*Debris flow*
Rock Fall : Rock fall is a phenomenon where foliated rocks and gravel due to enlarged cracks in the bedrock or outcropped rocks start to fall down a slope.	Slope Failure : The slope failures mass detached from steep slope/cliff along surface with little or no shear displacement. Compared to landslides, the quick slope moves on a small-scale, the inclination angle of the slope failure is a relatively high angle (over 30 degrees).	A landslide is a phenomenon where the soil mass on failure surfaces deep in the ground gradually shifts downward, triggered by heavy rain or earthquake, river erosion, earthworks. Compared to slope failure, the gentler slope moves on a large, the inclination angle of the landslides slope is a relatively low angle (about 5-30 degrees).	A Debris flow is a phenomenon where soil and boulders are liquefied by surface water or groundwater and tend to flow downward rapidly through a mountain torrent.
			

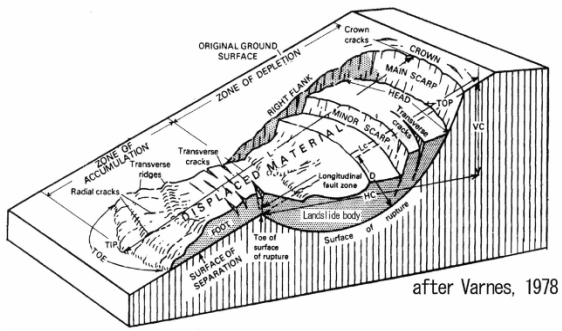
Management number	0	0	2	0	1	6	-	0	1	8

Evaluation sheet

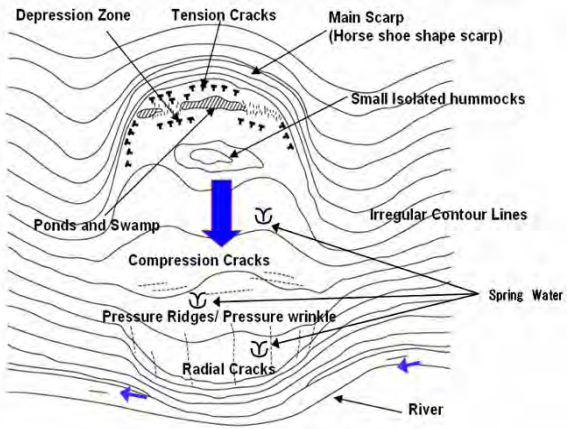
Reporter's name:	Tomoharu IWASAKI

[Check Point]

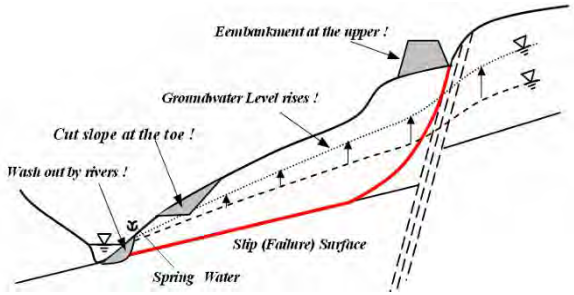
	Category			Check✓
Phenomenon on the Site	Scarp (Main or Minor , Horse shoe shape)			
	Transverse Cracks (Tension or Compression)			
	Pond and Swamp			
	Spring Water			
	Topography with the Step			
	Embankment at the upper			
	Cut Slope at the toe			✓
	Wash out by rivers			
	Damage on construction and houses	Obvious	(Community road and fill slope collapses)	✓
		Slight	(number :)	
		None		
	Monitoring Equipment	There is it	(name:)	
		There is it	(name: , number:)	
		none		✓
History	Existing record of Landslide (documents or patrimony)	Obvious		✓
		Slight		
		None		
Countermeasure	There is no Countermeasure			
	Effectiveness of Countermeasure	No effect		
		Some effect (Retaining wall)		✓
		High effect		



Structure of a landslide



Schematic diagram of landslide landforms



Schematic cross section of inducing factor and artificial cause

[Description]

The two sites are situated in this area, they lie in the vicinity of Grand River North West.

Site 1: It is the site where collapse of a boundary wall by the land development was reported recently, 2012. The slope angel is very steep and there are many unstable rocks on this slope. As a temporary countermeasure, a open drain had been excavated by the land owner where the wall collapsed. In future, Retaining wall will be installed there as a permanent countermeasure for the slope.

Site 2: There is significant volume of dumped materials including rock dust and boulders observed on the steep slope, terrace scarp. In future, a rock barrier (Retaining wall) will be installed there as a countermeasure to control a movement of the dumped materials.

Management Number	0	0	2	0	1	6	-	0	1	8

Photo sheet

Date	October 21, 2016

Site1

Site1

Site1

Site1

Site1

Site2

Survey on Structural/Non-structural Measures

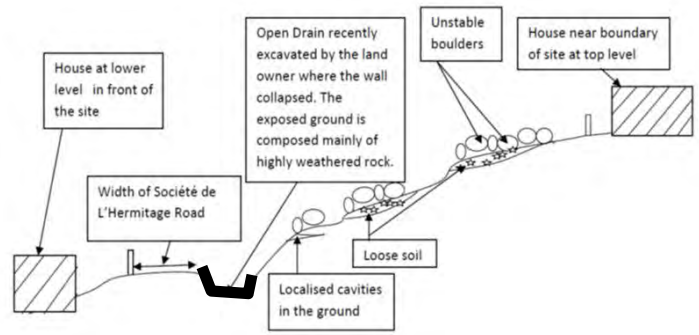
Management number	0	0	2	0	1	6	-	0	1	8

Reporter's name:	Tomoharu IWASAKI	Date of report :	October 21, 2016

Structural Measures (Hard-Component)

Existing landslide countermeasures	The kinds of landslide countermeasure	Number
	Repare and replace of the several culverts	
	Retainig wall and barrior fence for rock fall	
	Rock net	
	Open drain	1

[The illustration of countermeasure]



Non-structural Measure (Soft-Component)

Landslide Monitoring Equipment	The kinds of Landslide Monitoring / Spec	Number

Warning Threshold		
	Rainfall	
	Movement/displacement	
communication means		
evacuation support		

[The Photo of Monitoring Equipment]