Factual Report on Hong Kong Rainfall and Landslides in 2012

GEO Report No. 313

J.C.W. Leung, R.W.H. Lee & S.M. Ting

Geotechnical Engineering Office
Civil Engineering and Development Department
The Government of the Hong Kong
Special Administrative Region

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Preface

In keeping with our policy of releasing information which may be of general interest to the geotechnical profession and the public, we make available selected internal reports in a series of publications termed the GEO Report series. The GEO Reports can be downloaded from the website of the Civil Engineering and Development Department (http://www.cedd.gov.hk) on the Internet. Printed copies are also available for some GEO Reports. For printed copies, a charge is made to cover the cost of printing.

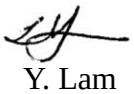
The Geotechnical Engineering Office also produces documents specifically for publication in print. These include guidance documents and results of comprehensive reviews. They can also be downloaded from the above website.

These publications and the printed GEO Reports may be obtained from the Government's Information Services Department. Information on how to purchase these documents is given on the second last page of this report.

H.N. Wong
Head, Geotechnical Engineering Office
August 2015

Foreword

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2012. Details of the landslides were obtained from records of landslide incidents reported to the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD). Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and including that by the GEO's landslide investigation consultants. The Hong Kong Observatory provided weather and rainfall information. The Standards and Testing Division of the GEO carried out a review of the available rainfall records as well as rainfall analyses, and prepared Section 2 of this report. All contributions are gratefully acknowledged.



Y. Lam
Atg. Chief Geotechnical Engineer/LPM 1

Abstract

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2012. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from records of landslide incidents reported to the GEO. Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and including that by the GEO's landslide investigation consultants, namely Fugro Scott Wilson Joint Venture and AECOM Asia Company Limited.

Rainfall recorded in 2012 at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 1,924.7 mm, much lower than the mean rainfall of 2,398.5 mm recorded between 1981 and 2010. No Black Rainstorm Warning was issued in 2012; two Red Rainstorm Warnings were issued on 29 April and 24 September 2012 and 19 Amber Rainstorm Warnings between 16 April and 24 September 2012.

One Landslip Warning was issued on 24 July 2012. A total of 169 incidents were reported to the Government in 2012. Of these, 163 were classified as genuine landslides and eight of them were designated as major failure (i.e. with a failure volume of 50 m^3 or more, or where a fatality has occurred).

There were fourteen landslides in 2012 with notable consequences. Of these landslides, one led to permanent evacuation of two squatter dwellings, one led to temporary evacuation of three village houses, eleven resulted in temporary closure of roads, and one involved a near-miss boulder fall incident above a tunnel portal. Other landslides in 2012 affected an open car park, footpaths or minor access roads and catchwaters, without any significant direct or indirect consequence. No injury or fatality was reported as a result of the 2012 landslides.

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1 Introduction

This report summarises the factual information on rainfall and reported landslides in Hong Kong throughout 2012. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from records of landslide incidents reported to the GEO. Supplementary information was collected from the Agriculture, Fisheries and Conservation Department (AFCD), Architectural Services Department (ArchSD), Drainage Services Department (DSD), Highways Department (HyD), Housing Department (HD), Lands Department (LandsD), Water Supplies Department (WSD), and including that by the GEO's landslide investigation consultants, namely AECOM Asia Company Limited (AECOM) and Fugro Scott Wilson Joint Venture (FSWJV), under Agreement Nos. CE 12/2011 (GE) and CE 13/2011 (GE) respectively.

In this report, a landslide is defined as the detachment or excessive displacement of soil or rock mass, and includes failure of a fill slope, cut slope, retaining wall, natural hillside, or disturbed terrain, as well as rockfall and boulder fall. A 'major' landslide is defined as a failure in which the estimated/recorded volume of the detached or displaced mass is ≥ 50 m^3, or where a fatality has occurred. A 'very minor' landslide is defined as a failure that is small in scale (i.e. ≤ 5 m^3 for failures involving soil, or ≤ 0.1 m^3 for rockfalls/boulder falls) and does not give rise to any significant public nuisance or notable consequences (e.g. casualty, near-miss, evacuation of buildings or squatter dwellings, road closure, etc.). Landslides that are not classified as 'major' or 'very minor' are taken as 'minor'.

2 Rainfall

2.1 The Raingauge System

The GEO, in collaboration with the HKO, operates an automatic raingauge system that transmits rainfall data through either telephone lines or the General Packet Radio Service (GPRS) of the mobile network, viz. a wireless transmission technology, to the GEO and the HKO at 5-minute intervals. The system comprises 88 GEO raingauges and 22 HKO raingauges. The raingauges are of the tipping-bucket type, tipping for every 0.5 mm of rainfall. The locations of the automatic raingauges are shown in Figure 2.1.

2.2 Rainfall Records

The rainfall data from the raingauge system are checked, verified and stored by the GEO in a database, from which they can be extracted for analysis. This report presents a selection of rainfall parameters for the whole year of 2012, as well as individual months and individual rainstorms.

The weather in 2012, as described by the HKO (2013), is excerpted as follows:

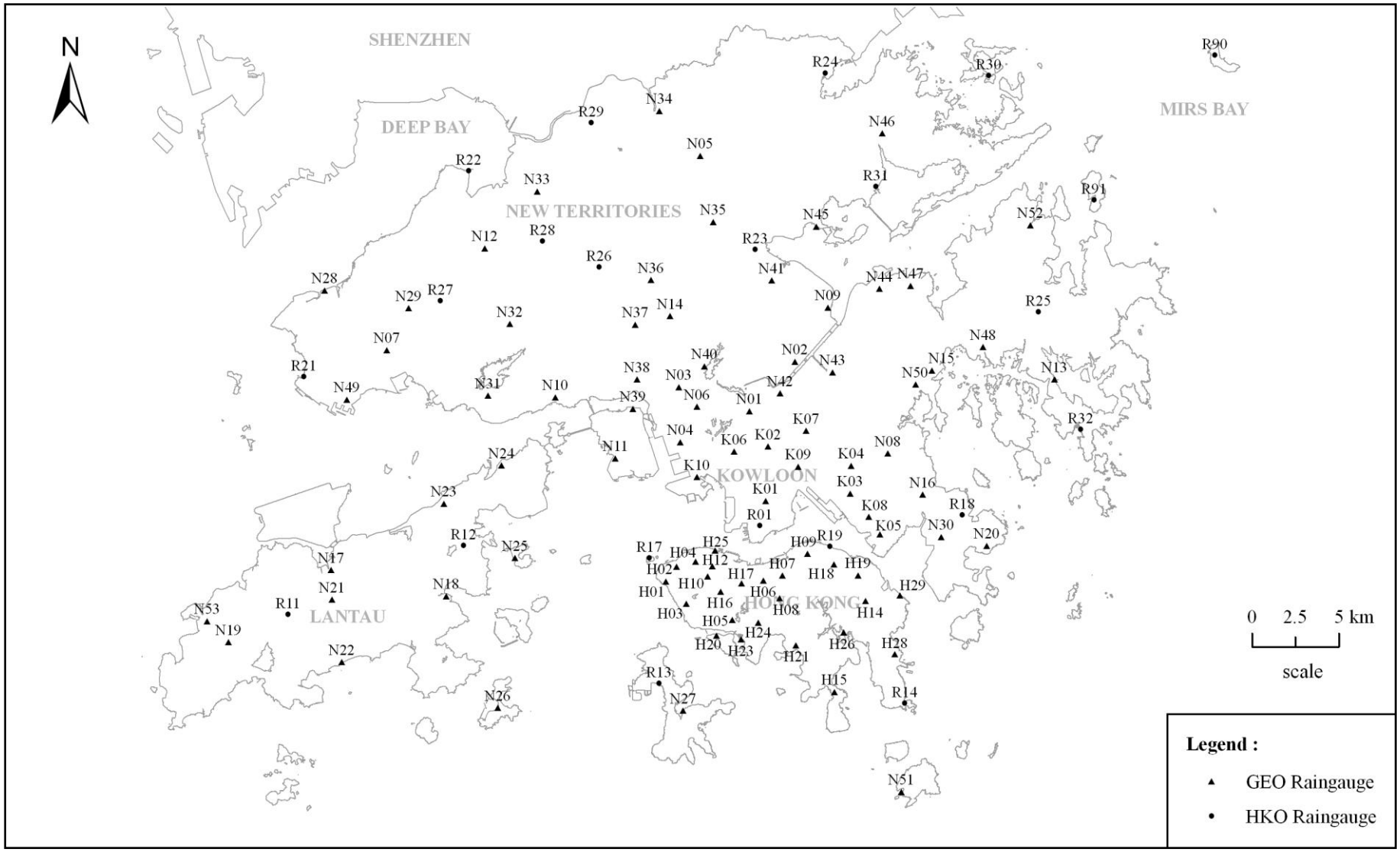


Figure 2.1 Locations of GEO and HKO Automatic Raingauges

> "The year 2012 was drier than usual. With well below normal rainfall in June and August, the annual rainfall of 1924.7 millimetres was about 20 percent below the 1981-2010 normal (which is about 13 percent below the 1961-1990 normal). There were only two red rainstorm warnings issued by the Hong Kong Observatory in 2012, about one half of the average number of red rainstorm warnings in a year since the Rainstorm Warning System commenced operation in 1992. There was no black rainstorm warning issued in the year. The number of days with thunderstorms reported in Hong Kong was 37 days in 2012, close to the 1981-2010 normal."

> "In Hong Kong, five tropical cyclones necessitated the issuance of local tropical cyclone warning signals, close to the long term average of about six in a year. The Hurricane Signal No. 10 was issued during the passage of Vicente in July, while the No. 8 Gale or Storm Signal was issued during the passages of Doksuri and Kai-tak respectively in June and August."

The following are excerpts from the HKO's Monthly Weather Summary describing the weather condition when the most intense rainstorms occurred in the wet season (i.e. between April and September 2012). Further details on the monthly weather are available on the HKO Website (http://www.hko.gov.hk/wxinfo/pastwx/mws.htm).

> "…another trough of low pressure formed over inland Guangdong on 18 April and brought some showers to Hong Kong. With the trough of low pressure moving southwards in the ensuing two days, local weather deteriorated with heavy showers and squally thunderstorms. More than 50 millimetres of rainfall were generally recorded over the territory on 20 April."

> "On 4 May, an intense thunderstorm developed over inland Guangdong and moved southwards across Hong Kong at night, bringing more than 100 millimetres of rainfall over the eastern part of Hong Kong Island and the southern part of Lantau Island."

> "A trough of low pressure lingered over the coastal areas of Guangdong and brought occasionally heavy showers and squally thunderstorms to the territory for the ensuing eight days. Rain was particularly heavy in the morning on 18 May with more than 50 millimetres of rainfall recorded over many places in Hong Kong and over 100 millimetres in Sai Kung. The heavy thundery showers in the afternoon and the evening on 20 May brought more than 70 millimetres over the northwestern part of Hong Kong Island and parts of the northern New Territories."

> "With the trough of low pressure over the northern part of the

South China Sea edging closer to the coast, the weather was cloudy with a few squally thunderstorms for the next three days. The rain was particularly heavy on the morning of 28 May. Over 100 millimetres of rainfall was recorded in northern part of the New Territories."

"The trough of low pressure deepened over the northern part of the South China Sea and brought more than 50 millimetres of rainfall over most parts of the territory on 16 June. An area of low pressure developed over the sea to the east of Hainan Island and intensified into a tropical depression on 17 June. While moving eastwards across the northern part of the South China Sea, it further intensified into a tropical storm, named Talim, in the next morning and finally became a severe tropical storm that night."

"Vicente began to edge towards the south China coast to the west of the Pearl River Estuary on 23 July, undergoing rapid intensification to a typhoon in the afternoon and further to a severe typhoon. With the approach of Vicente, local weather deteriorated significantly on that day with heavy squally showers. Local winds also strengthened generally in the evening and reached gale to storm force in some places. Hurricane force winds affected the southwestern part of the territory in the small hours on 24 July, necessitated the issuance of the Hurricane Signal No. 10, the first time since 1999. Vicente made landfall near the coastal areas of Taishan about 130 kilometers west-southwest of Hong Kong before dawn on 24 July and weakened gradually overland during the day. As Vicente moved away, local wind and rain abated gradually in that afternoon. Between 23 and 24 July, over 200 millimeters of rainfall were recorded at the Hong Kong Observatory."

"An active southwestern airstream brought cloudy weather with showers and squally thunderstorms to Hong Kong for the ensuing four days. The showers were heavier on the morning of 11 August. More than 80 millimetres of rainfall were recorded over parts of Hong Kong Island."

"A trough of low pressure developed over Guangdong and brought warmer and unstable weather with isolated thundery showers to the territory on 22 and 23 September. With the arrival of a surge of cooler easterlies, local weather deteriorated further with heavy thundery showers on 24 September. The rain was particularly heavy that night, with over 100 millimetres of rainfall recorded in Sai Kung and the urban areas."

The rainfall recorded at the HKO in the first quarter of 2012 is 93.7 mm (42% below the normal rainfall). The total rainfalls recorded in the second and third quarter are

834.1 mm (10% below normal) and 830.6 mm (27% below normal) respectively. For the last quarter of 2012, the total rainfall is 166.3 mm (3% below normal). The annual rainfall for 2012 is 1,924.7 mm, about 20 percent lower than the annual normal of 2,398.5 mm recorded between 1981 and 2010. The cumulative rainfall for 2012 is compared with the highest, lowest and mean rainfall in Figure 2.2.

Figure 2.3 shows the monthly rainfall distribution in 2012.

Figure 2.4 shows the annual rainfall distribution in 2012, together with the locations of the reported landslides.

2.3 Rainstorms in 2012

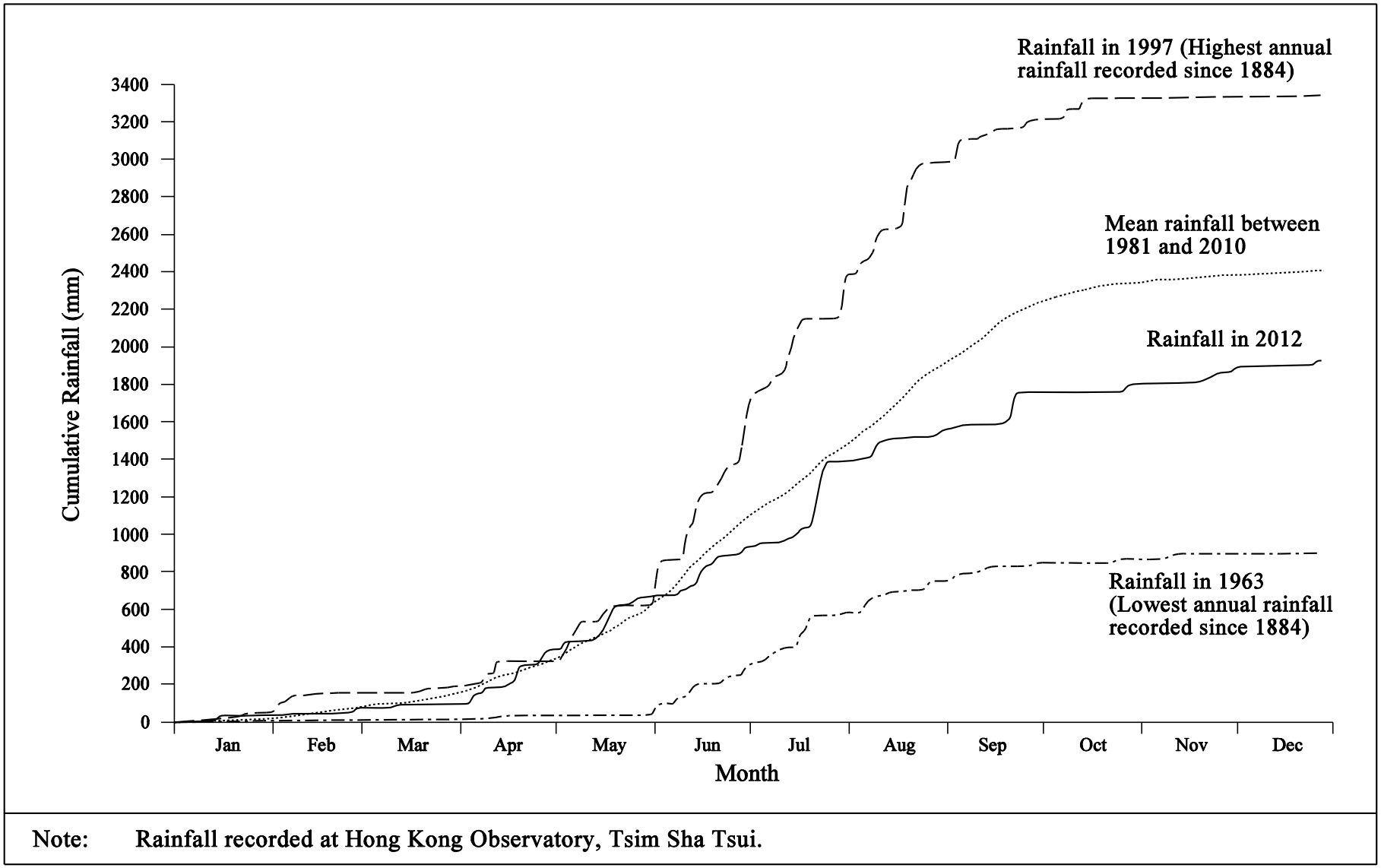
Table 2.1 tabulates the rainfall parameters for 12 rainstorms in 2012, during which the daily rainfall exceeded 100 mm at any of the HKO and the GEO raingauges. The parameters include the maximum 24-hour, 4-hour and 1-hour rolling rainfalls (based on 5-minute rainfall data). Table 2.1 also includes the 4-day and 15-day antecedent rainfalls at the HKO's Principal Raingauge. Similar data for selected major rainstorms in previous years are included in Table 2.1 for comparison. Other rainfall parameters for the above 12 rainstorms are also shown in Table A1 of Appendix A.

Figures A1 to A12 of Appendix A show the isohyets of the maximum rolling 24-hour rainfall during the above 12 rainstorms, together with the locations of reported landslides with reliable timing of occurrence that can be attributed to the rainstorm event, and the locations and values of maximum rolling rainfall for durations ranging from five minutes to 48 hours.

The rainstorms of 28 to 30 April 2012 and 23 to 27 July 2012 had caused 10 and 41 reported landslides respectively. Each of the other rainstorms in 2012 resulted in less than 10 reported landslides.

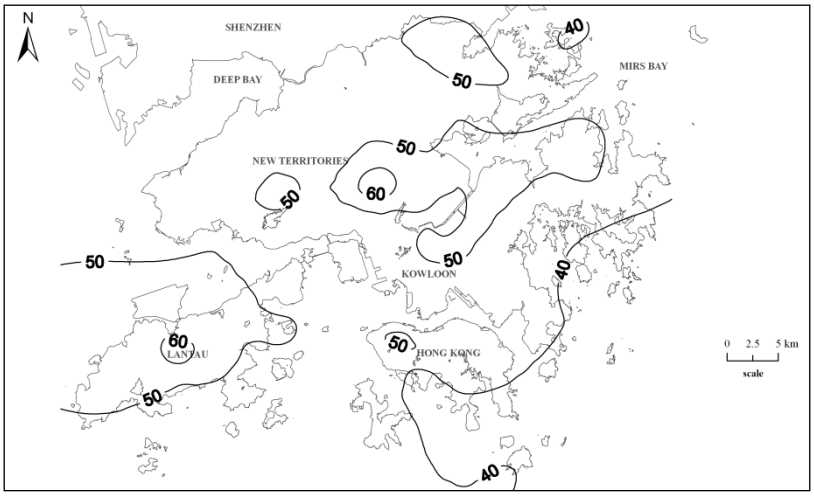
2.4 Warnings Issued by the Hong Kong Observatory

Table 2.2 summarises the details of the Thunderstorm, Flooding, Landslip, Tropical Cyclone and Rainstorm Warnings issued by the HKO in 2012. No Black Rainstorm Warning was issued in 2012. Two Red Rainstorm Warnings and 19 Amber Rainstorm Warnings were issued between 16 April and 24 September 2012. One Landslip Warning was issued on 24 July 2012.

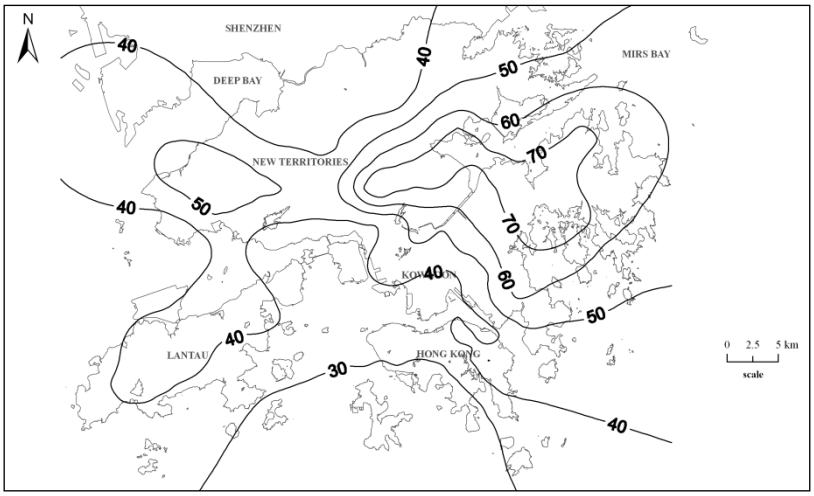


Note: Rainfall recorded at Hong Kong Observatory, Tsim Sha Tsui.

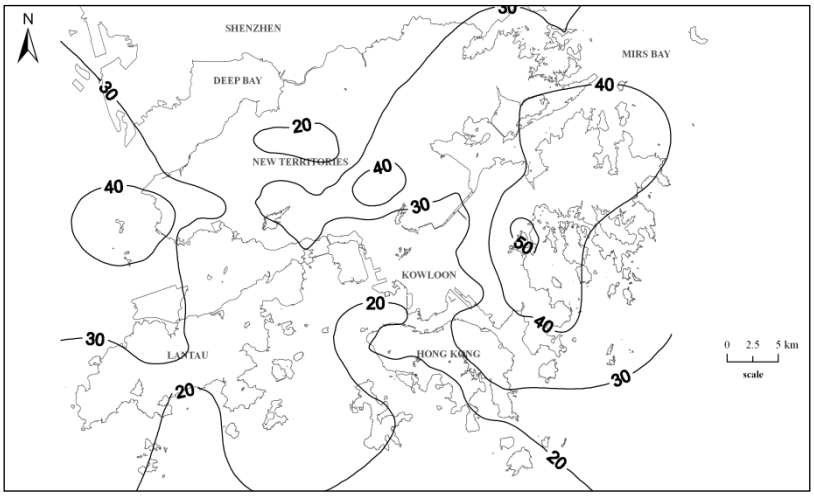
Figure 2.2 Cumulative Rainfall for 2012 at the Hong Kong Observatory and its Recorded Highest, Mean and Lowest Cumulative Rainfalls



January 2012



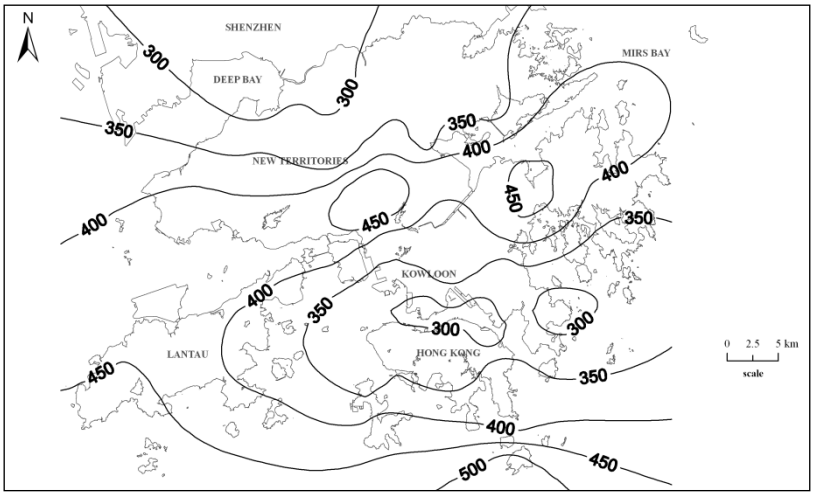
February 2012



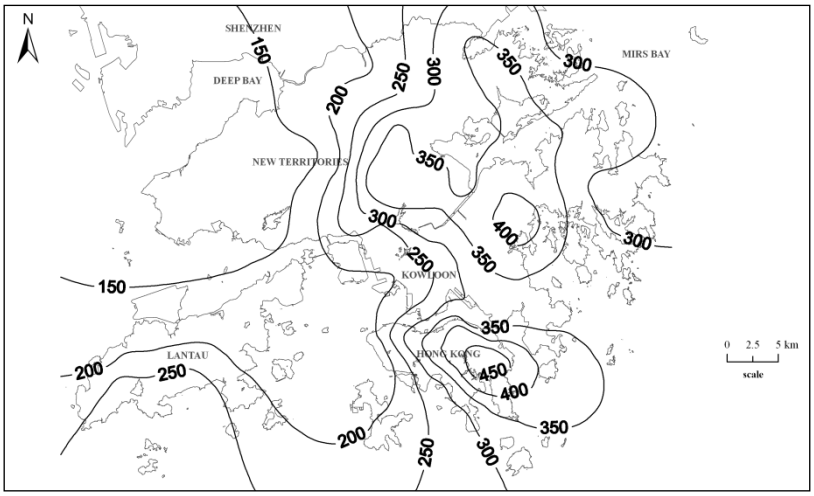
March 2012

Note: Isohyets are based on the GEO and HKO raingauges.

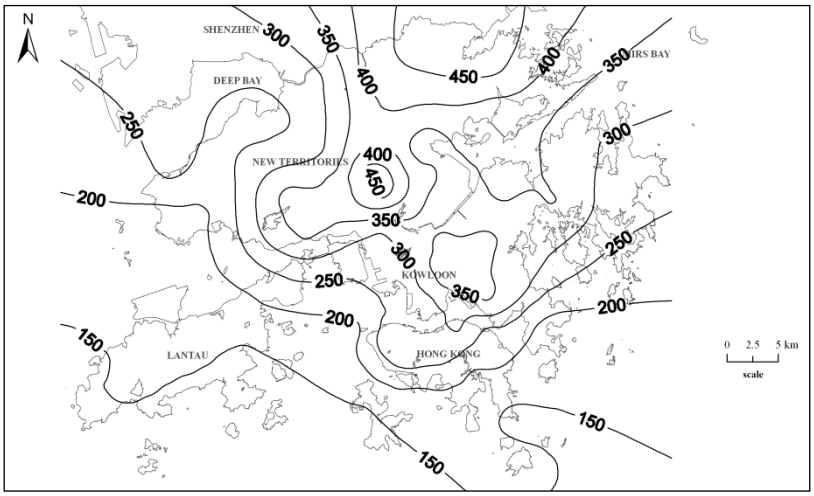
Figure 2.3 Monthly Rainfall Distribution in 2012 (Sheet 1 of 4)



April 2012



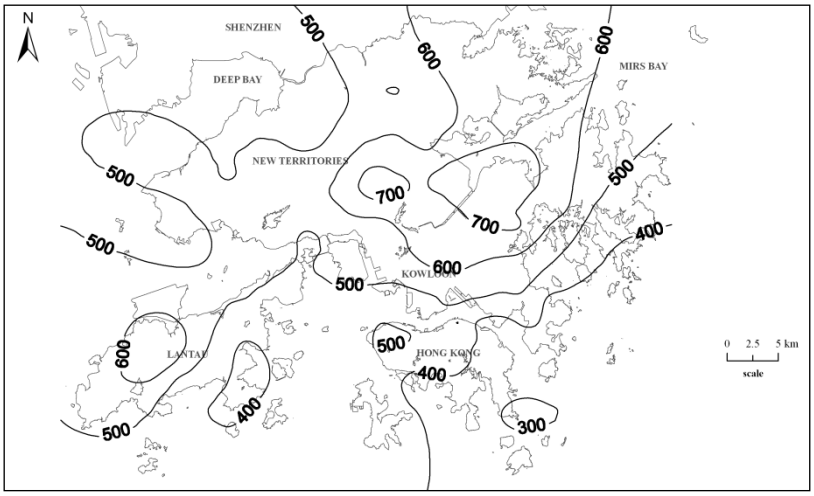
May 2012



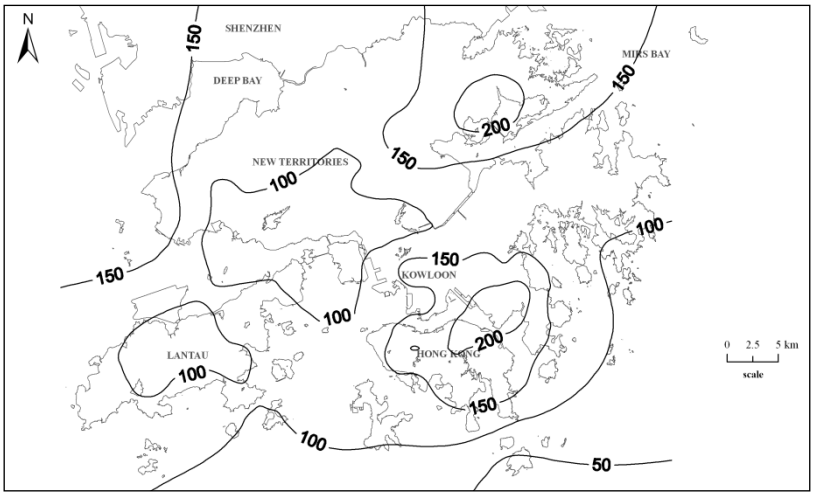
June 2012

Note: Isohyets are based on the GEO and HKO raingauges.

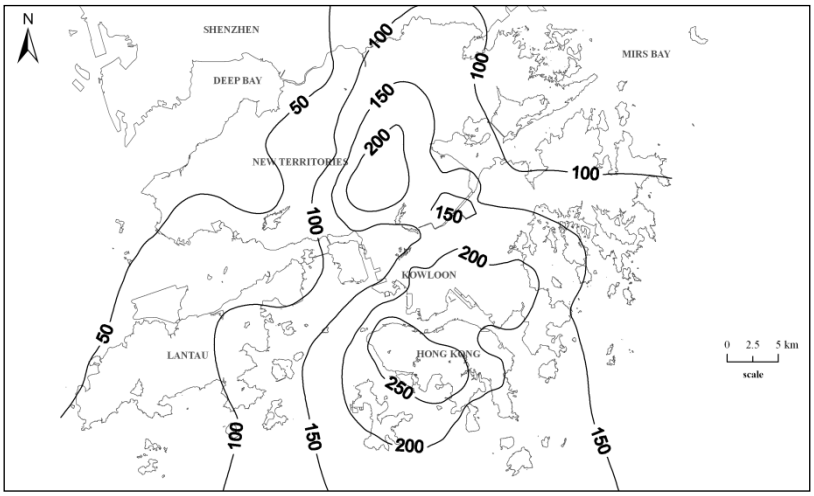
Figure 2.3 Monthly Rainfall Distribution in 2012 (Sheet 2 of 4)



July 2012



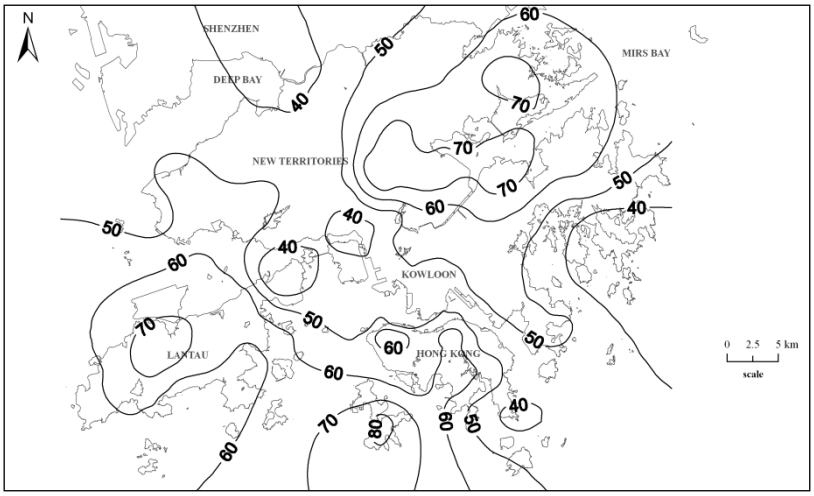
August 2012



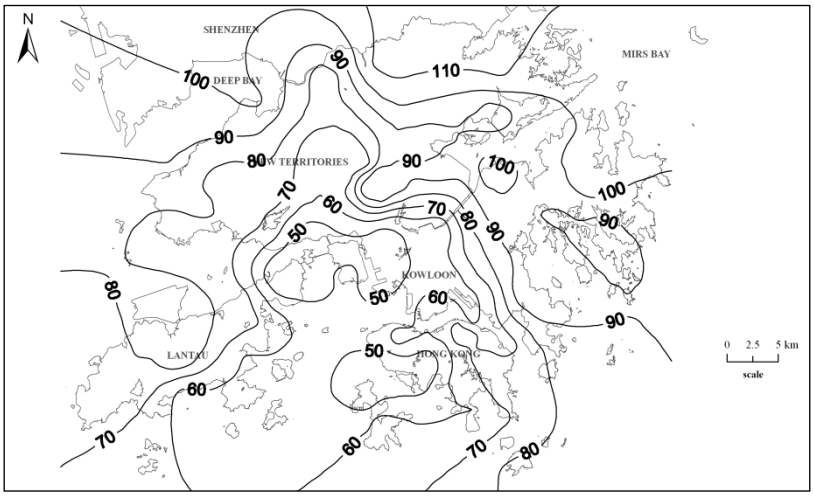
September 2012

Note: Isohyets are based on the GEO and HKO raingauges.

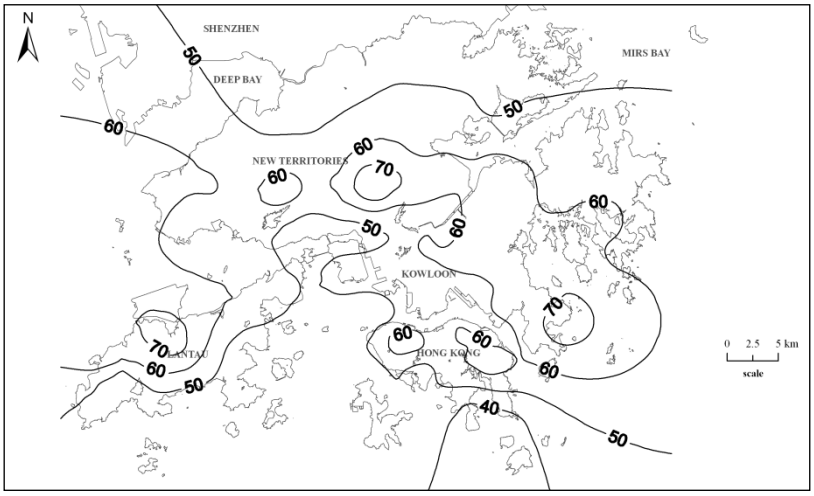
Figure 2.3 Monthly Rainfall Distribution in 2012 (Sheet 3 of 4)



October 2012



November 2012



December 2012

Note: Isohyets are based on the GEO and HKO raingauges.

Figure 2.3 Monthly Rainfall Distribution in 2012 (Sheet 4 of 4)

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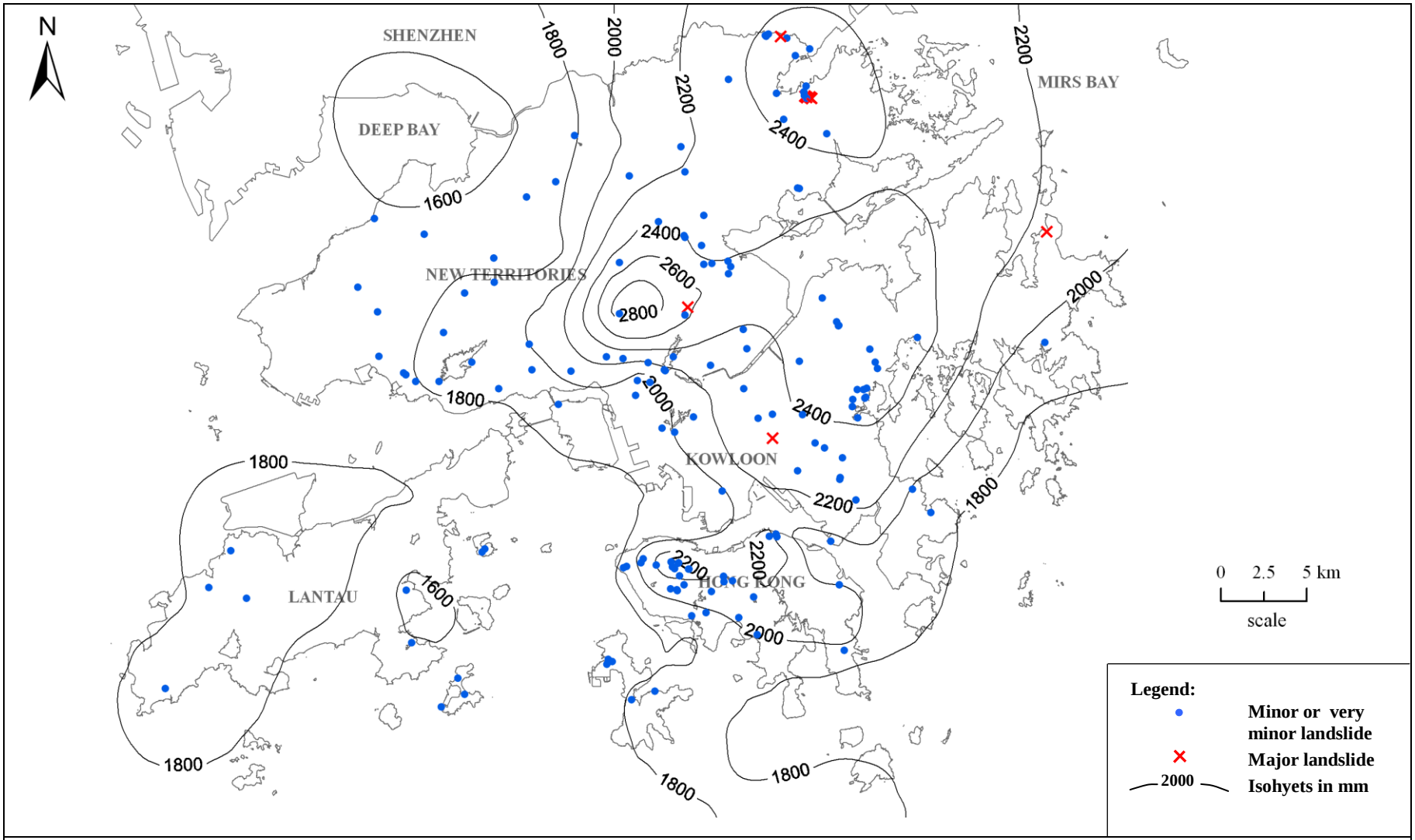

Notes: (1) Isohyets are based on the GEO and HKO raingauges.
(2) Only the genuine landslides in 2012 (163 nos.) reported to the GEO and other government departments are shown.

Figure 2.4 Annual Rainfall Distribution and Locations of Reported Landslides in 2012

Table 2.1 Rainfall and Landslides in 2012 and Selected Previous Major Rainstorms (Sheet 1 of 2)

Date of Rainstorm Event [1]	Maximum Rainfall (mm) [2]								Number of Landslides Reported to GEO [4]
	Hong Kong Observatory (HKO)					GEO Raingauges [3]			
	24-hr	4-hr	1-hr	Antecedent		24-hr	4-hr	1-hr	
				4-day	15-day				
16-17 April 2012	27.7	15	9.5	0	88.6	146.5 (N51)	117.5 (N51)	94.5 (N51)	1
19-20 April 2012	66.2	47.4	37	28.4	117	149.5 (N51)	60 (H28)	48.5 (H28)	6
28-30 April 2012	55.3	32.6	11.5	42.1	165.2	173 (N38)	161 (N38)	80 (N49)	10
4-5 May 2012	35.7	31.6	26.7	0.9	178.3	172.5 (H14)	167.5 (H14)	98.5 (H26)	3
18-19 May 2012	89.6	44.7	19.1	39.3	91.7	137 (N52)	90.5 (N51)	49.5 (N51)	0
28-29 May 2012	16	13	7.2	41.4	227.2	127 (N46)	115 (N41)	80 (N41)	4
12-13 June 2012	25.1	19.4	8.4	28.5	40.5	96.5 (N34)	75 (N34)	51 (N34)	0
16-17 June 2012	80.3	37.6	15.8	25.3	62.4	145.5 (N14)	74 (N16)	37.5 (N50)	2
22-23 June 2012	31.2	14.1	14	44.7	189	103.5 (N05)	46 (K08)	46 (K08)	1
23-27 July 2012	203	48.8	23.1	7.4	80.9	428 (N37)	173.5 (N50)	96 (N50)	41
11-12 August 2012	68.6	59.4	22.8	7.7	53.1	108.5 (H16)	99 (H16)	45.5 (H16)	2
24-25 September 2012	143.4	102.7	41.3	26.9	27.6	222 (N14)	170.5 (K08)	95 (N37)	3

Notes:
(1) Rainstorms are arranged in order of the rolling 24-hour rainfall at the Hong Kong Observatory in Tsim Sha Tsui.
(2) The maximum rainfalls are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO, for which the rolling rainfall is calculated using one-clock hour rainfall as the basic unit.
(3) The maximum rainfalls are selected from the 88 GEO Raingauges for the rainstorms. The GEO Raingauge reference number is shown in brackets.
(4) Reported nos. of landslides refer to those genuine landslides that can be attributed to the rainstorm events.

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Table 2.1 Rainfall and Landslides in 2012 and Selected Previous Major Rainstorms (Sheet 2 of 2)

Date of Rainstorm Event	Maximum Rainfall (mm) [1]								Number of Landslides Reported to GEO [2]
	Hong Kong Observatory (HKO)					GEO Raingauges [3]			
	24-hr	4-hr	1-hr	Antecedent		24-hr	4-hr	1-hr	
				4-day	15-day				
Selected Major Rainstorms in Previous Years (for comparison only)									
20-21 May 1989	387.8	119.3	37.3	27.9	41.7	566.0 (N14)	194.5 (N14)	61.5 (N14)	378
7-9 May 1992	324.7	195.0	109.9	4.2	9.1	386.5 (H10)	243.0 (H10)	144.5 (H19)	314
15-16 June 1993	155.1	122.3	54.1	155.8	296.1	285.0 (N13)	191.5 (N13)	111.0 (H13)	123
4-5 November 1993	106.6	27.8	9.4	0	0	745.0 (N17)	285.0 (N17)	114.0 (N17)	394
21-25 July 1994	310.2	141.9	70.4	18.7	310.1	956.0 (N14)	365.0 (N14)	211.5 (N14)	208
3-11 August 1994	74.1	44.9	27.1	8.1	759.1	381.0 (N14)	187.5 (N14)	103.5 (N14)	46
11-15 August 1995	325.7	109.1	43.8	5.1	436.9	468.0 (H08)	223.5 (H14)	106.0 (N14)	110
3-5 June 1997	150.2	83.7	46.4	0.9	33.6	367.5 (N04)	262.5 (N04)	128.5 (N04)	81
1-4 July 1997	148.8	106.7	45.4	33.5	362.7	800.0 (N09)	249.5 (N09)	125.0 (N01)	150
8-9 June 1998	428.4	152.4	71.7	86.6	246.8	562.0 (N15)	218.5 (N15)	98.0 (N09)	96
22-26 August 1999	313.1	127.4	50.7	6.8	170.3	565.0 (N14)	230.5 (N10)	120.5 (N10)	269
16-21 August 2005	416.4	122.9	39.1	110.7	214.1	570.0 (N01)	173.5 (N18)	82.0 (N25)	229
6-9 June 2008	417.6	246.3	145.5	99.9	242.5	622.5 (N19)	384.0 (N19)	153.5 (N21)	363

Notes:
(1) The maximum rainfalls are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO, for which the rolling rainfall is calculated using one-clock hour rainfall as the basic unit.
(2) Reported nos. of landslides refer to those genuine landslides that can be attributed to the rainstorm events.
(3) The maximum rainfalls are selected from all the available GEO Raingauges for the rainstorms. The GEO Raingauge reference number is shown in brackets.

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Table 2.2 Warnings Issued by the Hong Kong Observatory in 2012

Month	Monthly Total Rainfall (mm)	Dates on which Warnings [1] were in Effect				
		Thunderstorm [2]	Flooding	Landslip [3]	Tropical Cyclone [4]	Rainstorm
January	42.1	-	-	-	-	-
February	29.5	28	-	-	-	-
March	22.1	-	-	-	-	-
April	294.9	5, 6, 9, 13, 16, 17, 19, 20, 23, 25, 26, 27, 28, 29, 30	29	-	-	16 (Amber), 20 (Amber), 27 (Amber), 29 (Amber), 29 (Red)
May	277.7	1, 3, 4, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 26, 28	20, 28	-	-	4 (Amber), 18 (Amber), 26 (Amber), 28 (Amber)
June	261.5	2, 9, 10, 11, 12, 13, 16, 21, 22, 23, 29, 30	12	-	17-19 (1-3, TALIM), 28-30 (1-8, DOKSURI)	13 (Amber)
July	467.8	5, 8, 14, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26 ,27, 28, 31	24, 25	24	21-24 (1-10, VICENTE)	5 (Amber), 18 (Amber), 21 (Amber), 24 (Amber), 25 (Amber), 27 (Amber), 31 (Amber)
August	149.8	1, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 28, 30, 31	-	-	15-17 (1-8, KAI-TAK), 24 (1, TEMBIN)	11 (Amber)
September	213.0	1, 2, 3, 6, 7, 8, 9, 12, 13, 22, 23, 24	-	-	-	24 (2 x Amber), 24 (Red)
October	46.4	-	-	-	-	-
November	63.9	23	-	-	-	-
December	56.0	-	-	-	-	-
Total	1924.7	142 Warnings	6 Warnings	1 Warning	5 Warnings	21 Warnings (19 x Amber & 2 x Red)

Notes:
(1) Warnings and signals were based on the information from the HKO.
(2) More than one Thunderstorm Warning may have been issued within a day but have only been shown once for clarity.
(3) Landslip Warning was issued after consultation between the GEO and the HKO.
(4) Tropical Cyclone Warning signal no. hoisted is shown in the bracket followed by the name of the tropical cyclone.

3 Landslides

3.1 Landslides in 2012

Landslide incidents that occurred in 2012 and reported to the GEO and other government departments are summarised in Table 3.1.

A total of 169 landslide incidents that occurred in 2012 were reported to various government departments. These include 117 incidents (discounting duplicate cases) reported to the GEO. Another 52 incidents were reported to other government departments (i.e. AFCD, ArchSD, HyD, LandsD and WSD). Of these 169 reported incidents, 163 were genuine landslides (see details in Appendix B). The other reported incidents were non-landslide events such as tree falls.

Of the 163 genuine landslides, 8 (5%) was major landslide (see Table B1 in Appendix B), 88 (54%) were minor landslides, and 67 (41%) were very minor landslides with negligible consequences (see Section 1).

Selected notable landslides are presented in Section 4 and illustrated in Figures 4.1 to 4.4. For those landslide incidents inspected by the GEO, the information on the landslides was recorded in incident reports prepared by the GEO. For those landslide incidents attended to by other government departments responsible for slope maintenance, landslide incident reports were prepared by the respective departments. The above information is available in the Slope Information System (SIS). Further details of these slope failures can be found in the relevant files of the three District Divisions and the Landslip Preventive Measures Division 1 of the GEO.

Wherever possible, the dates and times of the landslides were assessed by geotechnical professionals. Of the 163 landslides, the timing of occurrence was determined to within one day for 46 incidents based on the reported date of failure given in the incident reports. For the remaining landslide incidents, the timing of occurrence could not be ascertained due to lack of information or that the incidents were not reported to the GEO or other government departments until several days or even weeks after occurrence.

3.2 Consequence of Landslides

The consequence of landslides in terms of the types of facilities affected (e.g. buildings, roads, registered squatter dwellings, catchwaters, construction sites, etc.) in different regions is summarised in Table 3.2. In regard to the landslides with significant consequences (e.g. casualties, evacuation of buildings or squatter dwellings, temporary closure of roads, etc.), they are classified with respect to the type of slope failure, as shown in Table 3.3. The facility group affected by the major landslide is presented in Table 3.4. Further descriptions of some selected notable landslides of 2012 are given in Section 4 below.

3.3 Types of Slope Failures

Landslides reported to the GEO and other government departments have been classified into five major types of slope failures, i.e. fill slopes, cut slopes, retaining walls, natural hillside and registered disturbed terrain. The breakdown of different types of slope failures is shown in Table 3.5.

Table 3.1 Breakdown of Landslides in 2012 Reported to Government Departments

Department	Reported Number of Landslides	Genuine Landslides
Agriculture, Fisheries and Conservation Department	18 (2)	17 (2)
Architectural Services Department	5 (0)	5 (0)
Drainage Services Department	0 (0)	0 (0)
Geotechnical Engineering Office, Civil Engineering and Development Department	117(1)	113(1)
Highways Department	36 (29)	35 (29)
Housing Department	0 (0)	0 (0)
Lands Department	10 (2)	10 (2)
Water Supplies Department	16 (0)	16 (0)
Total	202 (33)(2)	196 (33)(2)

Legend:

10 (2) Ten incidents were reported to the government department concerned, two of which were also reported to the GEO separately by other parties (i.e. duplicate cases)

Notes:

(1) A total of 117 landslide incidents that occurred in 2012 (discounting duplicated cases) were reported to the GEO, of which 113 incidents were classified as genuine landslides.

(2) The number of reported landslide incidents that occurred in 2012 (discounting duplicate cases) is 169 [202-33]. The number of genuine landslides is 163 [196-33].

Table 3.2 Breakdown of Landslides by Type of Affected Facility

Type of Affected Facility	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
Buildings (including village houses)	0 (0)	0 (0)	6 (0)	6 (0)
Registered Squatter Dwellings	0 (0)	0 (0)	19 (0)	19 (0)
Roads	11 (0)	0 (0)	8 (1)	19 (1)
Transportation Facilities (e.g. railways, tramways, etc.)	0 (0)	0 (0)	0 (0)	0 (0)
Pedestrian Pavements/Footways	1 (0)	1 (0)	1 (0)	3 (0)
Minor Footpaths/Access Paths/ Access Roads	11 (0)	6 (0)	50 (4)	67 (4)
Construction Sites	2 (0)	0 (0)	0 (0)	2 (0)
Open Areas	3 (0)	1 (1)	17 (0)	21 (1)
Catchwaters	0 (0)	0 (0)	5 (0)	5 (0)
Others (e.g. carparks, parks, playgrounds, gardens, backyards, etc.)	5 (0)	1 (0)	15 (3)	21 (3)
Nil	2(0)	0 (0)	7 (0)	9 (0)
Total	35 (0)	9 (1)	128 (8)	172 (9)

Legend:

8 (1) Eight landslides of which one was major failure (i.e. failure volume $\geq 50\ m^3$)

Notes: (1) Incidents that were not genuine landslides have been excluded.
(2) A given landslide may affect more than one type of facility.

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Table 3.3 Breakdown of Landslide Consequences by Type of Slope Failure

Type of Slope Failure		Number of Squatter Dwellings (1) Evacuated		Number of Floors, Houses or Flats Evacuated or Partially Closed	Number of Closure			Deaths	Injuries reported to GEO
		Permanent	Temporary		Roads	Pedestrian Pavements	Footpaths, Alleyways or Private Access Paths		
Fill Slopes		0	0	0	0	0	0	0	0
Cut Slopes	Soil	2(2)	0	0	2	0	5	0	0
	Soil/Rock	0	0	0	2	0	1	0	0
	Rock	0	0	0	0	0	1	0	0
Retaining Walls		0	0	3	0	0	0	0	0
Natural Hillside		0	0	0	7	0	7	0	0
Registered Disturbed Terrain		0	0	0	0	0	0	0	0
Total		2(2)	0	3	11	0	14	0	0

Legend:

2(2) Number of squatter dwellings evacuated, with the number of tolerated squatter structures evacuated shown in brackets

Note: (1) A squatter dwelling is defined as a place of residence that contains one or more tolerated squatter structures, i.e. structures built for domestic purposes or non-domestic purposes and registered in 1982 Housing Department's Squatter Structure Survey (GEO, 2010).

Table 3.4 Breakdown of Facility Groups Affected by Major Landslides

Type of Major Landslide	Facility Group Affected by Major Landslides (Group No.)						
	1a	1b	2a	2b	3	4	5
All Major Landslides	0	0	0	0	0	2	6
Major Landslides on Man-made Slopes	0	0	0	0	0	0	0
Major Landslides on Registered Disturbed Terrain	0	0	0	0	0	0	0
Major Landslides on Natural Hillsides	0	0	0	0	0	2	6

Note: Facility groups are classified in accordance with the GEO Technical Note No. 15 (GEO, 2007).

Table 3.5 Breakdown of Landslides by Type of Slope Failure

Type of Slope Failure		Number	Percentage (%)
Fill Slopes		7 (0)	4.3
Cut Slopes	Soil	63 (0)	38.7
	Soil/Rock	28 (0)	17.2
	Rock	9 (0)	5.5
Retaining Walls		9 (0)	5.5
Natural Hillsides		44 (8)	27.0
Registered Disturbed Terrain		3 (0)	1.8
Total		163 (8)	100.0

Legend:

44 (8) Forty-four landslides, eight of which were major failures

Notes:
(1) Where a landslide involved more than one type of failure, the predominant type of failure has been considered in the above classification.
(2) Incidents that were not genuine landslides have been excluded.

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3.4 Landslide Volume Distribution

Tables 3.6 and 3.7 show the distribution of failure volumes for all the reported landslides. A total of 102 landslides (62.6%) involved less than 5 m^3 of material. There were eight major landslides (with a failure volume of 50 m^3 or more), all of which occurred on natural hillside. The largest landslide with a failure volume of 200 m^3 occurred within a country park. Nil consequence was resulted despite of its large failure volume.

Table 3.6 Landslide Volume Distribution with Respect to Geographical Locations

Volume of Failure (m^3)	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
< 5	27	7	68	102 (62.6%)
≥ 5 to < 10	3	0	17	20 (12.3%)
≥ 10 to < 20	2	1	13	16 (9.8%)
≥ 20 to < 50	1	0	16	17 (10.4%)
≥ 50 to < 200	0	1	6	7 (4.3%)
≥ 200 to < 500	0	0	1	1 (0.6%)
≥ 500 to < 1000	0	0	0	0 (0%)
≥ 1000	0	0	0	0 (0%)
Total	33	9	121	163 (100%)

Legend:

7 (4.3%) Seven landslides, which amount to 4.3% of the total 163 genuine landslides reported to the Government

Table 3.7 Landslide Volume Distribution with Respect to Type of Slope Failure

Volume of Failure (m^3)	Fill Slopes	Cut Slopes			Retaining Walls	Natural Hillsides	Registered Disturbed Terrain	Total
		Soil	Soil/Rock	Rock				
< 5	4	37	22	9	5	24	1	102 (62.6%)
≥ 5 to < 10	3	9	3	0	1	3	1	20 (12.3%)
≥ 10 to < 20	0	10	2	0	2	2	0	16 (9.8%)
≥ 20 to < 50	0	7	1	0	1	7	1	17 (10.4%)
≥ 50 to < 200	0	0	0	0	0	7	0	7 (4.3%)
≥ 200 to < 500	0	0	0	0	0	1	0	1 (0.6%)
≥ 500 to < 1000	0	0	0	0	0	0	0	0 (0%)
≥ 1000	0	0	0	0	0	0	0	0 (0%)
Total	7	63	28	9	9	44	3	163 (100%)

Legend:

7 (4.3%) Seven landslides, which amount to 4.3% of the total 163 genuine landslides reported to the Government

4 Notable Landslides

4.1 General

Of the 163 genuine landslides reported to the Government that occurred in 2012, two incidents are described in more detail below. These two incidents have been selected on the basis of their consequences.

4.2 The 24 July 2012 Landslide and Boulder Falls on Natural Terrain above Tate's Cairn Tunnel Portal, Diamond Hill (Incident No. 2012/08/1230)

At about 4:00 a.m. on 24 July 2012 when Landslip Warning and Amber Rainstorm Warning were in effect, a 60 m^3 landslide and boulder falls occurred at the natural hillside above Tate's Cairn Tunnel Portal at Diamond Hill. The tunnel is an important route linking the east Kowloon area to the New Territories. The landslide source area was about 5 m wide, 9 m long and 2.5 m deep. The landslide debris travelled down along the hillside for a distance of about 16 m and most of the debris comprising soil and some boulders were deposited within a ditch behind an earth bund (Figure 4.1). Two large boulders, with volume of about 11 m^3 and 15 m^3 respectively, travelled further downhill over a plan distance of 70 m and came to rest on the upper berm (1.5 m wide) on slope No. 11NE-A/C237. The Tate's Cairn Tunnel Portal is about 25 m away downslope from the location of the boulders. The boulders knocked over 14 mature trees and damaged a section of chain-link fence along the crest of slope No. 11NE-A/C237. They also caused some damage to the surface drainage channel on the hillside and a catchpit on the man-made slope. No injury or casualty was reported as a result of the incident. However, the consequence of the landslide could have been very serious had the boulders travelled beyond the slope berm to the tunnel portal area.

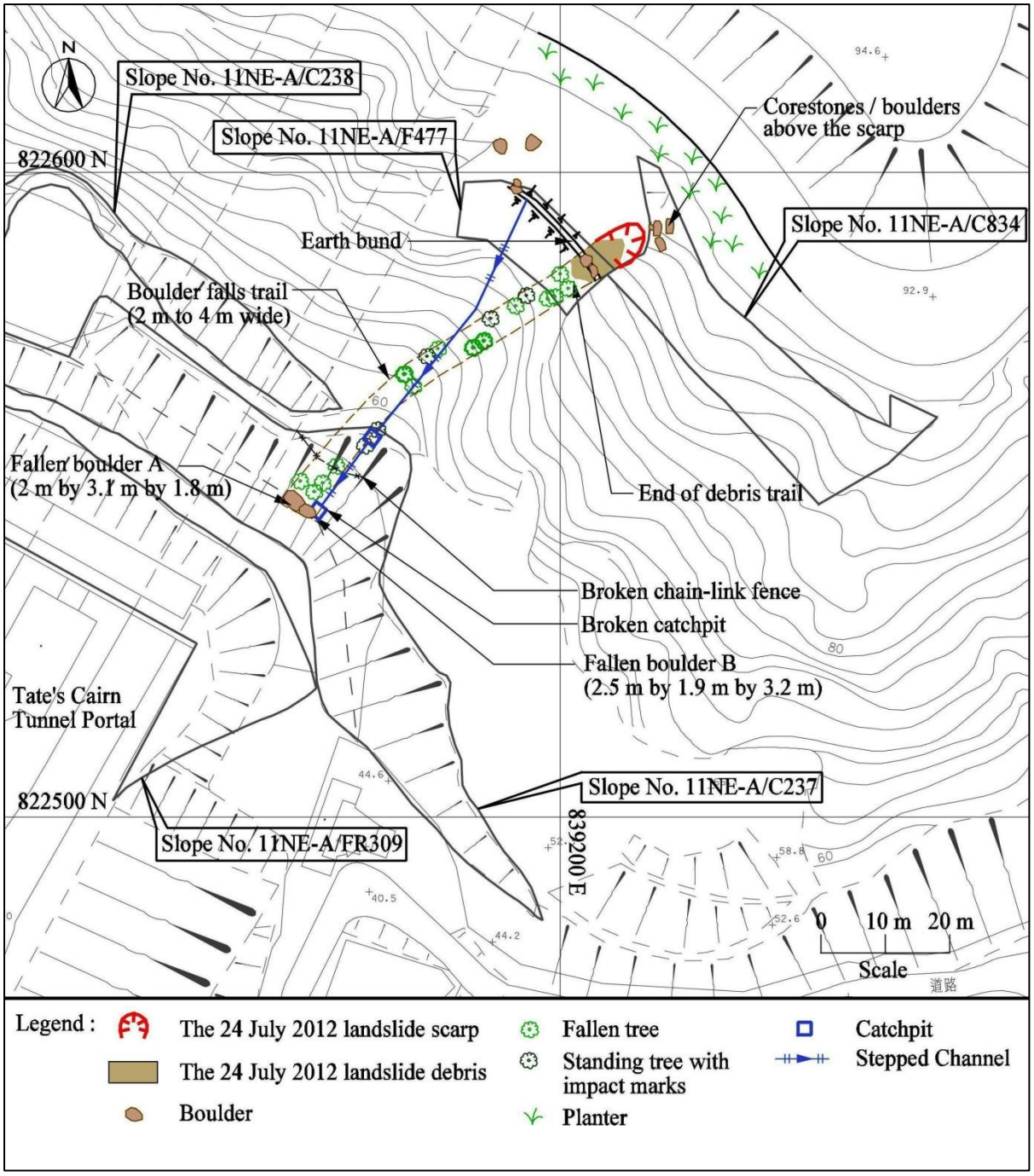
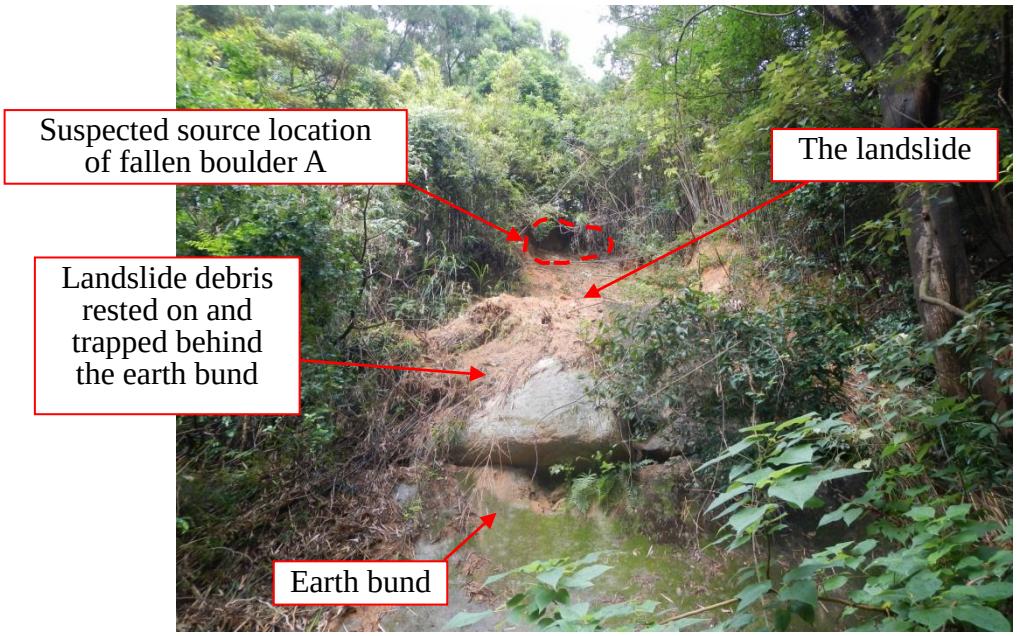
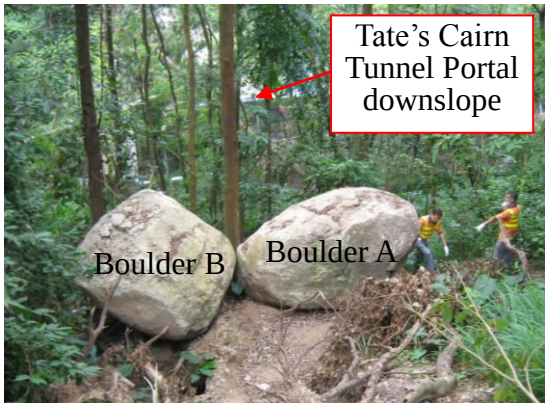


Figure 4.1 Location Plan of the 24 July 2012 Landslide and Boulder Falls on Natural Terrain above Tate's Cairn Tunnel Portal, Diamond Hill (Incident No. 2012/08/1230)



(a) The Landslide

(b) Boulder Fall Source Location



(c) Deposition Area of the Fallen Boulders

Figure 4.2 Views of the 24 July 2012 Landslide and Boulder Falls on Natural Terrain above Tate's Cairn Tunnel Portal, Diamond Hill (Incident No. 2012/08/1230)

4.3 The 25 September 2012 Landslide at an Unregistered Cut Slope behind Squatter Structures at the Platform above Slope No. 7SW-C/C880, North of Ham Tin Tsuen (Incident No. 2012/09/1239)

On 25 September 2012, a 6 m^3 landslide was reported to have occurred at the middle portion of an unregistered soil cut slope behind two squatter dwellings at the platform above slope No. 7SW-C/C880 to the north of Ham Tin Tsuen (Figure 4.3). The exact date and time of failure were however not known. The landslide scar is about 3.5 m long, 1.8 m wide and 1 m deep. The landslide debris damaged the back wall of a squatter dwelling at the slope toe and some of the debris went inside the dwelling. No injury or casualty was reported.

According to available records, a Category 2 Non-development Clearance[1] (NDC) to a dwelling at the slope toe was recommended by GEO in 1993. However, the occupants refused to leave. Subsequently, two affected squatter dwellings were permanently evacuated under a Category 1 NDC[2] recommended by GEO following the 2012 landslide.

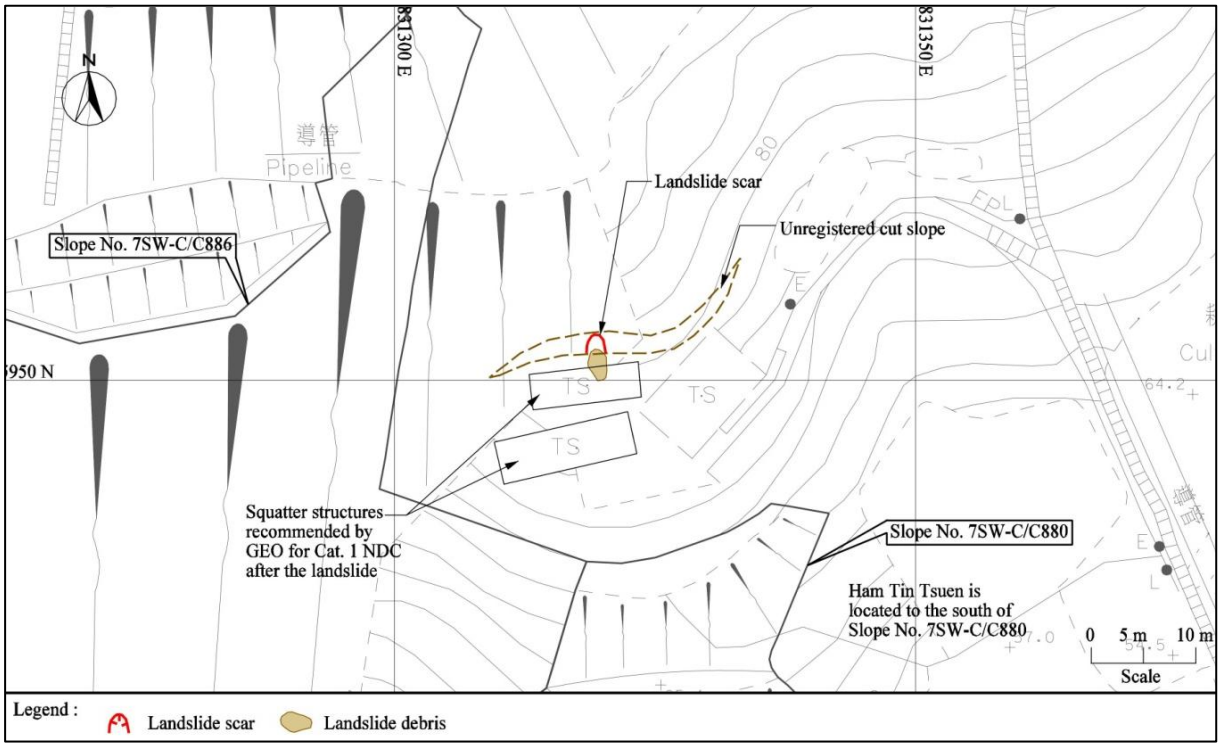


Figure 4.3 Location Plan of the 25 September 2012 Landslide at an Unregistered Cut Slope behind Squatter Structures at the Platform above Slope No. 7SW-C/C880, North of Ham Tin Tsuen (Incident No. 2012/09/1239)

[1] Category 2 Non-development Clearance (NDC) recommendations are issued to squatter structures that are considered especially vulnerable to landslides due to their close proximity to potentially unstable slopes; the clearance is through advice and persuasion.

[2] Category 1 NDC recommendations are issued to squatter structures that are in "immediate and obvious" danger; the clearance is compulsory and will be backed up by force if necessary.

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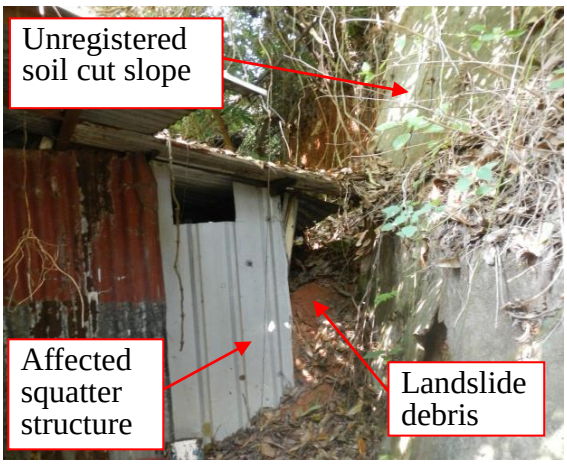

(a) The Landslide

(b) The Back Wall of the Squatter Structure Damaged by the Landslide Debris

Figure 4.4 Views of the 25 September 2012 Landslide at an Unregistered Cut Slope behind Squatter Structures at the Platform above Slope No. 7SW-C/C880, North of Ham Tin Tsuen (Incident No. 2012/09/1239)

5 Conclusion

Rainfall recorded at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 1,924.7 mm in 2012, much lower than the mean value of 2,398.5 mm between 1981 and 2010. In 2012, a Landslip Warning was issued on 24 July 2012 and no Black Rainstorm Warning was issued. Two Red Rainstorm Warnings were issued on 29 April and 24 September 2012 and 19 Amber Rainstorm Warnings between 16 April and 24 September 2012. Of the 163 genuine landslides, 8 were major failures, 88 were minor failures and 67 were very minor failures with negligible consequences.

There were fourteen landslides in 2012 with notable consequences. Of these landslides, one led to permanent evacuation of two squatter dwellings, one led to temporary evacuation of three village houses, eleven resulted in temporary closure of roads, and one involved a near-miss boulder fall incident above a tunnel portal. Other landslides in 2012 affected an open car park, footpaths or minor access roads and catchwaters, without any significant direct or indirect consequence. No injury or fatality was reported as a result of the 2012 landslides.

6 References

GEO (2007). *GEO Technical Guidance Note No. 15 (TGN 15) – Guidelines for Classification of Consequence-to-Life Category for Slope Features.* Geotechnical Engineering Office, Hong Kong, 14 p.

GEO (2010). *GEO Circular No. 3 – Non Development Clearance (Slope Safety) of Squatters.* Geotechnical Engineering Office, Hong Kong, 20 p.

HKO (2013). *Monthly Weather Summary December 2012.* Hong Kong Observatory, Hong Kong, 31 p.

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Appendix A

Some Selected Rainfall Parameters for the 12 Rainstorms with Daily Rainfall Exceeding 100 mm

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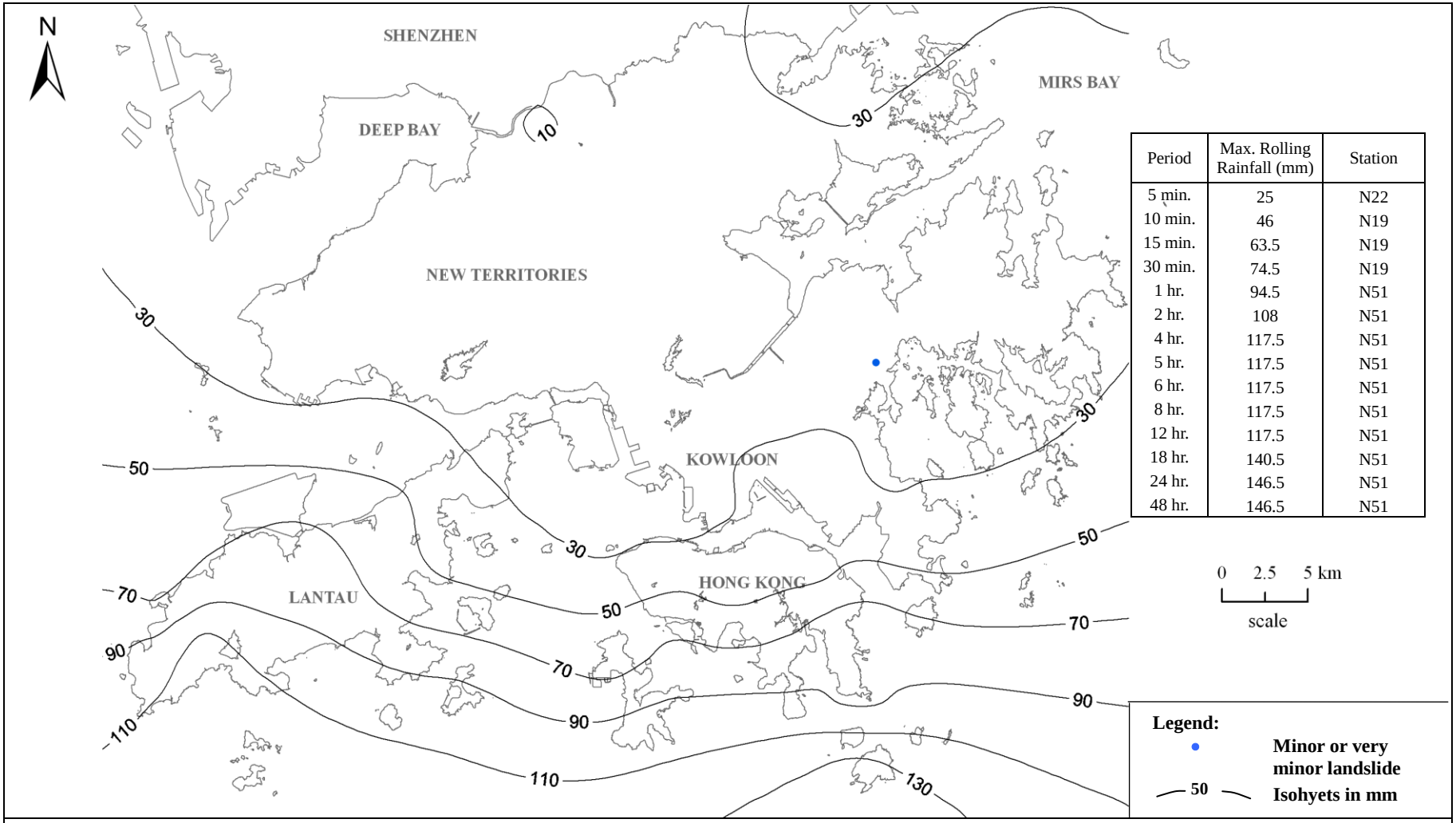
Table A1 Some Selected Rainfall Parameters for the 12 Rainstorms with Daily Rainfall Exceeding 100 mm in 2012

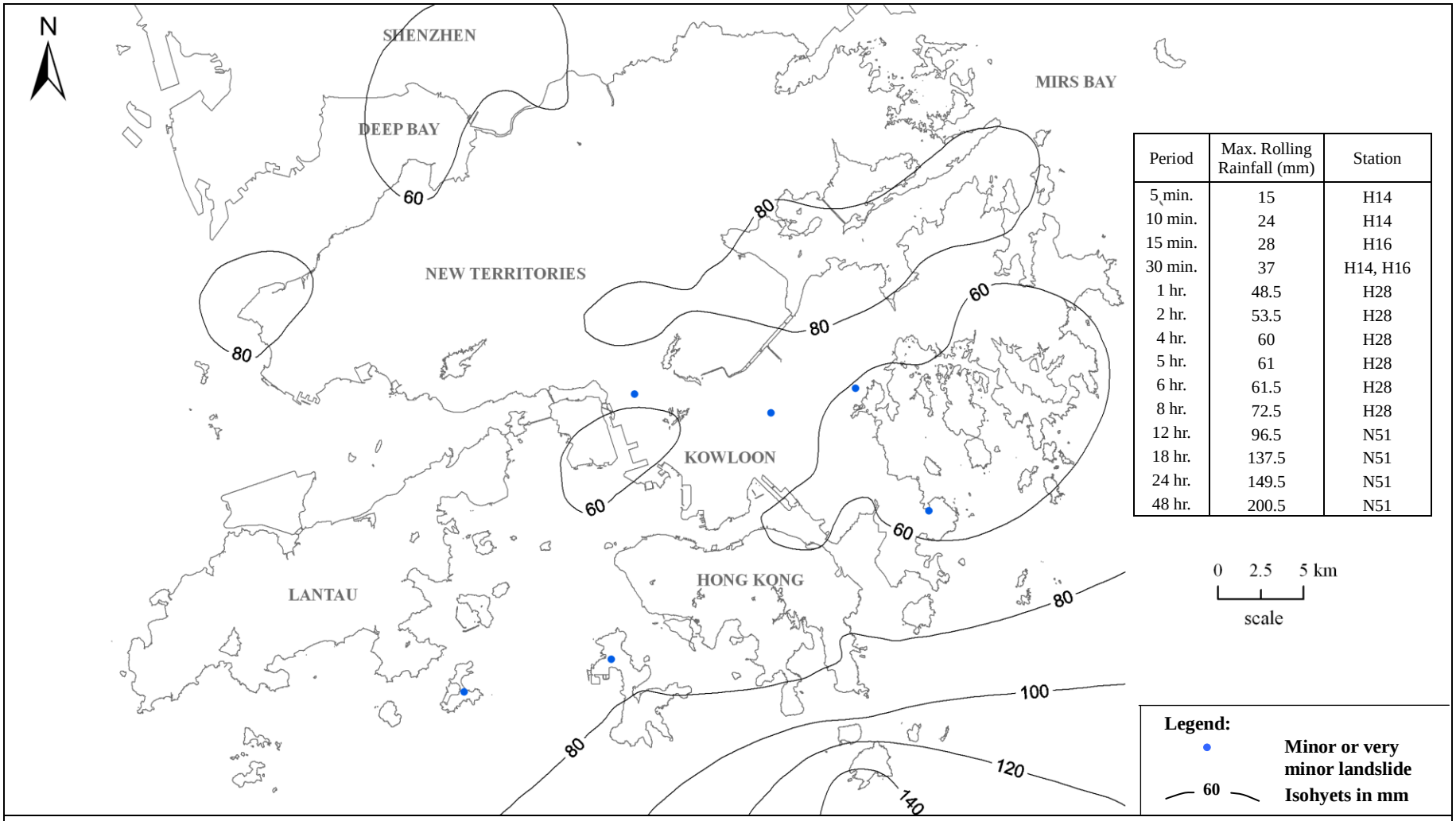
Rainstorm		5-min		10-min		15-min		30-min	
		Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station
1	16-17 April 2012	25	N22	46	N19	63.5	N19	74.5	N19
2	19-20 April 2012	15	H14	24	H14	28	H16	37	H14, H16
3	28-30 April 2012	15	N17	26	N31	34.5	N31, N40	53	N03, N39, N40
4	4-5 May 2012	14.5	H28	25	H08, N44	35.5	N09, N44	53.5	H14, H26
5	18-19 May 2012	10.5	N35, N37	18	N15	24.5	N15	38	N35
6	28-29 May 2012	13.5	N44	25	N44	32.5	N44	51	N44
7	12-13 June 2012	10.5	N46	13.5	N46	18.5	N34	34	N34
8	16-17 June 2012	7.5	N13, N52	15	N13	17.5	N08, N13	28	N40, N42
9	22-23 June 2012	12	K03	22	H06	29.5	H06	42.5	H06
10	23-27 July 2012	13.5	N46	24.5	N46	33	N46	54.5	N50
11	11-12 August 2012	10.5	H20, H25	18	H20	20.5	H25	30	H07
12	24-25 September 2012	17	N51	30	N51	39	N51	62	N15



Period	Max. Rolling Rainfall (mm)	Station
5 min.	25	N22
10 min.	46	N19
15 min.	63.5	N19
30 min.	74.5	N19
1 hr.	94.5	N51
2 hr.	108	N51
4 hr.	117.5	N51
5 hr.	117.5	N51
6 hr.	117.5	N51
8 hr.	117.5	N51
12 hr.	117.5	N51
18 hr.	140.5	N51
24 hr.	146.5	N51
48 hr.	146.5	N51

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) A genuine landslide reported to have occurred within the period between 16 April and 17 April 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A1 Maximum Rolling 24-hour Rainfall Distribution for the Period between 16 April (00:00) and 17 April 2012 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	15	H14
10 min.	24	H14
15 min.	28	H16
30 min.	37	H14, H16
1 hr.	48.5	H28
2 hr.	53.5	H28
4 hr.	60	H28
5 hr.	61	H28
6 hr.	61.5	H28
8 hr.	72.5	H28
12 hr.	96.5	N51
18 hr.	137.5	N51
24 hr.	149.5	N51
48 hr.	200.5	N51

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Six genuine landslides reported to have occurred within the period between 19 April and 20 April 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A2 Maximum Rolling 24-hour Rainfall Distribution for the Period between 19 April (00:00) and 20 April 2012 (24:00) and Locations of Landslides

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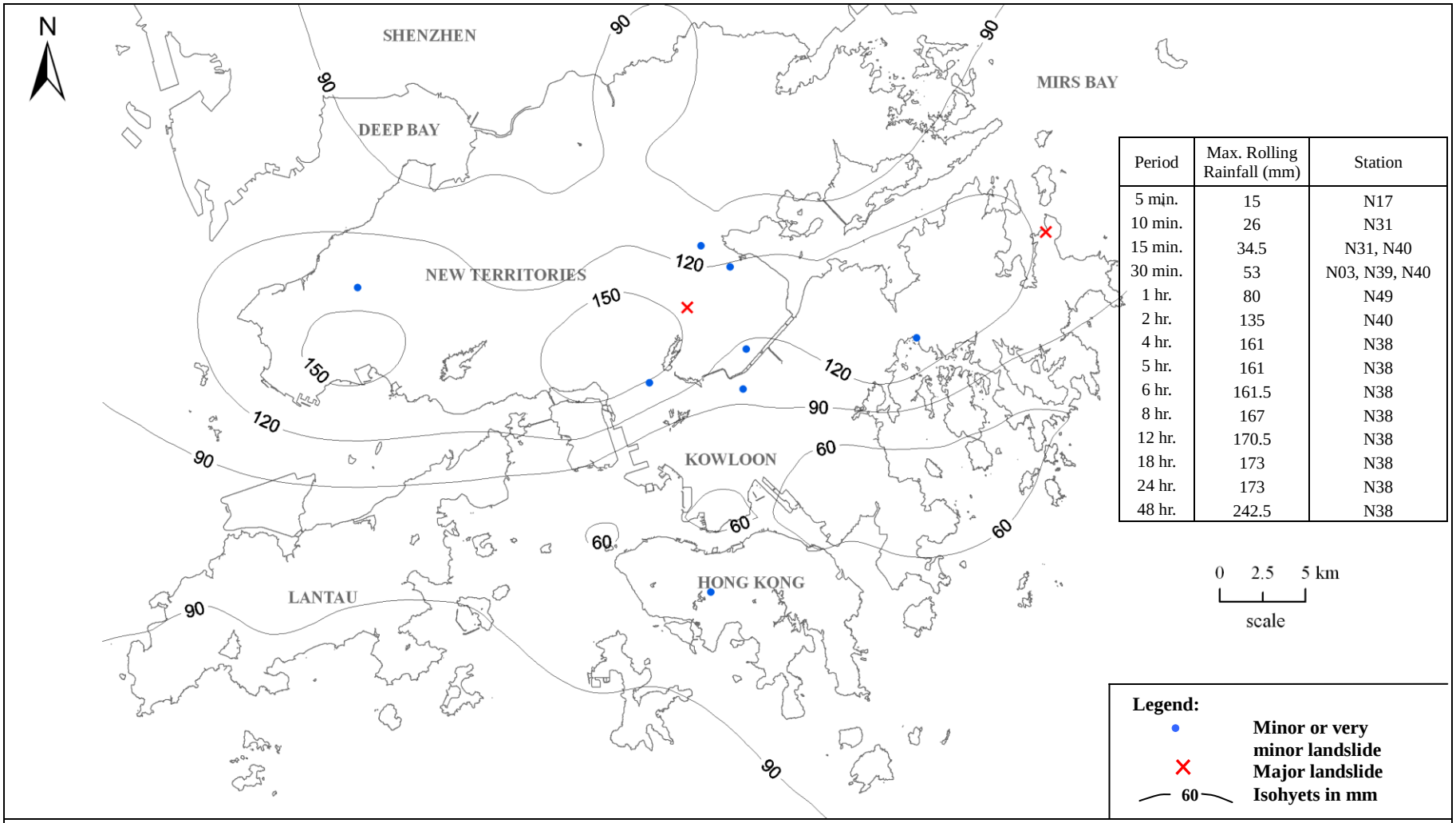
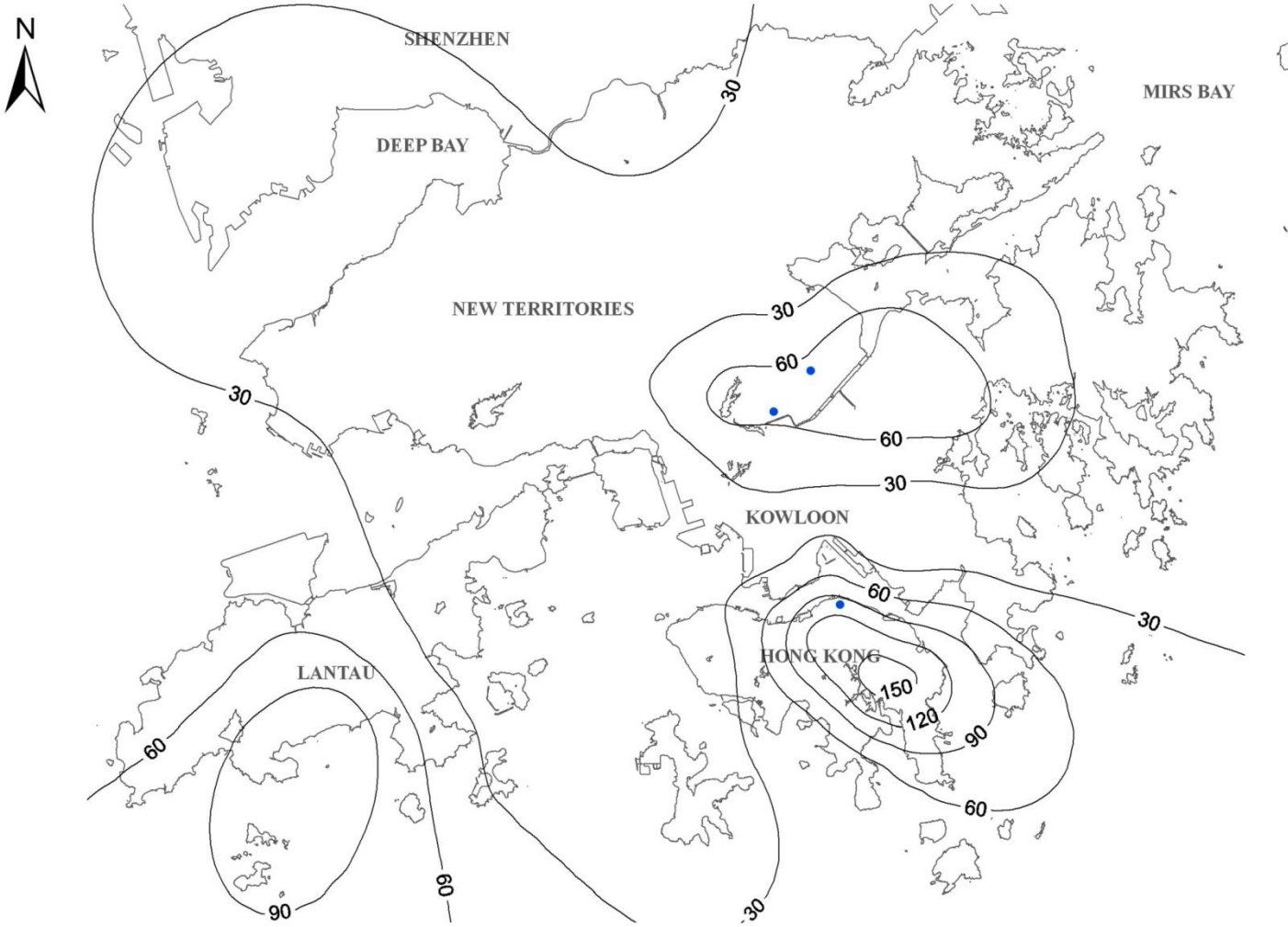


Period	Max. Rolling Rainfall (mm)	Station
5 min.	15	N17
10 min.	26	N31
15 min.	34.5	N31, N40
30 min.	53	N03, N39, N40
1 hr.	80	N49
2 hr.	135	N40
4 hr.	161	N38
5 hr.	161	N38
6 hr.	161.5	N38
8 hr.	167	N38
12 hr.	170.5	N38
18 hr.	173	N38
24 hr.	173	N38
48 hr.	242.5	N38

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Ten genuine landslides reported to have occurred within the period between 28 April and 30 April 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A3 Maximum Rolling 24-hour Rainfall Distribution for the Period between 28 April (00:00) and 30 April 2012 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	14.5	H28
10 min.	25	H08, N44
15 min.	35.5	N09, N44
30 min.	53.5	H14, H26
1 hr.	98.5	H26
2 hr.	142.5	H26
4 hr.	167.5	H14
5 hr.	170.5	H14
6 hr.	170.5	H14
8 hr.	170.5	H14
12 hr.	171	H14
18 hr.	172.5	H14
24 hr.	172.5	H14
48 hr.	173	H14

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Three genuine landslides reported to have occurred within the period between 4 May and 5 May 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A4 Maximum Rolling 24-hour Rainfall Distribution for the Period between 4 May (00:00) and 5 May 2012 (24:00) and Locations of Landslides

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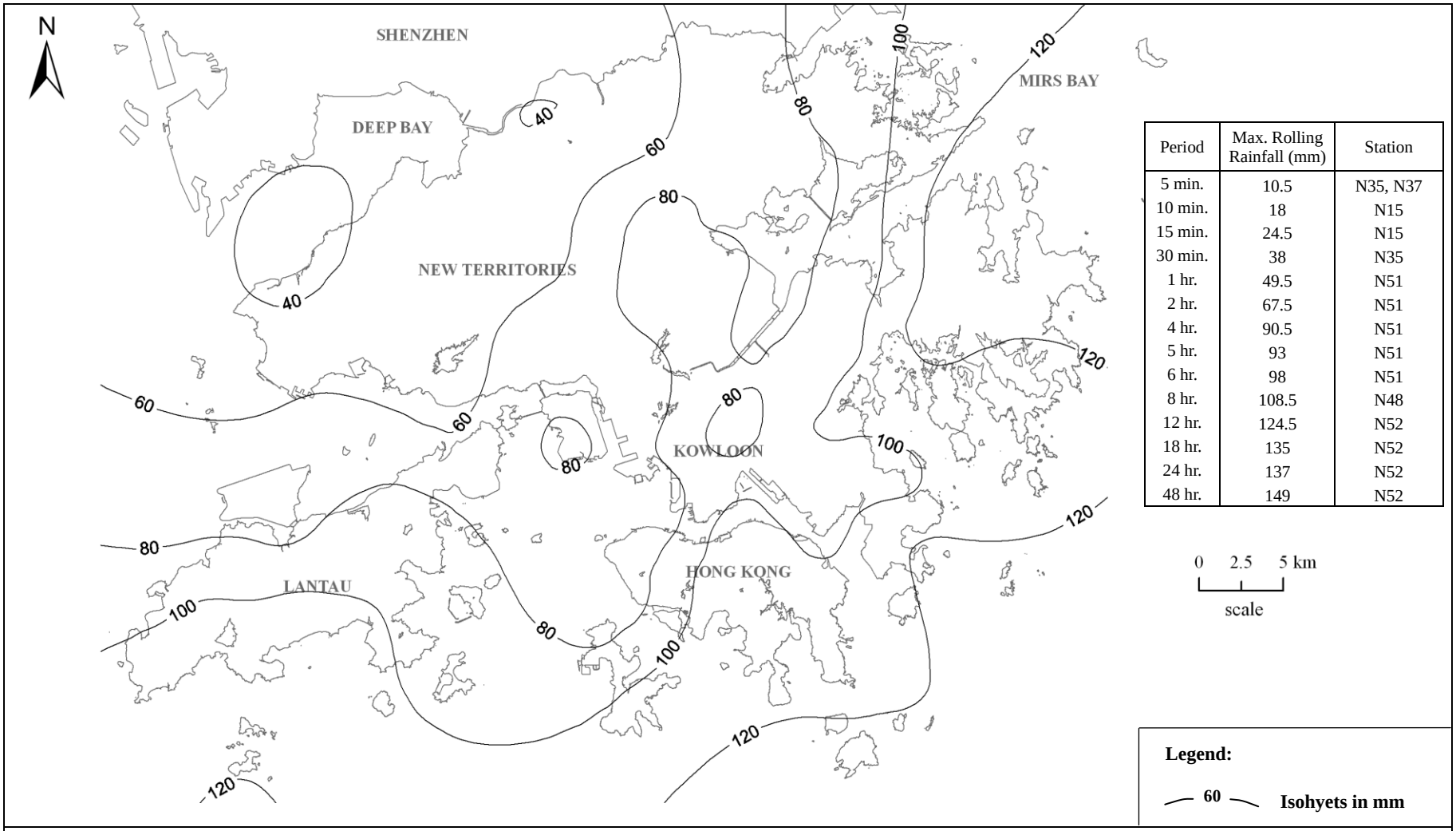
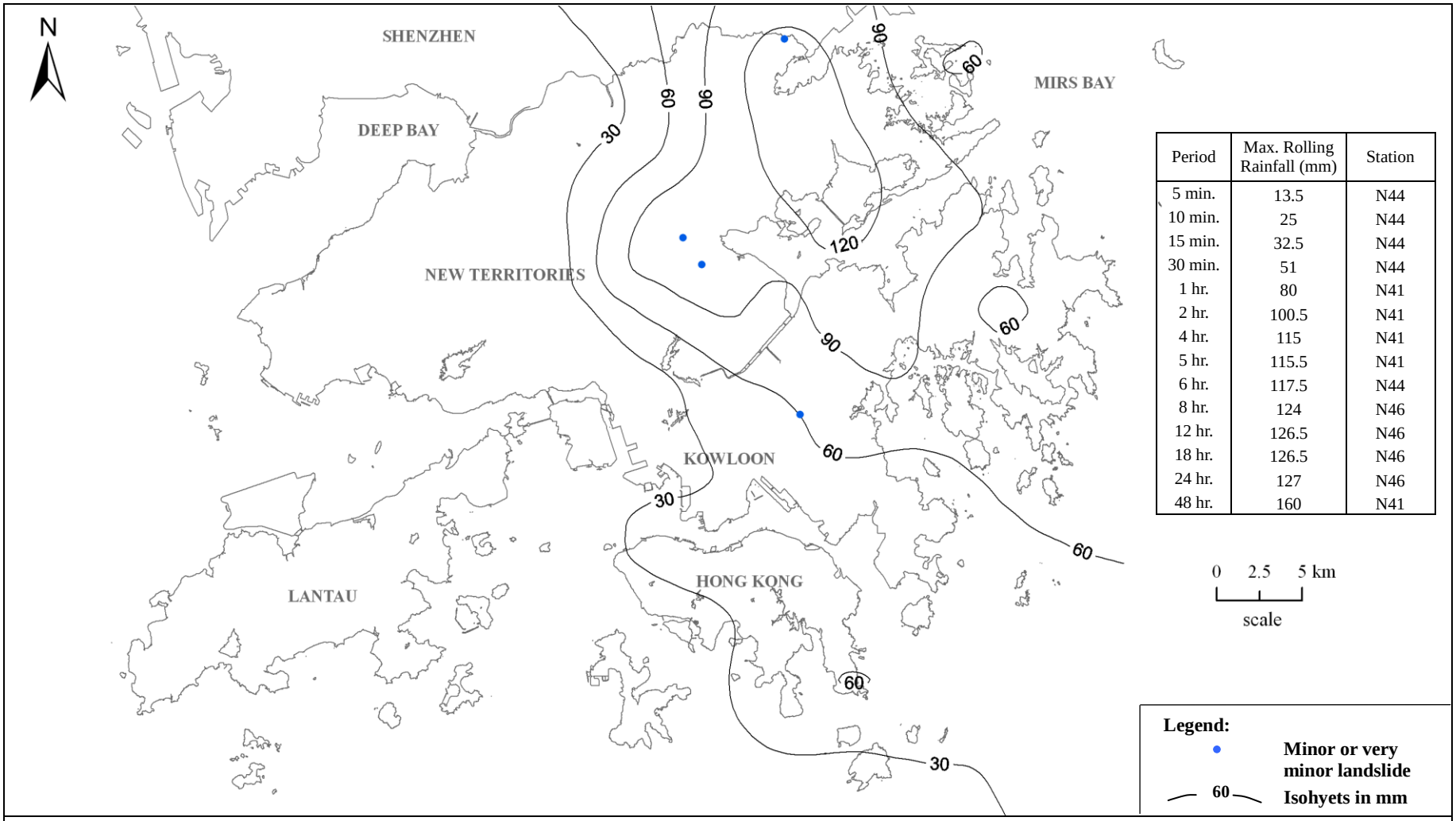


Period	Max. Rolling Rainfall (mm)	Station
5 min.	10.5	N35, N37
10 min.	18	N15
15 min.	24.5	N15
30 min.	38	N35
1 hr.	49.5	N51
2 hr.	67.5	N51
4 hr.	90.5	N51
5 hr.	93	N51
6 hr.	98	N51
8 hr.	108.5	N48
12 hr.	124.5	N52
18 hr.	135	N52
24 hr.	137	N52
48 hr.	149	N52

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) No genuine landslide reported to have occurred within the period between 18 May and 19 May 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

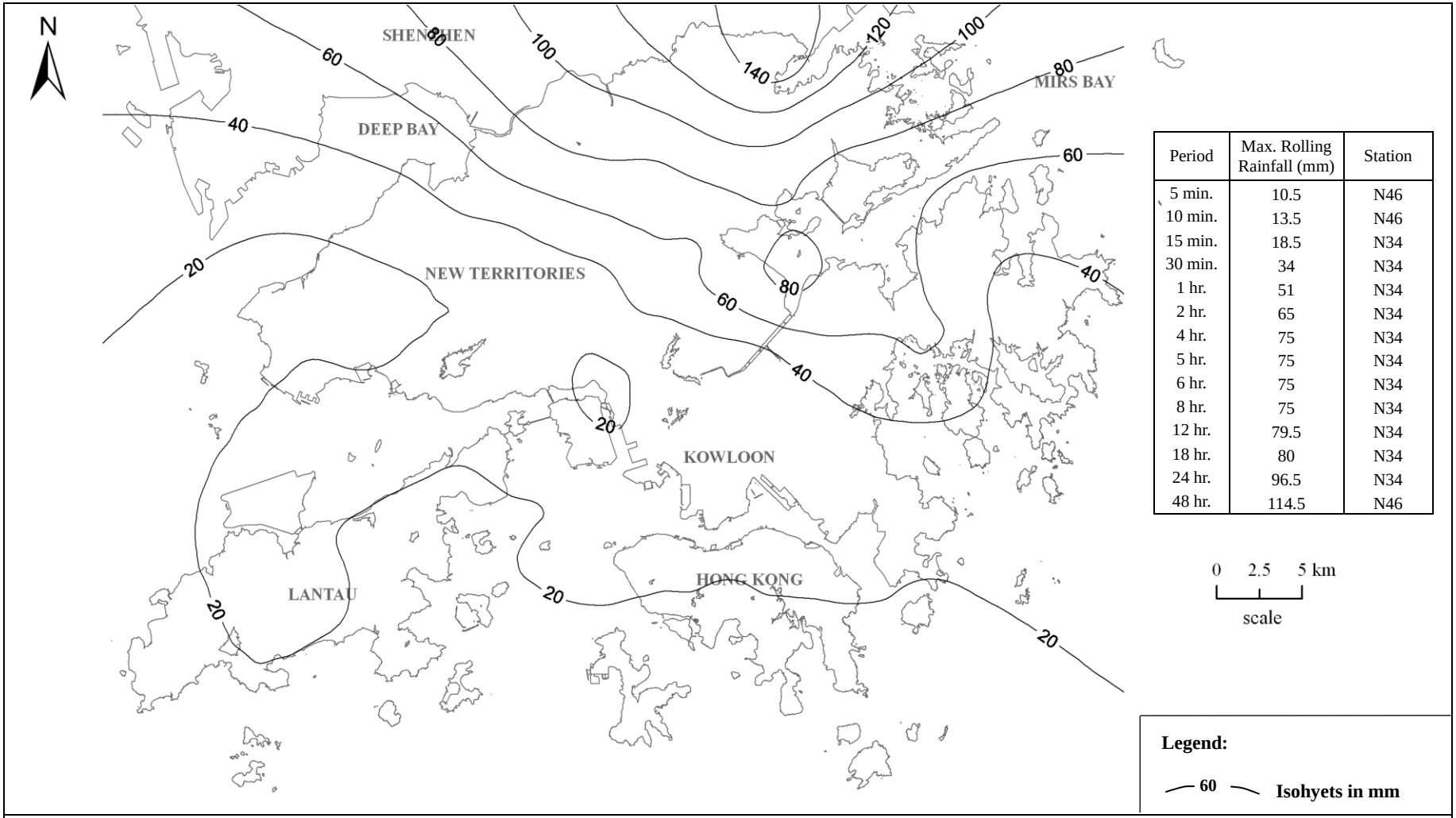
Figure A5 Maximum Rolling 24-hour Rainfall Distribution for the Period between 18 May (00:00) and 19 May 2012 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	13.5	N44
10 min.	25	N44
15 min.	32.5	N44
30 min.	51	N44
1 hr.	80	N41
2 hr.	100.5	N41
4 hr.	115	N41
5 hr.	115.5	N41
6 hr.	117.5	N44
8 hr.	124	N46
12 hr.	126.5	N46
18 hr.	126.5	N46
24 hr.	127	N46
48 hr.	160	N41

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Four genuine landslides reported to have occurred within the period between 28 May and 29 May 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

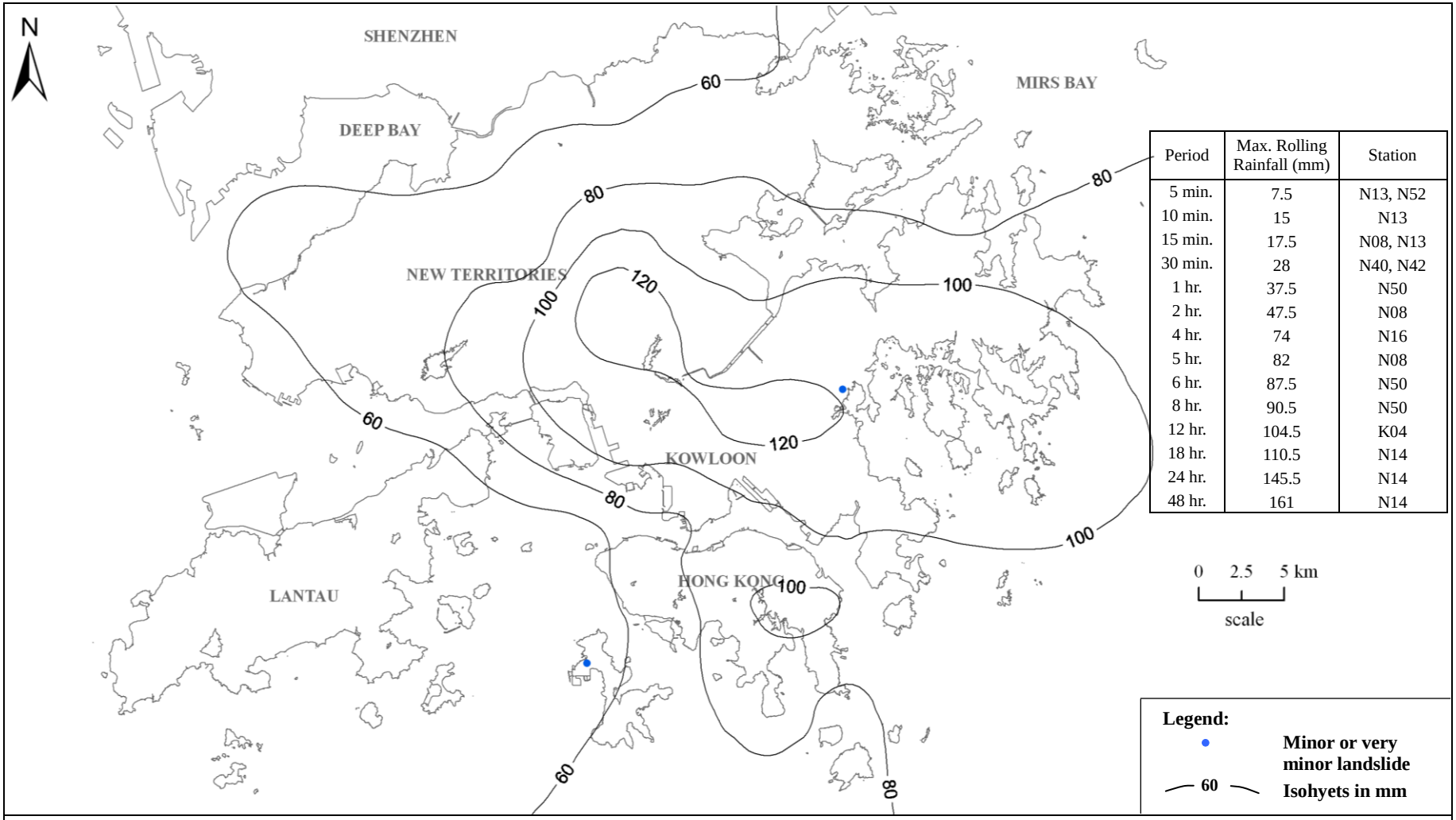
Figure A6 Maximum Rolling 24-hour Rainfall Distribution for the Period between 28 May (00:00) and 29 May 2012 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	10.5	N46
10 min.	13.5	N46
15 min.	18.5	N34
30 min.	34	N34
1 hr.	51	N34
2 hr.	65	N34
4 hr.	75	N34
5 hr.	75	N34
6 hr.	75	N34
8 hr.	75	N34
12 hr.	79.5	N34
18 hr.	80	N34
24 hr.	96.5	N34
48 hr.	114.5	N46

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) No genuine landslide reported to have occurred within the period between 12 June and 13 June 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

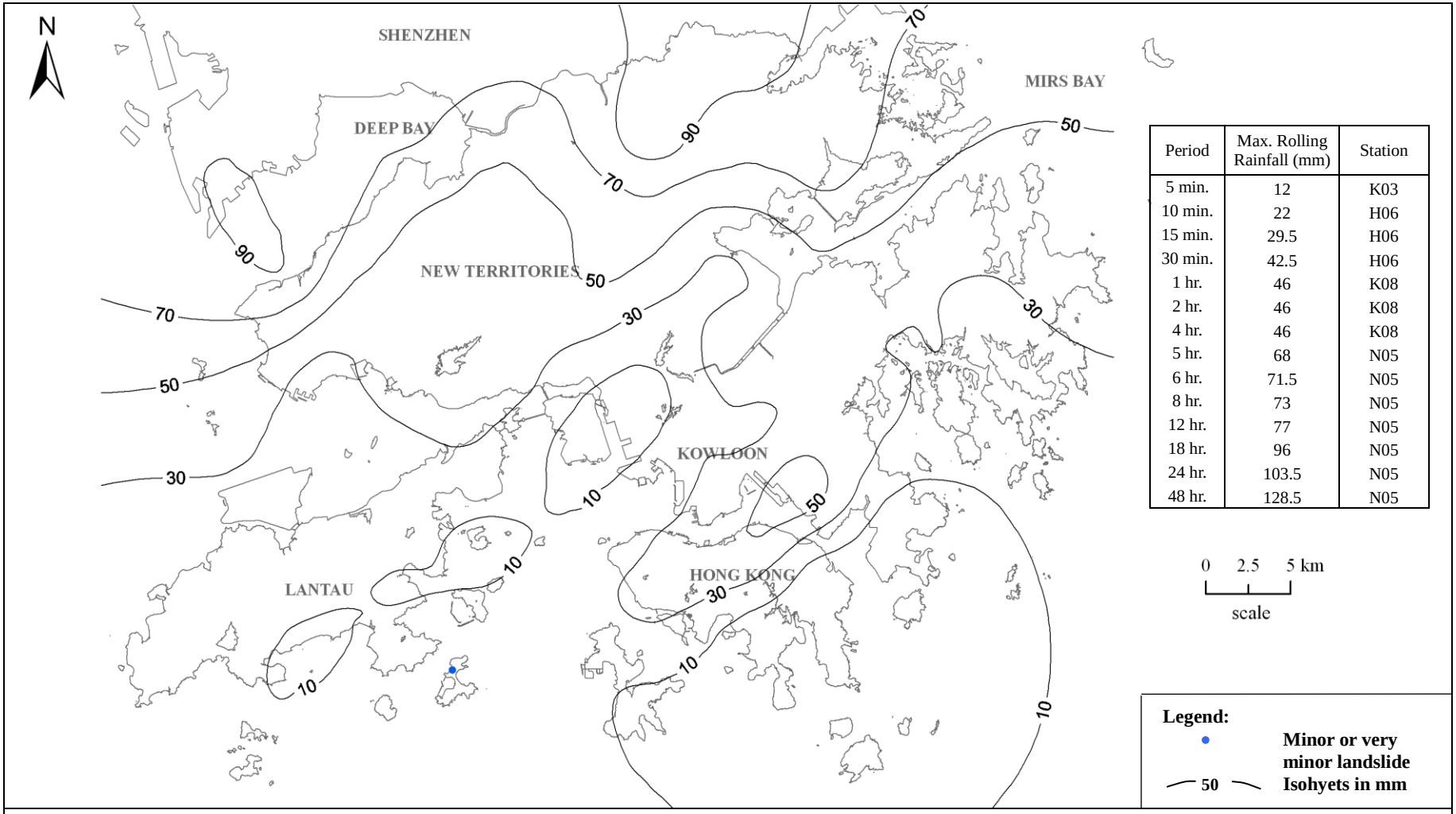
Figure A7 Maximum Rolling 24-hour Rainfall Distribution for the Period between 12 June (00:00) and 13 June 2012 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	7.5	N13, N52
10 min.	15	N13
15 min.	17.5	N08, N13
30 min.	28	N40, N42
1 hr.	37.5	N50
2 hr.	47.5	N08
4 hr.	74	N16
5 hr.	82	N08
6 hr.	87.5	N50
8 hr.	90.5	N50
12 hr.	104.5	K04
18 hr.	110.5	N14
24 hr.	145.5	N14
48 hr.	161	N14

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Two genuine landslides reported to have occurred within the period between 16 June and 17 June 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A8 Maximum Rolling 24-hour Rainfall Distribution for the Period between 16 June (00:00) and 17 June 2012 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	12	K03
10 min.	22	H06
15 min.	29.5	H06
30 min.	42.5	H06
1 hr.	46	K08
2 hr.	46	K08
4 hr.	46	K08
5 hr.	68	N05
6 hr.	71.5	N05
8 hr.	73	N05
12 hr.	77	N05
18 hr.	96	N05
24 hr.	103.5	N05
48 hr.	128.5	N05

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) A genuine landslide reported to have occurred within the period between 22 June and 23 June 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A9 Maximum Rolling 24-hour Rainfall Distribution for the Period between 22 June (00:00) and 23 June 2012 (24:00) and Locations of Landslides

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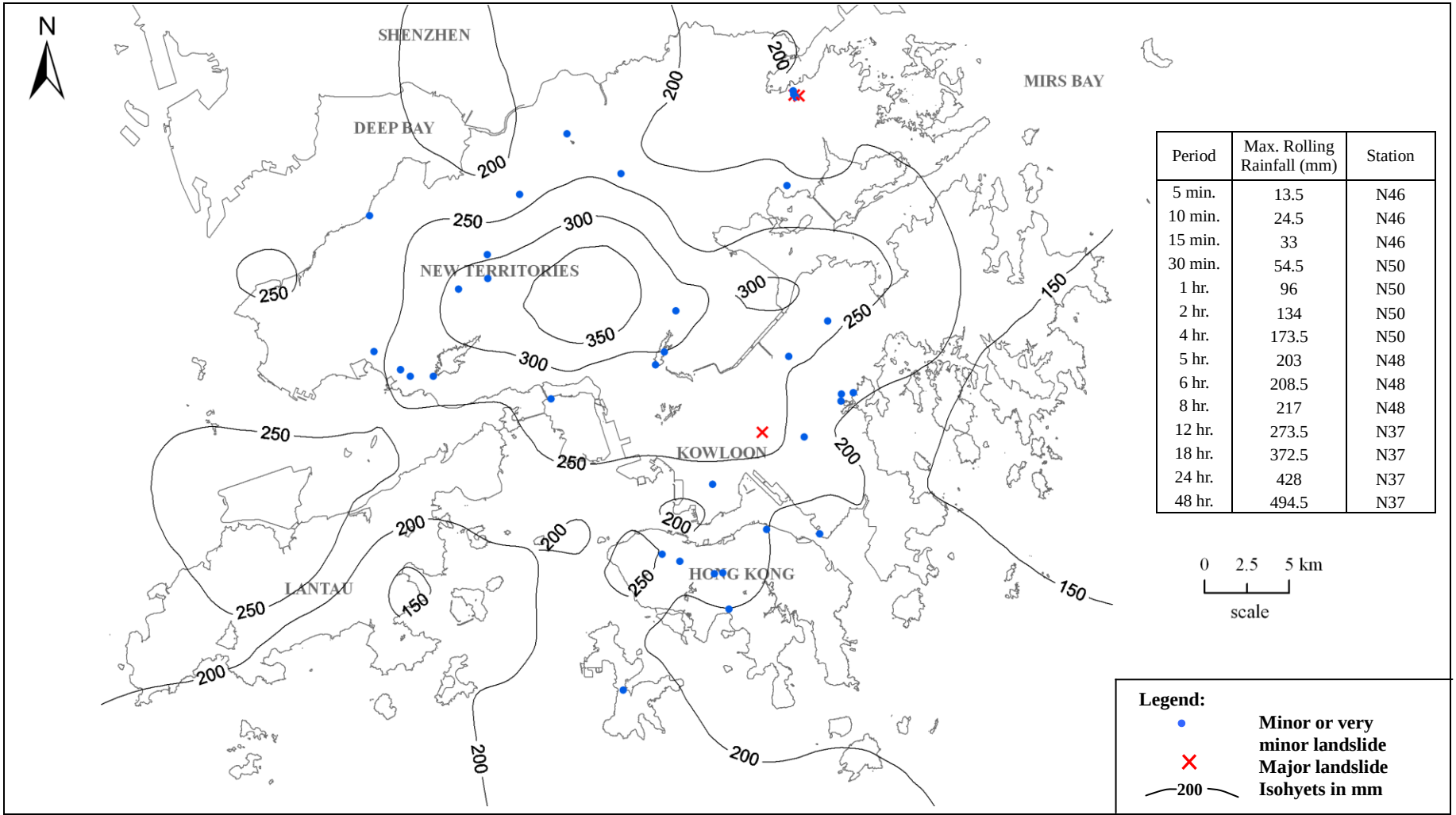
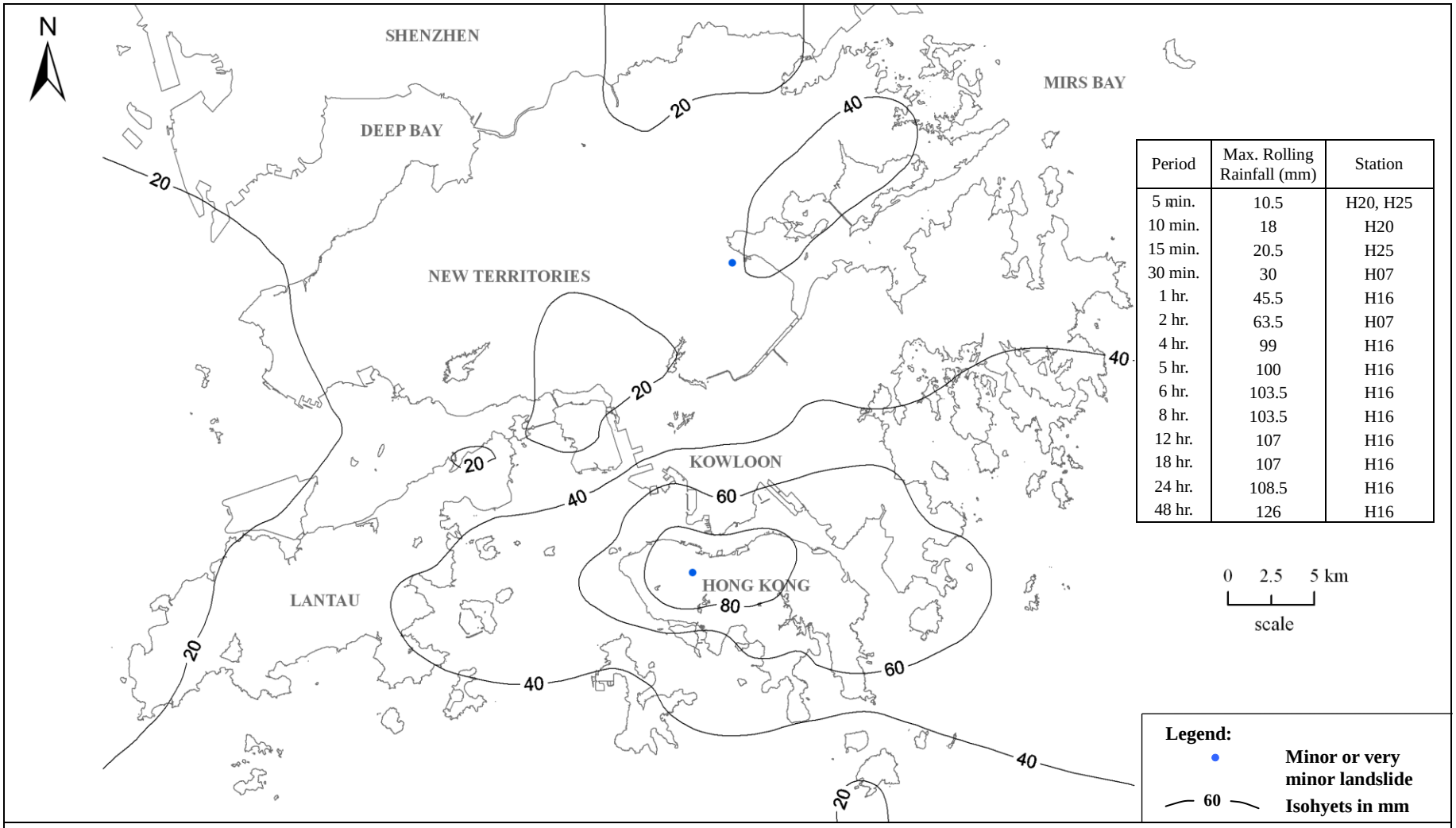


Period	Max. Rolling Rainfall (mm)	Station
5 min.	13.5	N46
10 min.	24.5	N46
15 min.	33	N46
30 min.	54.5	N50
1 hr.	96	N50
2 hr.	134	N50
4 hr.	173.5	N50
5 hr.	203	N48
6 hr.	208.5	N48
8 hr.	217	N48
12 hr.	273.5	N37
18 hr.	372.5	N37
24 hr.	428	N37
48 hr.	494.5	N37

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Forty-one genuine landslides reported to have occurred within the period between 23 July and 27 July 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

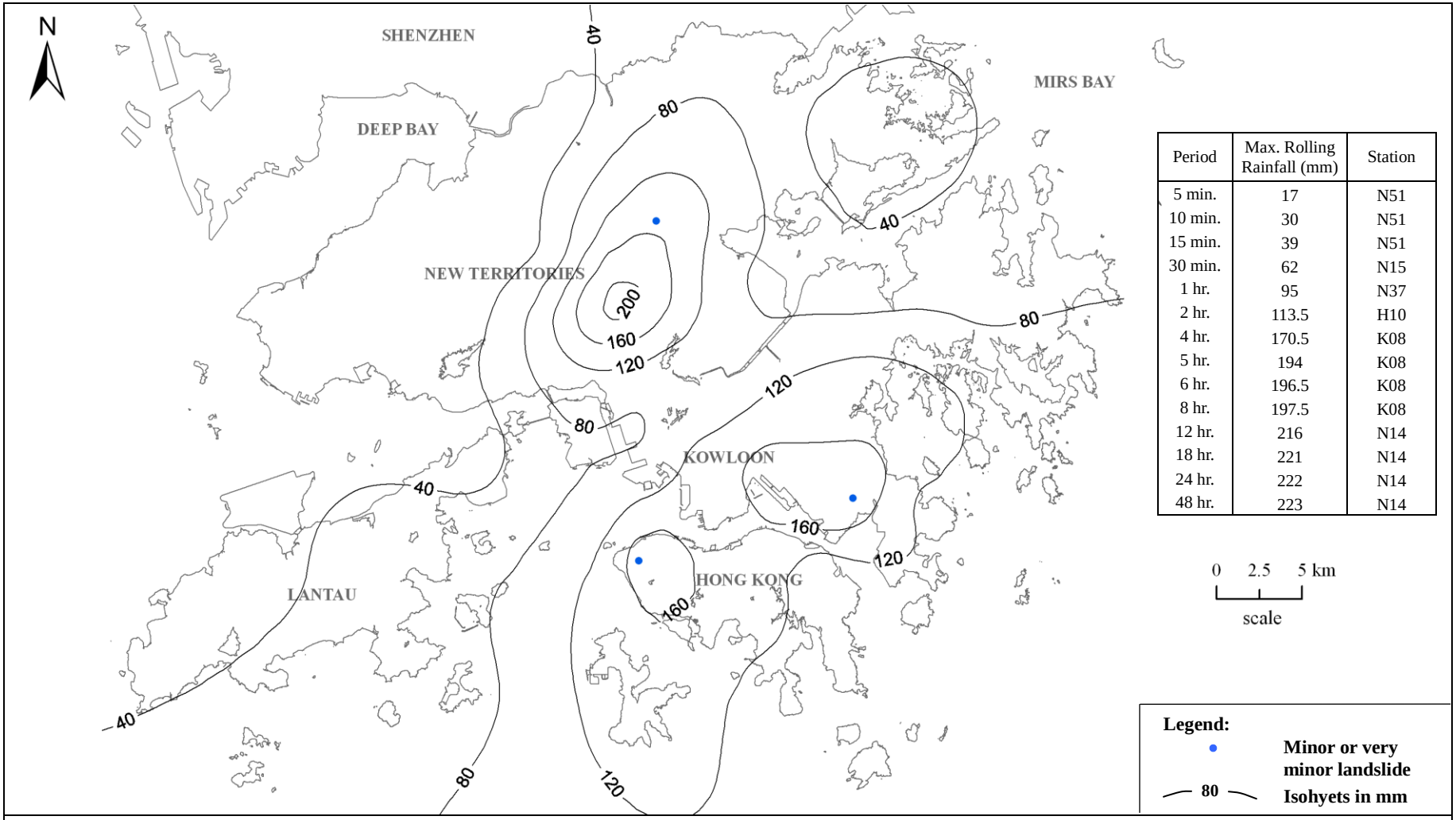
Figure A10 Maximum Rolling 24-hour Rainfall Distribution for the Period between 23 July (00:00) and 27 July 2012 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	10.5	H20, H25
10 min.	18	H20
15 min.	20.5	H25
30 min.	30	H07
1 hr.	45.5	H16
2 hr.	63.5	H07
4 hr.	99	H16
5 hr.	100	H16
6 hr.	103.5	H16
8 hr.	103.5	H16
12 hr.	107	H16
18 hr.	107	H16
24 hr.	108.5	H16
48 hr.	126	H16

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Two genuine landslides reported to have occurred within the period between 11 August and 12 August 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A11 Maximum Rolling 24-hour Rainfall Distribution for the Period between 11 August (00:00) and 12 August 2012 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	17	N51
10 min.	30	N51
15 min.	39	N51
30 min.	62	N15
1 hr.	95	N37
2 hr.	113.5	H10
4 hr.	170.5	K08
5 hr.	194	K08
6 hr.	196.5	K08
8 hr.	197.5	K08
12 hr.	216	N14
18 hr.	221	N14
24 hr.	222	N14
48 hr.	223	N14

Notes:
(1) Isohyets are based on the GEO and HKO raingauges. The maximum rainfalls in the table are selected from the GEO Raingauges.
(2) Three genuine landslides reported to have occurred within the period between 24 September and 25 September 2012.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A12 Maximum Rolling 24-hour Rainfall Distribution for the Period between 24 September (00:00) and 25 September 2012 (24:00) and Locations of Landslides

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Appendix B

List of Landslide Incidents Reported to the Government

List of Tables

Table B1 List of Major Landslide Incidents

Incident No.[1]	Location	Feature Registration No. (if any)	Failure			Facility Affected	Consequence
			Date (Time)	Feature Type	Scale (m^3)		
2012/04/1162	Near House No. 144, Tan Ka Wan, Sai Kung	Natural hillside	29/4	Natural hillside	90	Footpath and Others (Temporary storage)	Footpath blocked
2012/08/1230	Above Tate's Cairn Tunnel Portal, Diamond Hill	Natural hillside	24/7 (04:00)	Natural hillside	60	Open Area	-
2012/09/1235	Zone 258 of Lin Ma Hang Road, Sha Tau Kok	Natural hillside	17/8	Natural hillside	120	Road	Section of restricted Lin Ma Hang Road closed
2012/12/1259	Fung Hang Family Walk	Natural hillside	Unknown	Natural hillside	50	Others (Country Park)	-
2012/12/1260	Fung Hang Family Walk	Natural hillside	Unknown	Natural hillside	200	Others (Country Park)	-
2012/04/1006AF (AFCD/2012/04/0001)	Shing Mun Country Park - TMSE Track	Natural hillside	30/4	Natural hillside	50	Access Road	Part of access road closed
2012/07/1022AF (AFCD/2012/08/0005)	Fung Hang Family Walk 104	Natural hillside	25/7	Natural hillside	55	Footpath	Part of footpath closed
2012/07/1024AF (AFCD/2012/08/0008)	Fung Hang Family Walk 110	Natural hillside	25/7	Natural hillside	70	Footpath	Part of footpath closed

Note: (1) The bracket denotes the landslide number adopted by the government department concerned, other than the GEO.

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Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 1 of 5)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/01/1148	Gough Hill Road, The Peak	11SW-D/C1625	27/1	HyD	Unknown	Rock cut	0.004 (Rockfall)	Road	-
2012/02/1149	Caritas Chai Wan Marden Foundation Secondary School, Chai Wan	11SE-D/C20 (Sub-division 2)	10/2	Private	Unknown	Rock cut	0.01	Minor footpath	Footpath (slope maintenance access) temporarily closed
2012/03/1151	Below 29 Lugard Road (Near Lamp Post No. 16718), The Peak	Natural hillside	6/3	Public	Unknown	Natural hillside	5	Nil	-
2012/03/1152	Behind L'Hotel (Island South), Tong Bin Lane, Wong Chuk Hang	11SW-D/C91	29/2	HyD	29/2 (09:00)	Rock cut	0.06 (Rockfall)	Pedestrian pavement	-
2012/04/1164	No.19 Middle Gap Road, Hong Kong	11SW-D/C556	28/4	Police	28/4 (05:30)	Soil/rock cut	0.01	Open area	-
2012/05/1165	Above Findlay Road (Near Lamp Post No. 42467), The Peak	Natural hillside	1/5	Public	Unknown	Natural hillside	0.1 (Boulder fall)	Road	-
2012/05/1172	Behind Full Wealth Garden, Nos. 5-6 Kai Yuen Terrace, North Point	11SE-A/CR93	7/5	BD	5/5 (10:30)	Rock cut	0.01 (Rockfall)	Nil	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 2 of 5)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/06/1185	No. 115 Repulse Bay Road	15NE-A/C74	11/6	Public	5/6	Rock cut	< 0.1 (Rockfall)	Others (open car park)	-
2012/06/1187	Above Feature No. 11SW-A/FR90, Hornsey Road	Natural hillside	16/6	Police	Unknown	Natural hillside	0.1 (Boulder fall)	Minor footpath	Area affected temporarily cordoned off by Police
2012/07/1193	Hillside above Feature No. 11SW-A/FR90, Hornsey Road	Natural hillside	6/7	HyD	6/7	Natural hillside	0.1 (Boulder fall)	Minor footpath	Minor footpath temporarily closed
2012/07/1194	Near No. 51 Mount Kellett Road, The Peak	11SW-C/C956	7/7	Police	7/7	Soil/rock cut	3	Road	One lane of Mount Kellett Road temporarily closed
2012/07/1196	Junction of Magazine Gap Road and May Road	Natural hillside	24/7	Police	24/7 (00:39)	Natural hillside	2 (Boulder fall)	Road, construction site	Each of the lanes of Magazine Gap Road and May Road temporarily closed
2012/07/1198	Access Road to No. 26 Lugard Road, The Peak	11SW-A/C215	24/7	Public	Unknown	Soil cut	1	Access road	-
2012/07/1200	Mansion Street, Quarry Bay	11SE-A/C84	25/7	Public	24/7	Soil/rock cut	0.07 (Rockfall)	Others (alleyway)	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 3 of 5)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/07/1210	Behind No. 27 Village Terrace, Happy Valley	2.5 m high rock cut slope	25/7	Public	25/7 (04:00)	Rock cut	0.06 (Rockfall)	Others (alleyway)	-
2012/07/1212	Lugard Road near Lamp Post No. 16699, The Peak	2 m high soil cut slope	26/7	HyD	25/7	Soil cut	0.3	Road	-
2012/07/1213	Old Peak Road near Lamp Post No. 27558, The Peak	2.5 m high soil cut slope	26/7	HyD	Unknown	Soil cut	0.5 (Rockfall)	Road	-
2012/07/1216	Bowen Road Near Lamp Post No. 26730, Mid-Levels	11SW-D/C2044	30/7	HyD	Unknown	Soil cut	2	Others (recreation facility)	A roadside outdoor recreational facility temporarily cordoned off
2012/08/1226	Junction of Magazine Gap Road and May Road	Natural hillside	11/8	Public	11/8 (13:00)	Natural hillside	0.02 (Boulder fall)	Road, construction site	A private wagon damaged by fallen rock block
2012/08/1228	East of Pokfulam Heights, No.86D Pok Fu Lam Road, Pok Fu Lam	2.5 m high soil cut slope	14/8	Public	Unknown	Soil cut	0.5	Access road	-
2012/08/1229	Hillside below Peel Rise, The Peak	Natural hillside	16/8	DLO	Unknown	Natural hillside	25	Road	One lane of Peel Rise temporarily closed

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 4 of 5)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/09/1240	Pokfulam Court, No. 94 Pok Fu Lam Road, Pok Fu Lam	11SW-A/C327	26/9	FSD	26/9 (03:00)	Soil cut	6	Access road	Private access road temporarily closed
2012/10/1241	Behind The Hong Kong Federation of Youth Groups Building, No. 204 Tsat Tsz Mui Road, Quarry Bay	11SE-A/CR85	22/9	Police	22/9 (11:00)	Soil/rock cut	1 (Rockfall)	Others (alleyway)	Alleyway behind a building temporarily fenced off
2012/10/1242	Feature No. 11SW-C/C790, Peel Rise, The Peak	11SW-C/C790	3/10	Public	Unknown	Soil cut	10	Road	One lane of Peel Rise temporarily closed
2012/10/1243	No. 46 Stubbs Road, Wan Chai	11SW-D/C343	27/9	Public	24/7 (00:00)	Soil cut	3	Access road	-
2012/12/1257	Natural Slope above Feature No. 15NE-B/C273, Shek O Road, Shek O	Natural hillside	5/12	Police	5/12 (07:30)	Natural hillside	0.73 (Boulder fall)	Road	One lane of Shek O Road temporarily closed
2012/01/1001AD (ArchSD/S/2012/01/0001)	Sitting Area between Aberdeen Main Road and Ap Lei Chau Bridge Flyover	11SW-D/C83	13/1	ArchSD	13/1	Rock cut	2	Open area	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 5 of 5)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/01/1002WS (WSD/2012/1/1/HKI)	West of Mount Davis Fresh Water Primary Service Reservoir, Mount Davis	11SW-A/C1218	30/1	WSD	Unknown	Soil/rock cut	0.5 (Rockfall)	Access road	-
2012/07/1036LI*	Adjacent to No. 79 Deep Water Bay Road	11SW-D/C172	26/7	Public	25/7	Soil/rock cut	10	Road	-
2012/07/1021AF (AFCD/2012/08/0003)	Tai Tam Management Centre, Tai Tam	Natural hillside	20/8	AFCD	24/7	Natural hillside	1	Access road	Part of access road fenced off
2012/07/1029AF (AFCD/2012/08/0015)	Near Stage 4 of Hong Kong Trail, Middle Gap	< 3 m high soil & rock cut slope	20/8	AFCD	31/7	Soil/rock cut	1 (Rockfall)	Access road	Part of access road fenced off
2012/10/1050WS (WSD/2012/10/1/HK)	Mount Davis Service Reservoir, Mount Davis	11SW-A/C297	10/10	WSD	Unknown	Soil/rock cut	0.5 (Rockfall)	Open area	-
2012/09/1046WS (AFCD/2012/09/0001)	Sir Cecil's Ride, North Point	11SE-C/C390	12/3/13	AFCD	9/12	Soil cut	5	Minor footpath	-

Legend:

* The incident was reported by the media and inspected by the GEO's landslide investigation consultants

Note: (1) The bracket denotes the landslide number adopted by the government department concerned, other than the GEO.

Table B3 List of Landslide Incidents in Kowloon

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/05/1175	Adjacent to Feature No. 11NE-A/C495, Shatin Pass Road, Wong Tai Sin	Natural hillside	16/5	GEO	16/5 (12:00)	Natural hillside	2	Access Road	-
2012/07/1202	North of Wing On Court at Princess Margaret Road	11NW-D/C526	25/7	BD	25/7 (12:00)	Soil/rock cut	4.7	Pedestrian Pavement	-
2012/07/1205	Behind House No. 22A, Ma San Tsuen, Lei Yue Mun	11SE-B/C297	24/7	DO	24/7	Soil/rock cut	0.2 (Boulder fall)	Footpath	Footpath partially blocked
2012/08/1230	Above Tate's Cairn Tunnel Portal, Diamond Hill	Natural hillside	21/8	HyD	24/7 (4:00)	Natural hillside	60	Open Area	-
2012/04/1008HY (HyD/K/2012/04/0004)	Near Lamp Post No. AF0658, Shatin Pass Road	11NE-A/C351	25/4	HyD	19/4 (22:00)	Soil/rock cut	1 (Rockfall)	Access Road	-
2012/05/1012HY (HyD/NTE/2012/05/0010)	Fei Ngo Shan Road	11NE-A/C510	31/5	HyD	28/5	Soil/rock cut	3	Access Road	-
2012/05/1016WS (WSD/2012/5/1/K)	Tai Po Road Fresh Water Service Reservoir	Natural hillside	9/5	WSD	Unknown	Natural hillside	0.3	Access Road	-
2012/07/1030HY (HyD/NTE/2012/07/0016)	Fei Ngo Shan Road	11NE-B/C210	27/7	HyD	27/7	Soil/rock cut	2 (Boulder fall)	Access road	-
2012/11/1047AD (ArchSD/KT/ 2012/09/0001)	Jordan Valley Playground	11NE-C/C286	25/9	ArchSD	Unknown	Soil cut	15	Others (Planting area)	-

Note: (1) The bracket denotes the landslide number adopted by the government department concerned, other than the GEO.

Table B4 List of Landslide Incidents in the New Territories (Sheet 1 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/03/1153	Above Feature No. 7NE-D/FR58, Ma On Shan Tsuen, Ma On Shan	Natural hillside	5/3	Public	5/3 (15:45)	Natural hillside	11.6 (Boulder fall)	Open Area	-
2012/03/1154	Near House No. 99, Nam Shan Lane, Sai Kung	4 m high retaining wall	26/3	Public	Unknown	Retaining wall (Masonry wall)	8	Others (Planting area)	-
2012/04/1157	Mang Kung Wo Road, Sai Kung	Natural hillside	20/4	FSD	20/4 (9:45)	Natural hillside	1.2 (Boulder fall)	Road	Partial closure of Mang Kung Wo Road
2012/04/1159	Access road to Serene Bay Villa, Nos. 150-156 Tai Hang Hau Village, Clearwater Bay	2.8 m high soil cut slope	24/4	Public	22/4	Soil cut	0.1	Access Road	-
2012/04/1161	Kwai Shing Circuit near Methodist Lee Wai Lee College	7SW-C/C67	19/4	Public	19/4 (17:30)	Soil/rock cut	0.02	Pedestrian Pavement	-
2012/04/1162	Near House No. 144, Tan Ka Wan, Sai Kung	Natural hillside	29/4	HyD	29/4	Natural hillside	90	Footpath and Others (Temporary storage)	Footpath blocked
2012/04/1163	House No. 165, Ha Wo Che Village, Shatin	7SE-A/CR377	30/4	Public	29/4 (12:00)	Soil/rock cut	1	Squatter structure	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 2 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/05/1166	Cheung Yuen Road, Lai Chi Kok	11NW-A/C287	28/4	Public	Unknown	Soil cut	1	Road	-
2012/05/1167	Behind House No. 18 Shatin Tau San Tsuen, Shatin	7SE-C/C300	30/4	Public	29/4 (10:00)	Soil cut	2.5	Open Area	-
2012/05/1168	Near Lamp Post No. V4778, Lai Chi Hang Village, Tai Po	2.9 m high soil cut slope	29/4	Public	29/4 (17:04)	Soil cut	1	Footpath	-
2012/05/1169	Next to House No. 20, Cho Ma Wu, Ham Hang, Tai Po	1 m high retaining wall	2/5	DLO	Unknown	Retaining wall (Masonry wall)	0.4	Footpath	-
2012/05/1170	Pak Tin Village, Tai Wai	7SW-D/DT40	5/5	FSD	5/5 (5:30)	Disturbed Terrain	0.8 (Boulder fall)	Squatter structure	Wall and air-conditioner damaged
2012/05/1171	House No. 51C Pan Chung San Tsuen, Tai Po	2.6 m high soil cut slope	3/5	Public	29/4 (0:00)	Soil cut	1	Footpath	-
2012/05/1173	Footpath to Sai Wan, Sai Kung	8SE-A/C82	3/5	Public	3/5 (12:00)	Soil cut	5	Footpath	-
2012/05/1174	South of House No. 2D Pak Kong Au Village, Sai Kung	2.5 m high retaining wall	13/5	Public	16/4 (15:59)	Retaining wall (Masonry wall)	0.3	Open Area	-

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Table B4 List of Landslide Incidents in the New Territories (Sheet 3 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/05/1176	Kingsway Industrial Building, 13-17 Cheung Wing Road and 167-175 Wo Yi Hop Road, Kwai Chung	4 m high soil cut slope	10/5	BD	29/4	Soil cut	3	Buildings (storage area)	-
2012/05/1177	Behind House No. 61 of Ma On Shan Tsuen, Ma On Shan	7SE-B/C160	14/5	Public	3/5 (15:00)	Soil cut	1.5	Open Area	-
2012/05/1178	So Kwun Wat Tsuen, Tuen Mun	6SW-C/C178	15/5	GEO	8/5 (12:30)	Soil/rock cut	0.5 (Rockfall)	Squatter structure	-
2012/05/1179	Opposite Block 1-6, Bayview Villas, Tai Mong Tsai	8SW-A/CR49	2/5	GEO	2/5 (9:00)	Soil cut	5	Access Road	-
2012/05/1180	Yat Wing Garden Phase 3, Tai Po	1.86 m high retaining wall	28/5	FSD	28/5 (3:30)	Retaining wall (Masonry wall)	20	Village Houses and Access Road	Access road blocked and 3 village houses with 9 families (30 persons) temporarily evacuated
2012/05/1181	House No. 4 Pun Shan Chau, Tai Po	Natural hillside	28/5	Police	28/5 (9:30)	Natural hillside	6.5	Village Houses and Access Road	Platform and toilet structure at crest undermined

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Table B4 List of Landslide Incidents in the New Territories (Sheet 4 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/06/1183	Zone 262 of Lin Ma Hang Road, Sha Tau Kok	3NE-A/C142	29/5	HyD	28/5 (9:00)	Soil cut	10	Road	Section of restricted Lin Ma Hang Road closed
2012/06/1184	Near Lamp Post No. EB7338, Anderson Road	Natural hillside	6/6	Public	23/5 (15:42)	Natural hillside	0.1	Footpath	-
2012/06/1186	Between Lamp Post Nos. V2180 and V2181, Mang Kung Wo Road, Sai Kung	Natural hillside	16/6	Police	16/6 (19:00)	Natural hillside	20	Others (Layby)	A layby condoned off
2012/06/1190	Near a shelter on Yuen Tsuen Ancient Trail, Shek Lung Kung, Tsuen Wan	< 3 m high soil cut slope	28/6	FSD	Unknown	Soil cut	0.6	Others (Trail Shelter)	-
2012/07/1191	Above the access road to Sze Lok Yuen, Tai Mo Shan	7SW-A/C303	30/6	FSD	Unknown	Soil cut	1.1	Access Road	-
2012/07/1192	South of House No. 8 Ma Yau Tong, Tseung Kwan OTerrace	11NE-D/DT37	3/7	LandsD	30/6 (10:00)	Disturbed Terrain	9	Open Area	-
2012/07/1197	House No. 15, Ma On Shan Tsuen	7SE-B/CR198	24/7	Public	24/7 (13:15)	Soil cut	10	Open Area and footpath	Footpath at the middle of 7SE-B/CR198 damaged

Table B4 List of Landslide Incidents in the New Territories (Sheet 5 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/07/1199	Shek Tong Tsuen, Yuen Long	6NE-A/DT7	25/7	LandsD	25/7 (8:00)	Disturbed Terrain	20	Access Road	-
2012/07/1201	DD118 Lot 495, Yuen Long	2 m high soil cut slope	25/7	Public	24/7	Soil cut	5	Open Area	-
2012/07/1203	No. 29 Siu Sau Village, Tuen Mun	6SW-C/C551	25/7	LandsD	25/7 (16:00)	Soil cut	1	Squatter structure	-
2012/07/1206	Block 20, Elle Villas, House No. 269B, Shan Liu Road, Tai Po	2.7 m high fill slope	25/7	Police	25/7 (13:30)	Fill	4	Others (Parapet wall)	-
2012/07/1207	About 120 m south of House No. 68A, Tsz Tong Tsuen, Fanling	Natural hillside	25/7	Police	Unknown	Natural hillside	3	Footpath	Part of footpath closed
2012/07/1208	Sung Shan New Village, Yuen Long	2.75 m high soil cut slope	25/7	Public	24/7	Soil cut	2	Buildings	-
2012/07/1209	Near Lamp Post No. VD3201, Sha Kong Tsuen, Lau Fau Shan	< 3 m high soil cut slope	26/7	DO	26/7	Soil cut	15	Open Area and footpath	-
2012/07/1211	Nam Chung, Sha Tau Kok	3NE-C/C115	24/7	Public	Unknown	Soil cut	45	Open Area	-

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Table B4 List of Landslide Incidents in the New Territories (Sheet 6 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/07/1214	Caritas Li Ka Shing care & Attention Home, Wah Fat Street, Tuen Mun	6SW-A/C87	27/7	Public	25/7 (14:30)	Soil cut	5	Footpath	-
2012/07/1215	Adjoining Access Road to DD104 Lot 4666, Ngau Tam Mei	2SE-C/C199	27/7	Public	25/7 (17:30)	Soil/rock cut	15	Nil (Debris rest on slope)	-
2012/07/1218	Behind House No. 64 Pak Sha Wan Village, Sai Kung	7SE-D/C360	27/7	Public	26/7 (15:00)	Soil cut	2	Squatter structure	-
2012/07/1219	Adjacent to Feature No. 6SW-C/C875, So Kwun Wat	Natural hillside	31/7	HyD	24/7	Natural hillside	1.5	Footpath	-
2012/07/1220	Near Feature No. 6SW-D/C593, Siu Lam	1.5 m high retaining wall	30/7	LandsD	28/7 (8:30)	Retaining wall (Masonry wall)	0.5	Footpath	-
2012/08/1221	Northeast of licence no. S11656 at Yue Tsai Chung Tsuen , Sai Kung	Natural hillside	31/7	Public	27/7 (13:00)	Natural hillside	30	Squatter structure and Others (Streamcourse)	-
2012/08/1222	15 m west of House No. 85 Pan Long Wan Village, Clearwater Bay, Sai Kung	12NW-C/C422	1/8	GEO	30/6 (0:00)	Soil cut	20	Open Area	-
2012/08/1224	Behind House no. 45 Sun On Village, Sai Kung	4 m high soil cut slope	3/8	Public	Unknown	Soil cut	5	Open Area	-

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Table B4 List of Landslide Incidents in the New Territories (Sheet 7 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/08/1225	East of House No. 55 Luk Mei Tsuen, Sai Kung	4 m high retaining wall	3/8	Public	24/7 (8:00)	Retaining wall (Masonry wall)	2	Open Area	-
2012/08/1227	House No. 21, Tsung Yuen Village, Tai Po Kau	2.9 m high soil cut slope	13/8	FSD	13/8 (14:45)	Soil cut	3	Squatter structure	-
2012/08/1231	370 m South West of No. 280 Ma On Shan Tsuen, Ma On Shan	7SE-B/F54	23/8	Public	3/8 (18:00)	Fill	6.5	Access Road	-
2012/08/1232	Footpath to Fa Sam Hang Village, Siu Lek Yuen, Sha Tin	Natural hillside	17/8	DLO	27/7 (10:30)	Natural hillside	1	Footpath	-
2012/08/1233	Behind House No. 7A, Shan Liu Road, Tai Po	Natural hillside	27/8	HyD	23/8	Natural hillside	1	Others (Temporary storage structure)	-
2012/08/1234	Above Access Road to Ngau Kok Wan, Tsing Yi	Natural hillside	21/8	HyD	25/7 (15:00)	Natural hillside	1.2	Access Road	-
2012/09/1235	Zone 258 of Lin Ma Hang Road, Sha Tau Kok	Natural hillside	3/9	HyD	17/8 (9:00)	Natural hillside	120	Road	Section of restricted Lin Ma Hang Road closed

Table B4 List of Landslide Incidents in the New Territories (Sheet 8 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/09/1236	Fung Hang, Sha Tau Kok	Natural hillside	10/9	HyD	Unknown	Natural hillside	25	Squatter structure	-
2012/09/1237	Fung Hang, Sha Tau Kok	Natural hillside	10/9	HyD	Unknown	Natural hillside	25	Squatter structure	-
2012/09/1238	Near Lamp Post No. N2277, Po Lam Road South, Tseung Kwan O	11NE-D/C716	25/9	Public	24/9 (22:00)	Soil cut	5	Others (Drainage channel)	-
2012/09/1239	Behind squatter structures at the platform above Feature No. 7SW-C/C880, North of Ham Tin Tsuen	4 m high soil cut slope	25/9	Public	Around end of July 2012	Soil cut	6	Squatter structure	One squatter structure damaged by landslide debris; Cat 1 NDC issued for 2 structures and 2 persons permanently evacuated
2012/10/1244	Near Feature No. 7NW-A/R32, Fong Ma Po, Tai Po	2 m high retaining wall	27/9	DO	24/9 (19:00)	Retaining wall (Masonry wall)	10	Open Area	-
2012/10/1245	Above access road to Wo Yi Hop Village (near Interchange at Wo Yi Hop Lane), Kwai Chung	7SW-C/CR457	8/10	Public	Unknown	Rock cut	0.1 (Rockfall)	Footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 9 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/10/1247	Lin Ma Hang Road, Sha Tau Kok	3NE-A/C118	11/10	HyD	17/8 (9:00)	Soil/rock cut	6	Road	Section of restricted Lin Ma Hang Road closed
2012/10/1248	Zone 248 of Lin Ma Hang Road, Sha Tau Kok	Natural hillside	11/10	HyD	17/8 (9:00)	Natural hillside	40	Road	Section of restricted Lin Ma Hang Road closed
2012/10/1249	Little Hawaii Trail, Sai Kung	Natural hillside	15/10	Public	6/10 (7:00)	Natural hillside	40	Footpath and Others (Streamcourse)	Rocky stream bed at the toe of landslide partially blocked
2012/10/1251	Zone 247 of Lin Ma Hang Road, Sha Tau Kok	Natural hillside	11/10	HyD	17/8 (9:00)	Natural hillside	3.5	Road	Section of restricted Lin Ma Hang Road closed
2012/11/1253	Near Lamp Post No. VA4155, Shek Kwu Lung No.94	Natural hillside	11/10	Public	11/10 (14:00)	Natural hillside	0.2	Footpath	-
2012/11/1254	Near Feature No. 7NW-D/C107, Shan Tong Road, Tai Po	Natural hillside	15/10	Public	15/10 (14:00)	Natural hillside	6.5 (Boulder fall)	Footpath	-
2012/12/1256	Near Feature No. 7NW-C/F20, Lam Kam Road	< 3 m high retaining wall	19/11	Public	14/11 (14:12)	Retaining wall (Masonry wall)	0.2	Others (Planting area)	-

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Table B4 List of Landslide Incidents in the New Territories (Sheet 10 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/12/1258	Walking Trail in Tseng Lan Shue	2.5 m high soil cut slope	3/12	DO	Unknown	Soil cut	1	Footpath	-
2012/12/1259	Fung Hang Family Walk	Natural hillside	29/10	AFCD	Unknown	Natural hillside	50	Others (Country Park)	-
2012/12/1260	Fung Hang Family Walk	Natural hillside	29/10	AFCD	Unknown	Natural hillside	200	Others (Country Park)	-
2012/12/1261	Bride's Pool Road	3SE-B/C135	21/12	Police	Unknown	Rock cut	1 (Rockfall)	Road	-
2013/01/1263	Behind House Nos. 329, Nam Wai, Sai Kung	Natural hillside	17/1	DLO	28/8	Natural hillside	1	Nil (Debris rested on slope)	-
2013/02/1266	West of No. 42 Tsoi Yuen Kok, Sha Tau Kok	2.3 m high fill slope	8/2	Police	3/9 (9:00)	Fill	7	Village Houses	-
2013/03/1267	At northeast of lot 145 s.B in D. D. 41, Sha Tau Kok (within government land)	Natural hillside (bank of streamcourse)	1/3	DSD	1/8 (9:00)	Natural hillside	12	Others (Streamcourse)	-
2012/03/1004AF (AFCD/2012/03/0001)	Shing Mun Country Park, Tsuen Wan	7SW-C/C820	14/3	AFCD	12/3	Soil/rock cut	5	Open Area	Part of BBQ area fenced off

Table B4 List of Landslide Incidents in the New Territories (Sheet 11 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/03/1005WS (WSD/2012/3/1/NTE)	70 m Southeast of Pavilion, Tai Po Road, Shatin Heights	11NW-B/C459	1/3	WSD	Unknown	Soil cut	<1	Catchwater	-
2012/04/1006AF (AFCD/2012/04/0001)	Shing Mun Country Park - TMSE Track	Natural hillside	30/4	AFCD	30/4	Natural hillside	50	Access Road	Part of access road closed
2012/04/1009LD (LandsD/TM/2012/05/0001)	No. 158 Tsz Tin Tsuen, Tuen Mun	Natural hillside	2/5	LandsD	30/4	Natural hillside	3	Squatter structure	-
2012/04/1010WS (WSD/2012/4/1/NTW)	Abutting WSD Assess Road NT31 near Spot Level 128.3, Tai Lam Country Park, Tai Lam	6SW-B/C42	30/4	WSD	Unknown	Soil/rock cut	1.1 (Rockfall)	Access Road	-
2012/05/1011AD (ArchSD/TP/2012/05/0001)	Along Tai Po Kau Track, Tai Po Kau Forest Office	7NW-D/C240	20/5	ArchSD	Unknown	Soil/rock cut	3	Access Road	-
2012/05/1013HY (HyD/NTE/2012/05/0013)	San Chuk Street, Fo Tan	7SE-A/C155	9/7	HyD	6-8/5	Soil cut	35	Access Road	-
2012/05/1014HY (HyD/NTW/2012/05/0015)	Castle Peak Road - Lingnan	4 m high soil cut slope	5/7	HyD	17/5	Soil cut	2.82	Squatter structure	-
2012/05/1015LD (LandsD/TP/2012/06/0001)	Near Lamp Post No. VA8967, 16B Kau Lung Hang	Natural hillside	26/5	LandsD	Unknown	Natural hillside	4	Nil (Debris rested on slope)	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 12 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/05/1017WS (WSD/2012/5/2/NTW)	Adjoining WSD Access Road NT 22 near Spot Level 165.1, Tai Lam Country Park, Tai Lam	6SW-B/C112	10/5	WSD	Unknown	Soil/rock cut	0.9 (Rockfall)	Access Road	-
2012/06/1018LD (LandsD/YL/2012/06/0001)	No. 249 Sheung Cheung Wai, Yuen Long	Natural hillside	29/6	LandsD	Unknown	Natural hillside	4	Squatter structure	-
2012/07/1019AF (AFCD/2012/08/0001)	Shing Mun Jogging Trail Wilson Trail Stage 7	2.4 m high soil cut slope	20/8	AFCD	24/7	Soil cut	40	Footpath	Part of footpath closed
2012/07/1020AF (AFCD/2012/08/0002)	Shing Mun Jogging Trail	5 m high soil cut slope	20/8	AFCD	24/7	Soil cut	40	Footpath	Part of footpath closed
2012/07/1022AF (AFCD/2012/08/0005)	Fung Hang Family Walk 104	Natural hillside	20/8	AFCD	25/7	Natural hillside	55	Footpath	Part of footpath closed
2012/07/1023AF (AFCD/2012/08/0007)	Fung Hang Family Walk 109	2 m high soil cut slope	20/8	AFCD	25/7	Soil cut	10	Footpath	-
2012/07/1024AF (AFCD/2012/08/0008)	Fung Hang Family Walk 110	Natural hillside	20/8	AFCD	25/7	Natural hillside	70	Footpath	Part of footpath closed
2012/07/1025AF (AFCD/2012/08/0009)	Fung Hang Family Walk 112	3NE-C/C185	20/8	AFCD	25/7	Soil cut	10	Footpath	-
2012/07/1026AF (AFCD/2012/08/0010)	Fung Hang Family Walk 113	3NE-C/C169	20/8	AFCD	25/7	Soil cut	10	Footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 13 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/07/1027AF (AFCD/2012/08/0011)	Fung Hang Family Walk 114	3NE-C/C169	20/8	AFCD	25/7	Soil cut	30	Footpath	-
2012/07/1028AF (AFCD/2012/08/0013)	Shing Mun Forest Track - Lead Mine Pass Section	2 m high soil cut slope	20/8	AFCD	25/7	Soil cut	1	Access Road	Part of access road closed
2012/07/1031HY (HyD/NTW/2012/07/0027)	Near Lamp Post No. AD7369 and Feature No. 6SW-C/C875 So Kwun Wat Road, Tuen Mun	Natural hillside	17/8	HyD	28/7	Natural hillside	2	Footpath	-
2012/07/1032LD (LandsD/N/2012/07/0002)	Kwu Tung South, Sheung Shui, North	2SE-B/C167	25/7	LandsD	25/7 (15:48)	Soil/rock cut	2	Squatter structure	-
2012/07/1033LD (LandsD/N/2012/07/0003)	Tai Lung Hang Tsuen, Sheung Shui, North	< 3 m high soil cut slope	27/7	LandsD	27/7 (11:10)	Soil cut	20	Access Road	-
2012/07/1034LD (LandsD/SK/2012/07/0001)	No. 64 Pak Sha Wan, Sai Kung	2.2 m high soil cut slope	10/8	LandsD	26/7	Soil cut	3	Open Area	-
2012/07/1035LD (LandsD/SK/2012/07/0002)	Mang Kung Wo Road, Sai Kung	7SE-D/C74	30/7	LandsD	Unknown	Soil cut	10	Open Area	-
2012/07/1037WS (WSD/2012/7/1/NTW)	Near SMOF 30, Shing Mun Catchwater, Tsuen Wan	6SE-B/CR246	26/7	WSD	Unknown	Soil/rock cut	2 (Rockfall)	Catchwater	-
2012/07/1038WS (WSD/2012/7/2/NTW)	Uphill Slope of Shing Mun Catchwater	7SW-A/CR94	26/7	WSD	Unknown	Soil cut	0.1	Catchwater	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 14 of 14)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/07/1039WS (WSD/2012/7/3/NTW)	CH 1475 - 1705, Section L, Tai Lam Chung Catchwater	6SE-C/CR612	27/7	WSD	Unknown	Soil/rock cut	8.3	Catchwater	-
2012/07/1040WS (WSD/2012/7/4/NTE)	Near Intake "B-B" along Access Road to Country Park Management Centre, Pat Sin Leng Country Park	3SE-A/C18	30/7	WSD	Unknown	Soil/rock cut	22.5	Access Road	-
2012/08/1041AF (AFCD/2012/08/0017)	Tai Lam Forest Track - Tin Fu Tsai Section	4.8 m high soil cut slope	20/8	AFCD	8/8	Soil cut	1	Access Road	Part of access road closed
2012/08/1042LD (LandsD/SK/2012/08/0001)	No. 80 Pak Sha Wan, Sai Kung	2.3 m high soil cut slope	3/8	LandsD	Unknown	Soil cut	1	Open Area	-
2012/08/1043WS (WSD/2012/8/1/NTW)	Access Road to Ngau Tam Mei Treatment Works	2SE-D/CR437	2/8	WSD	Unknown	Soil cut	15	Access Road	-
2012/08/1044WS (WSD/2012/8/2/NTW)	Adjoining WSD Access Road NT33, Tsuen Wan	6SE-C/C249	1/8	WSD	Unknown	Soil cut	4.5	Access Road	-
2012/11/1051AD (ArchSD/F/2012/11/0001)	Access Road to Robin's Next, Miu Keng, Sha Tau Kok	3NW-D/C157	6/11	ArchSD	Unknown	Soil/rock cut	2 (Rockfall)	Access Road	-

Note: (1) The bracket denotes the landslide number adopted by the government department concerned, other than GEO.

Table B5 List of Landslide Incidents on Outlying Islands (Sheet 1 of 2)

Incident No.[(1)]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/03/1150	Sham Shek Tsuen, Tai O	2.5 m high soil cut slope	17/2	Public	Unknown	Soil cut	1	Minor footpath	-
2012/04/1156	Cheung Po Tsai Cave, Cheung Chau	Natural hillside	13/4	Police	13/4 (17:45)	Natural hillside	1 (Boulder fall)	Minor footpath	Minor footpath temporarily closed
2012/04/1158	West of No. 28A Peak Road, Cheng Chau	14NW-D/CR245	19/4	FSD	19/4 (16:25)	Soil cut	0.2	Village house	-
2012/04/1160	Behind House No. 24 Nam Shan Road, Peng Chau	< 3 m high soil cut slope	23/4	FSD	23/4 (09:00)	Soil cut	0.6	Squatter dwelling	-
2012/06/1182	Near House No. 12, Tai Yuen Village, Lamma Island	14NE-B/C209	18/5	DLO	22/4 (12:00)	Soil cut	3	Nil	-
2012/06/1188	Behind House 14 in Tai Shan East, Lamma Island	2.3 m high soil cut slope	18/6	Public	17/6 (14:00)	Soil cut	0.5	Squatter dwelling	-
2012/06/1189	No.22, Tai Kwai Wan San Tsuen, Cheung Chau	2 m high soil cut slope	22/6	Police	22/6	Soil cut	1	Squatter dwelling	-
2012/07/1204	Lo So Shing, Lamma Island	< 3 m high retaining wall	25/7	Public	24/7 (00:00)	Retaining wall	10.5	Others (other temporary structure)	Temporary structure at slope toe damaged by landslide debris

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Table B5 List of Landslide Incidents on Outlying Islands (Sheet 2 of 2)

Incident No.[1]	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m^3)		
2012/08/1223	House No. 32, Po Lin Monastery, Ngong Ping, Lantau	> 3 m high soil cut slope	31/7	Public	Unknown	Soil cut	1	Others (alleyway)	-
2012/10/1246	No. 4 Sha Po New Village, Lamma Island	2 m high fill slope	11/10	DO	Unknown	Fill	2.2	Squatter dwelling	-
2013/01/1262	No. 43 Chung Tsai Tsuen, Peng Chau	2 m disturbed terrain	21/12	DLO	21/12	Fill	1.5	Squatter dwelling	-
2012/01/1003WS (WSD/2012/1/2/HK)	West of Catchwater (Section D) at CH 0032, Sham Wat, Lantau	9SW-D/F98	30/1	WSD	Unknown	Fill	3	Access road	-
2012/04/1007AD (ArchSD/L/2012/04/0001)	Chi Ma Wan Prison, Lantau	14NW-A/FR26	2/5	ArchSD	11/4	Fill	7	Nil	-
2012/08/1045WS (WSD/2012/8/3/HK)	Adjoining Catchwater within Lantau South Country Park	13NW-C/CR9	16/8	WSD	Unknown	Soil/rock cut	0.1 (Rockfall)	Catchwater	-
2012/09/1048WS (WSD/2012/9/1/HK)	Along WSD access road to Silvermine Bay Filtered Water Tank, Lantau	10SW-C/C121	4/9	WSD	Unknown	Soil cut	0.1	Nil	-
2012/09/1049WS (WSD/2012/9/2/HK)	Sok Kwu Wan and Mo Tat Wan Near Lamp Post No. 35027, Lamma Island	15NW-C/C8	13/9	WSD	Unknown	Soil cut	0.8	Nil	-

Note: (1) The bracket denotes the landslide number adopted by the government department concerned, other than GEO.

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