Factual Report on Hong Kong Rainfall and Landslides in 2010

GEO Report No. 296

J.C.W. Leung, H.W.K. Lam & H.W. Chan

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

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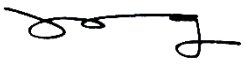
Preface

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.

The 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
June 2014

Foreword

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2010. 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, Fire Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and 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.S. Au-Yeung
Chief Geotechnical Engineer/LPM Division 1

Abstract

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2010. 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, Fire Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and that by the GEO's landslide investigation consultants, namely Fugro Scott Wilson Joint Venture and AECOM Asia Company Limited.

Rainfall recorded in 2010 at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 2,371.7 mm, close to the mean rainfall of 2,382.7 mm recorded between 1971 and 2000. Two Black Rainstorm Warnings were issued on 22 July and 28 July 2010; seven Red Rainstorm Warnings were issued between 22 July and 21 September 2010 and 17 Amber Rainstorm Warnings between 7 May and 21 September 2010.

Three Landslip Warnings were issued on 22 July, 28 July and 21 September 2010. A total of 210 incidents were reported to the Government in 2010. Of these, 206 were classified as genuine landslides and 15 of them were designated as major failures (i.e. with a failure volume of 50 m^3 or more, or where a fatality has occurred).

Thirteen landslides in 2010 resulted in notable consequences. Of these landslides, one led to permanent evacuation of a squatter dwelling, three led to temporary evacuation of squatter dwellings, two affected residential structures but did not result in any evacuation, and seven resulted in temporary closure of roads. Other landslides in 2010 affected a 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 2010 landslides.

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1 Introduction

This report summaries the factual information on rainfall and landslides reported in Hong Kong throughout 2010. 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 (Arch SD), Drainage Services Department (DSD), Highways Department (HyD), Housing Department (HD), Lands Department (Lands D), Water Supplies Department (WSD), and 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 09/2009 (GE) and CE 10/2009 (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 notable consequences (e.g. casualty, 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 86 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.

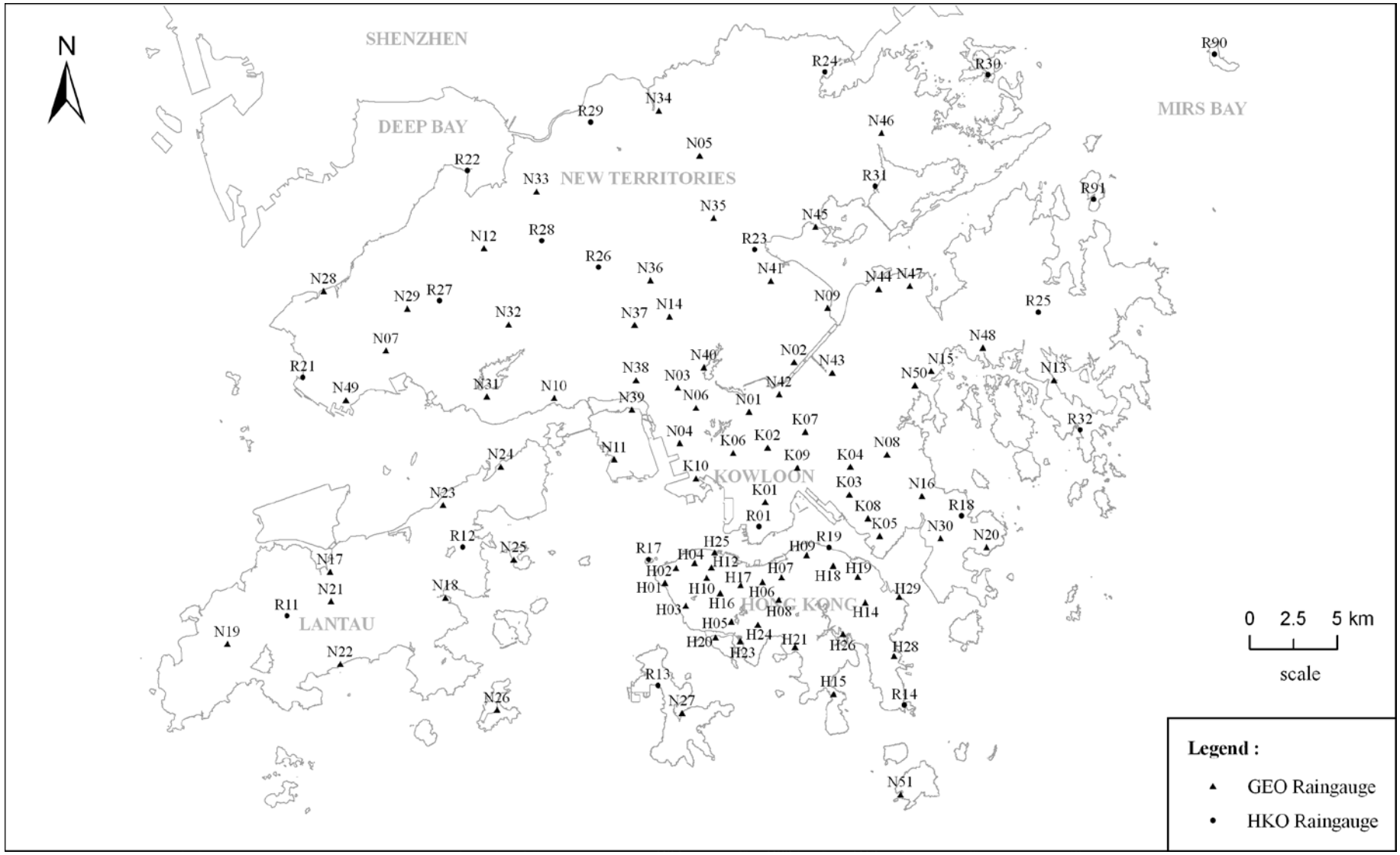


Figure 2.1 Locations of GEO and HKO Automatic Raingauges

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 2010, as well as individual months and individual rainstorms.

The weather in 2010, as described by the HKO (2011), is excerpted as follows:

> "According to the World Meteorological Organization, year 2010 is almost certain to rank among the top 3 warmest years globally since the beginning of instrumental climate records in 1850. In Hong Kong, 2010 was characterized by irregular variations in temperature and rainfall, despite the annual figures were close to normal."
>
> "Despite a record breaking daily rainfall of 94.1 millimetres for February, the first half of year 2010 was relatively dry with the total rainfall about 16% below normal. However, the two heavy rain episodes which necessitated the issuance of the Black Rainstorm Warning in July and the torrential rainfall due to the passage of two tropical cyclones, namely Lionrock and Fanapi in September, added up the annual rainfall to 2,371.5 millimetres which was close to the normal figure of 2,382.7 millimetres."
>
> "The rainfall over the territory was highly uneven in May. The total rainfall recorded at the Hong Kong Observatory Headquarters in the month was only 176.6 millimetres, about 54% of the normal figure of 329.5 millimetres, whereas over 300 millimetres of rainfall were recorded at the eastern part of the New Territories and western Lantau."
>
> "The two heavy rain episodes which necessitated the issuance of the Black Rainstorm Warning on 22 and 28 July respectively made the month wetter than usual."
>
> "September was the wettest month of the year with monthly rainfall of 583.1 millimetres, more than double the normal figure of 287.5 millimetres."

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 2010). Further details on the monthly weather are available on the HKO Website (http://www.hko.gov.hk/wxinfo/pastwx/mws.htm).

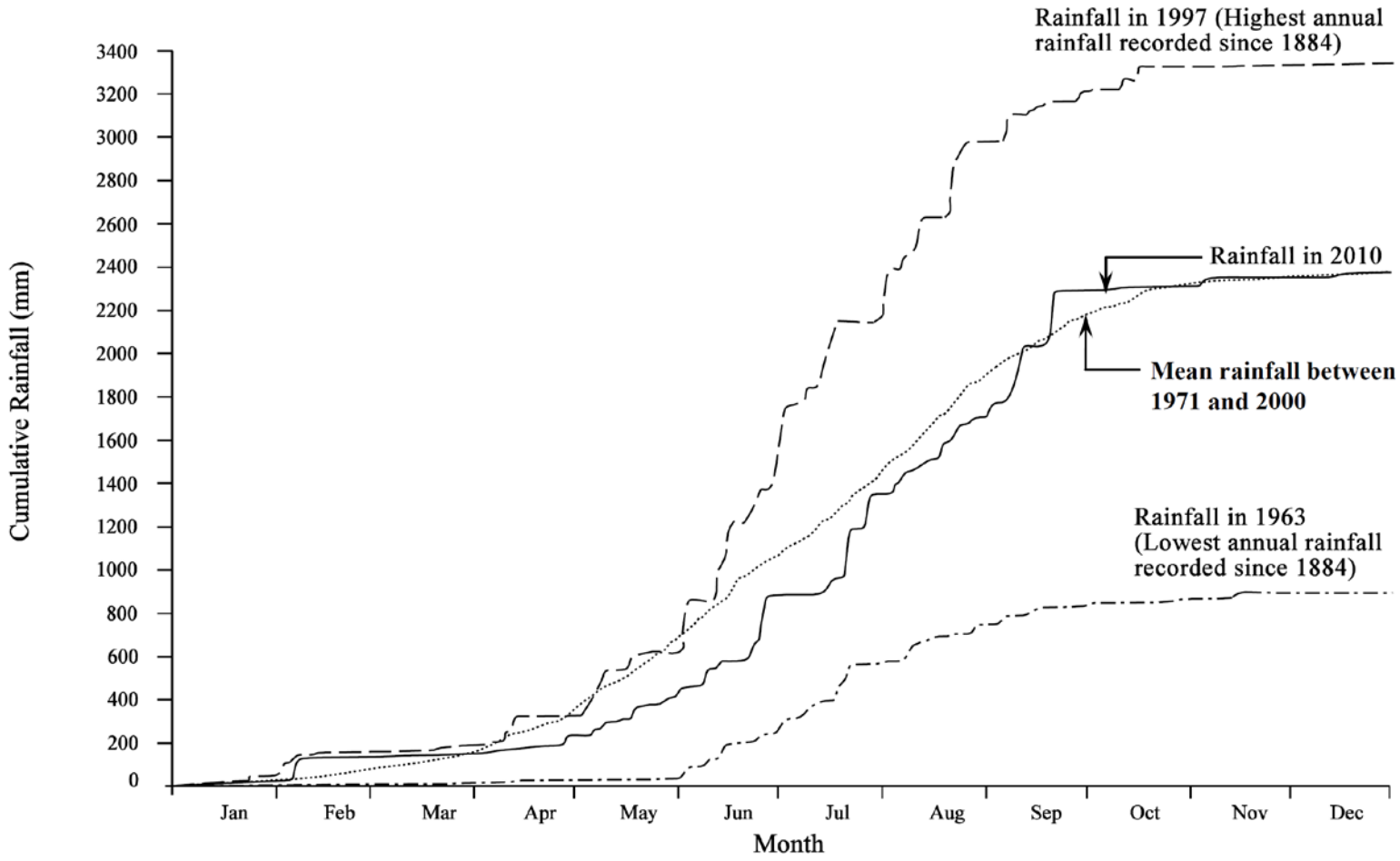
> "….an active trough of low pressure developed over southern China and moved to the coastal areas of Guangdong, giving rise to heavy rain and squally thunderstorms from 26 to 28 June.

> The rain was particularly heavy and persistent on 26 June with more than 150 millimeters of rainfall recorded in Kowloon and over parts of the Lantau Island."
>
> "….a tropical depression developed over the South China Sea to the west of Luzon on 19 July. It intensified into a tropical storm and was named Chanthu the next day….. Chanthu intensified into a typhoon on 22 July. As Chanthu passed to the southwest of Hong Kong towards the western coast of Guangdong later that day, local winds began to moderate. However, the outer rainbands associated with Chanthu brought unstable weather with heavy rain and thunderstorms to the territory. Over 150 millimetres of rainfall were recorded at Tsim Sha Tsui, Tai Po, Shatin and North Point and a waterspout was seen near Siu Sai Wan."
>
> "A trough of low pressure caused occasionally scattered heavy showers and squally thunderstorms to affect the territory on 27 and 28 July. A few funnel clouds and waterspouts were observed near Deep Bay in the morning on 27 July. A heavy rain episode in the afternoon on 28 July brought more than 100 millimetres of rainfall to the urban areas. The rainfall even exceeded 150 millimetres over Lantau, Sai Kung and the eastern part of the New Territories."
>
> "After making landfall over the coastal areas of southern Fujian on 20 September, Fanapi moved westward across inland Guangdong and weakened gradually. Affected by the rainbands of Fanapi, there were heavy rain and squally thunderstorms on 20 and 21 September. A total of 245.8 millimetres of rainfall were recorded at the Hong Kong Observatory Headquarters during these two days."

The rainfall recorded at the HKO in the first quarter of 2010 is 155.2 mm (4.4% above normal). The total rainfalls recorded in the second and third quarter are 730.4 mm (19.4% below the normal rainfall) and 1,402.8 mm (26.8% above the normal rainfall) respectively. For the last quarter of 2010, the total rainfall is 83.3 mm (62.4% below normal). The annual rainfall for 2010 is 2,371.7 mm, close to the mean rainfall (2,382.7 mm) recorded between 1971 and 2000. The cumulative rainfall for 2010 is compared with the highest, lowest and mean rainfall in Figure 2.2.

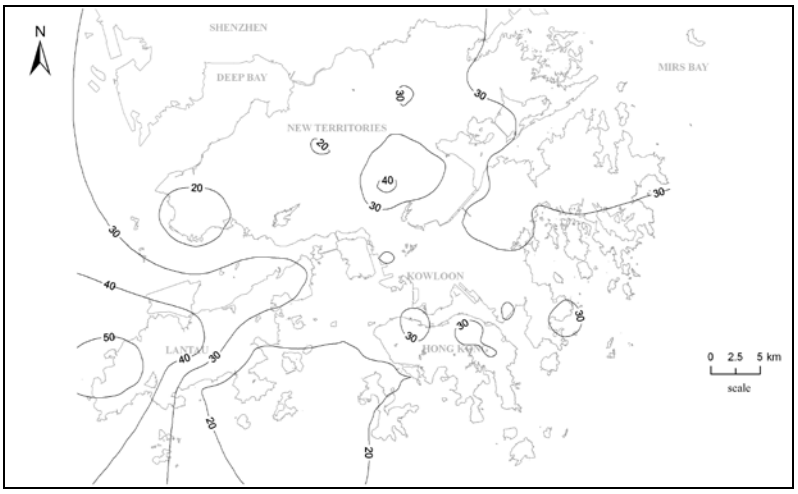
Figures 2.3a, 2.3b, 2.3c and 2.3d show the monthly rainfall distribution in 2010.

Figure 2.4 shows the annual rainfall distribution in 2010, together with the locations of the reported landslides.

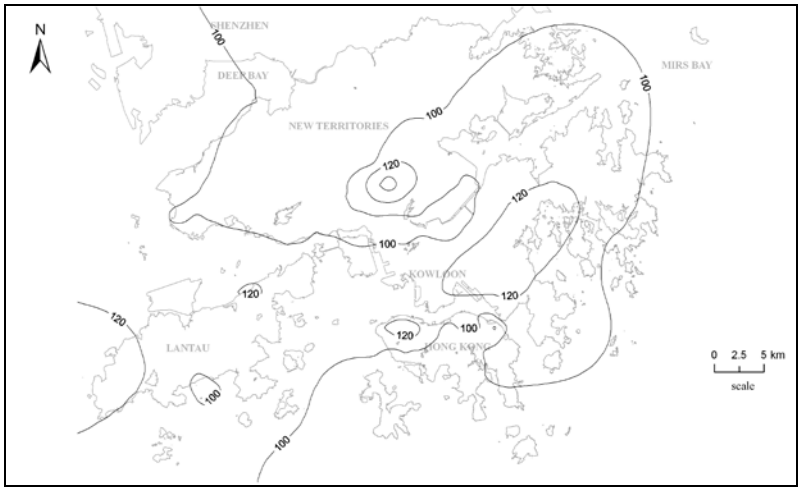


Note: Rainfall recorded at Hong Kong Observatory, Tsim Sha Tsui.

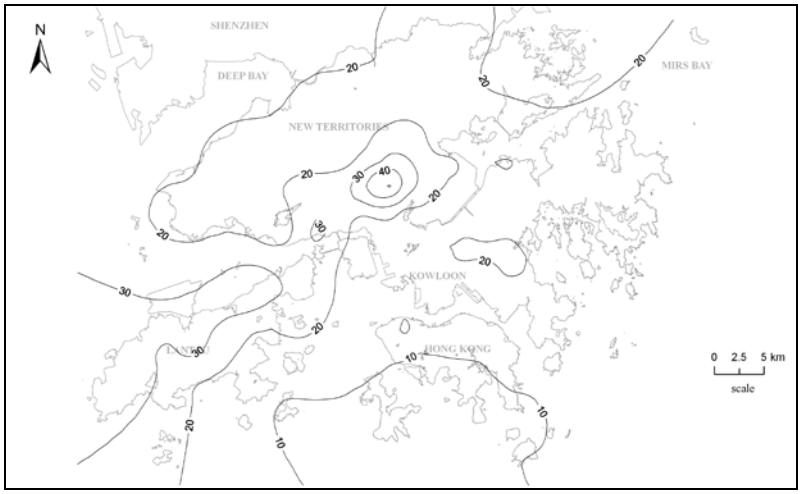
Figure 2.2 Cumulative Rainfall for 2010 at the Hong Kong Observatory and Its Recorded Highest, Mean and Lowest Cumulative Rainfalls



January 2010



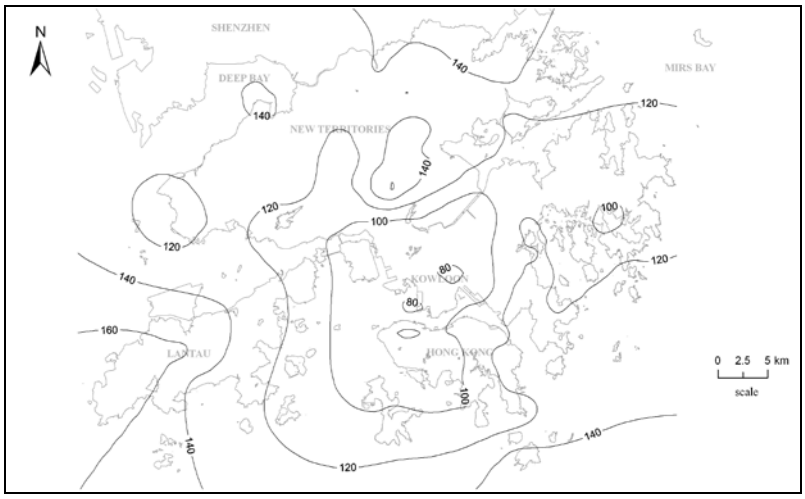
February 2010



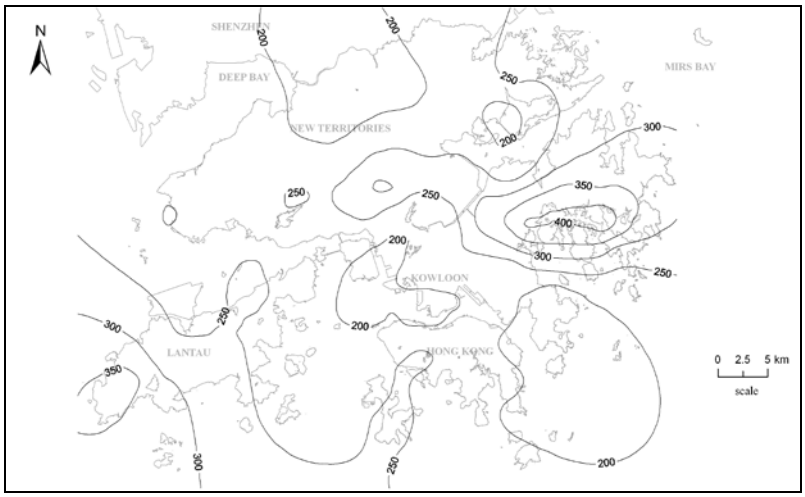
March 2010

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

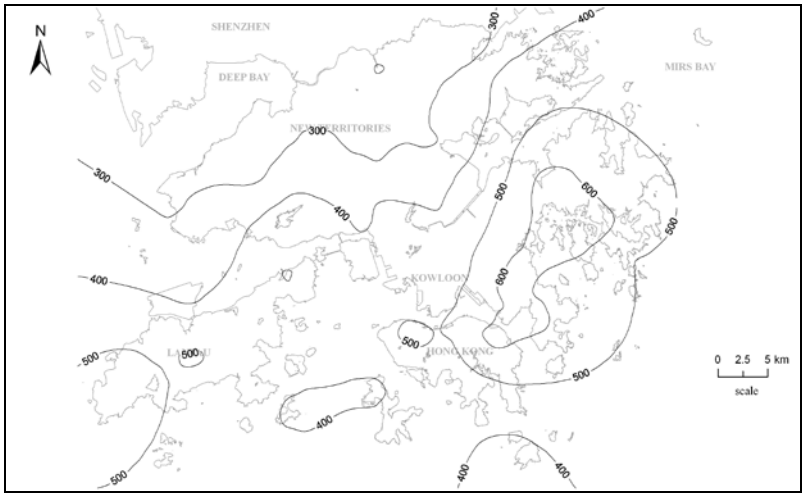
Figure 2.3a Monthly Rainfall Distribution in 2010



April 2010



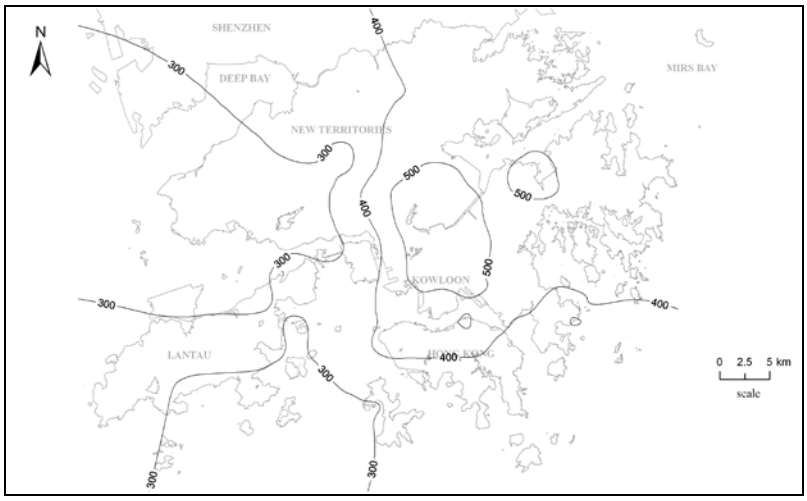
May 2010



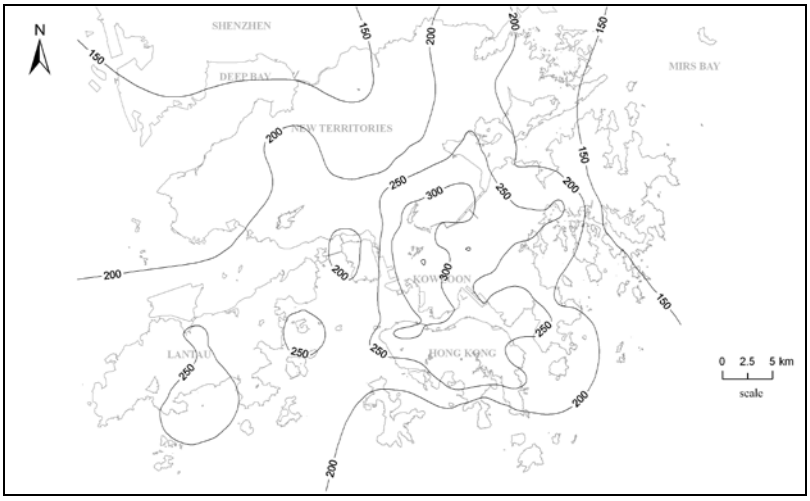
June 2010

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

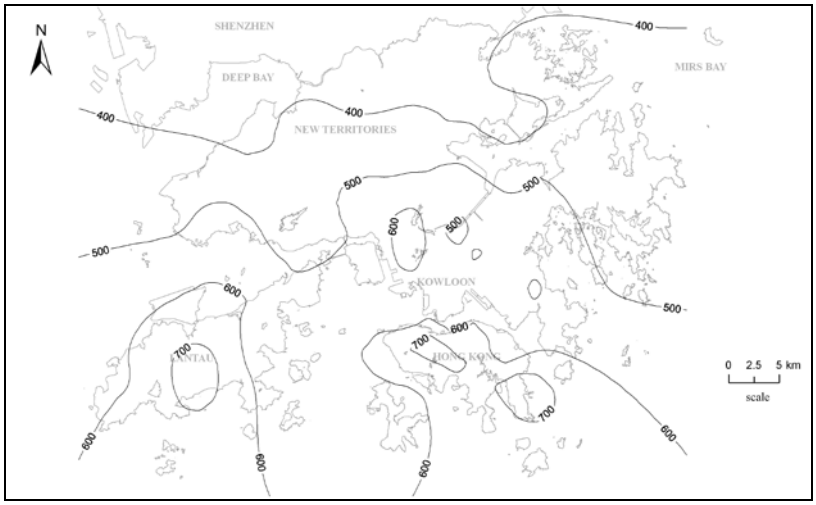
Figure 2.3b Monthly Rainfall Distribution in 2010



July 2010



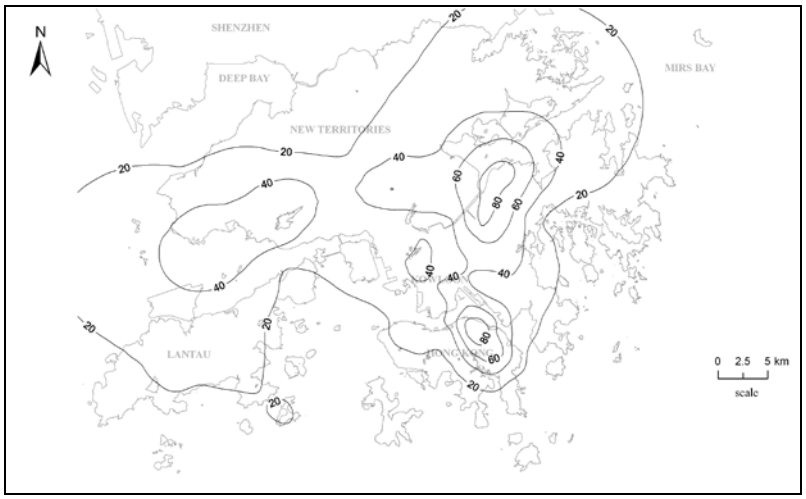
August 2010



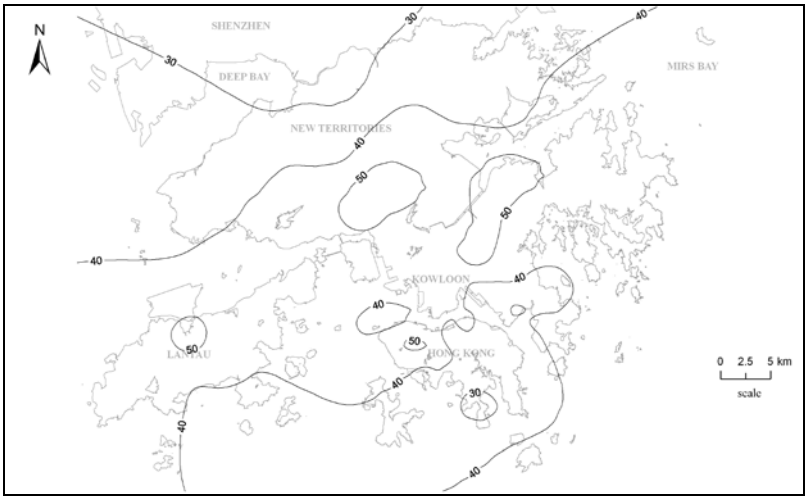
September 2010

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

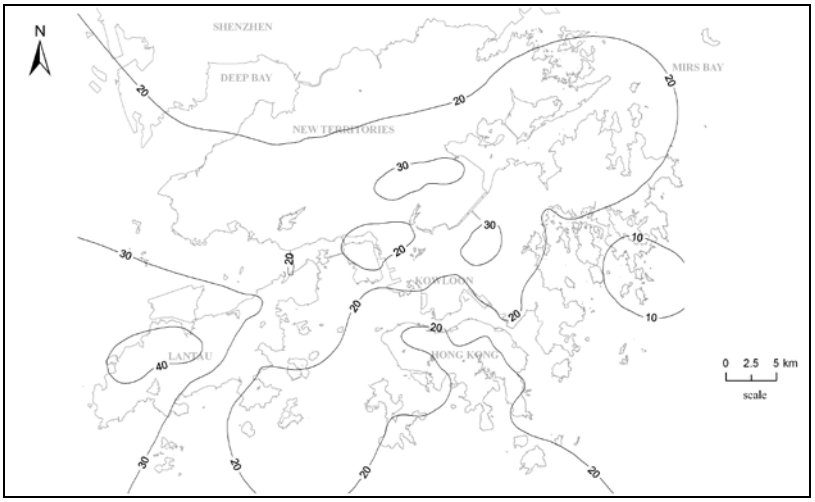
Figure 2.3c Monthly Rainfall Distribution in 2010



October 2010



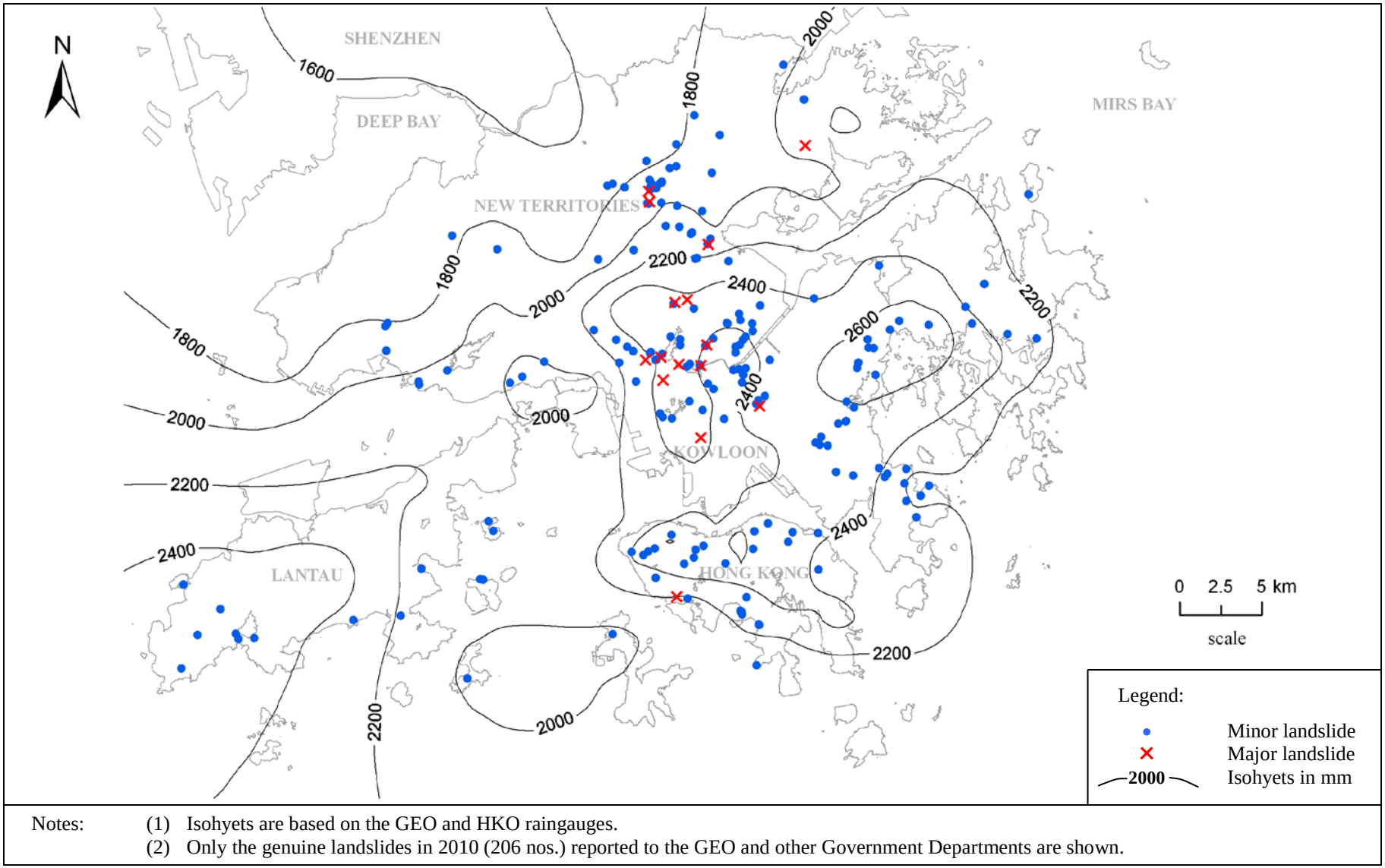
November 2010



December 2010

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

Figure 2.3d Monthly Rainfall Distribution in 2010



Notes: (1) Isohyets are based on the GEO and HKO raingauges.
(2) Only the genuine landslides in 2010 (206 nos.) reported to the GEO and other Government Departments are shown.

Figure 2.4 Annual Rainfall Distribution and Locations of Reported Landslides in 2010

2.3 Rainstorms in 2010

Table 2.1 tabulated the rainfall parameters for 20 rainstorms in 2010, during which the daily rainfall exceeded 50 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 20 rainstorms are also shown in Table A1 of Appendix A.

Figures A1 to A20 of Appendix A show the isohyets of the maximum rolling 24-hour rainfall during the above 20 rainstorms, together with the locations of reported landslides with reliable timing of occurrence that can be attributed to the rainstorm events, and the locations and values of maximum rolling rainfall for durations ranging from five minutes to 48 hours.

The rainstorms of 21 to 25 July 2010, 27 to 29 July and 23 to 29 June had caused 58, 29 and 14 reported landslides respectively. Each of the other rainstorms in 2010 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, Flood, Landslip, Tropical Cyclone and Rainstorm Warnings issued by the HKO in 2010. Two Black Rainstorm Warnings were issued on 22 July and 28 July 2010. Seven Red Rainstorm Warnings and 17 Amber Rainstorm Warnings were issued between 22 July and 21 September 2010, and between 7 May and 21 September 2010 respectively. Three Landslip Warnings were issued on 22 July, 28 July and 21 September 2010.

Table 2.1 Rainfall and Landslides in 2010 as Compared with 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				
20-22 September 2010	219.5	126.5	57.4	0	265.0	270.5 (H16)	143.0 (H16)	82.0 (H12)	6
21-25 July 2010	193.8	176.3	93.1	41.1	75.1	286.5 (N40)	261.0 (N40)	139.5 (N40)	58
27-29 July 2010	136.2	103.3	62.3	15.7	295.0	264.0 (N13)	175.5 (N21)	131.0 (N21)	29
23-29 June 2010	127.9	52.2	28.0	7.9	122.3	204.5 (N48)	103.5 (N48)	79.5 (N48)	14
8-13 September 2010	102.0	49.9	40.5	8.4	149.9	185.5 (H21)	146.5 (H21)	102.5 (N25)	2
7-8 February 2010	99.9	55.3	24.4	0.4	0.4	117.5 (H12)	72.0 (H01)	45.0 (H01)	1
16-21 August 2010	77.0	43.1	20.7	29.0	152.8	100.0 (H26)	62.5 (K08)	42.5 (N24)	4
23-24 August 2010	66.3	29.6	19.0	87.6	165.3	66.5 (N06)	42.5 (N37)	33.0 (N37, N40)	1
9-11 June 2010	64.3	38.9	16.5	8.2	82.8	143.0 (N30)	105.5 (N30)	85.5 (N30)	3
19-21 May 2010	63.6	38.1	15.4	12.7	74.5	120.0 (H05)	76.0 (H05)	49.0 (N14)	4
5-8 August 2010	57.0	56.2	33.0	1.1	395.4	93.5 (H02)	93.0 (H02)	78.0 (N47)	0
3-6 September 2010	51.0	21.7	9.6	16.2	205.4	263.0 (N21)	155.0 (N21)	75.0 (N22)	1
29-30 April 2010	41.2	28.7	12.2	0.2	21.7	87.0 (N19)	60.5 (N51)	39.0 (N51)	0
16-18 July 2010	41.1	22.2	14.9	8.4	16.2	127.5 (N47)	80.0 (H01)	57.5 (N47)	1
2-3 June 2010	41.0	15.1	10.0	44.3	118.2	62.0 (N20)	28.0 (N28)	19.5 (N20)	2
7-10 May 2010	31.5	17.5	10.8	0.2	48.4	77.0 (N32)	69.5 (N12, N33)	48.5 (N49)	5
26-29 August 2010	30.1	30.1	30.0	80.6	218.6	106.0 (N31)	106.0 (N31)	97.0 (N31)	0
29-31 May 2010	26.8	21.5	10.0	0	86.6	259.0 (N13)	225.0 (N13)	85.5 (N48)	4
11-12 August 2010	25.2	21.9	12.0	57.3	268.2	104.5 (N02)	92.0 (N02)	61.0 (N02)	0
11-12 October 2010	12.8	4.4	2.6	11.6	19.1	93.0 (H18)	58.5 (H14)	44.5 (H18)	0

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 86 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.

Table 2.1 Rainfall and Landslides in 2010 as Compared with 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.

Table 2.2 Warnings Issued by the Hong Kong Observatory in 2010

Month	Monthly Total Rainfall (mm)	Dates on which Warnings [1] were in Effect				
		Thunderstorm [2]	Flooding	Landslip [3]	Tropical Cyclone [4]	Rainstorm
January	24.6	-	-	-	-	-
February	113.1	7	-	-	-	-
March	17.5	-	-	-	-	-
April	78.9	2, 8, 15, 17, 22, 29	-	-	-	-
May	176.6	7, 9, 10, 15, 19, 20, 22, 23, 29, 30, 31	-	-	-	7 (Amber), 19 (Amber)
June	474.9	9, 10, 13, 14, 16, 22, 23, 24, 25, 26, 27, 28, 29	-	-	-	10 (Amber), 26 (Amber), 27 (Amber), 28 (Amber)
July	469.4	10, 11, 12, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 26, 27, 28, 29, 30	22-23	22 (18:10) - 23 (04:35) 28 (16:30 - 21:30)	15-16 (1, CONSON), 20-22 (1-3, CHANTHU)	22 (2 x Amber, Red, Black), 28 (Amber, 2 x Red, Black)
August	350.3	2, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 28, 29, 30	28	-	29-30 (1, LIONROCK)	5 (Amber, Red), 28 (Amber)
September	583.1	2, 3, 4, 5, 8, 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22, 25, 29, 30	9, 10	21 (04:15 - 09:00)	2-3 (1, LIONROCK) 19-21 (1-3, FANAPI)	5 (Amber), 9 (Amber, Red), 10 (Amber, Red), 20 (Amber), 21 (2 x Amber, Red)
October	22.7	15	-	-	20-20 (1-3, MEGI)	-
November	42.2	-	-	-	-	-
December	18.4	-	-	-	-	-
Total	2,371.7	138 Warnings	4 Warnings	3 Warnings	6 Warnings	26 Warnings (17 x Amber, 7 x Red & 2 x Black)

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 2010

Landslide incidents reported to the GEO and other Government Departments in 2010 are summarised in Table 3.1.

Table 3.1 Breakdown of Landslides Reported to Government Departments in 2010

Department	Reported Number of Landslides	Genuine Landslides
Agriculture, Fisheries and Conservation Department	9 (0)	9 (0)
Architectural Services Department	23 (4)	23 (4)
Drainage Services Department	2 (0)	2 (0)
Geotechnical Engineering Office, Civil Engineering and Development Department	144(1)	141(1)
Highways Department	47 (41)	45 (40)
Housing Department	0 (0)	0 (0)
Lands Department	35 (10)	35 (10)
Water Supplies Department	6 (1)	6 (1)
Total	266 (56)(2)	261 (55)(2)

Legend:

6 (1) Six incidents were reported to the Government Department concerned, one of which was also reported to the GEO separately by other parties (i.e. duplicate cases)

Notes:

(1) A total of 144 landslide incidents (discounting duplicated cases) were reported to the GEO in 2010, of which 141 incidents were classified as genuine landslide.

(2) The number of reported landslide incidents in 2010 (discounting duplicate cases) is **210** [266-56]. The number of genuine landslides is 206 [261-55].

A total of 210 landslide incidents were reported in 2010 to various Government Departments. These include 144 incidents reported to the GEO. Another 66 incidents were reported to other Government Departments (i.e. AFCD, Arch SD, DSD, FSD, HyD, HD, Lands D or WSD). Of these 210 reported incidents, 206 were genuine landslides (see details in Appendix B). The other reported incidents were non-landslide events with no geotechnical concern.

Of the 206 genuine landslides, 15 (7.3%) were major landslides (see Table B1 in Appendix B), 149 (72.3%) were minor landslides, and 42 (20.4%) 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 4.3. 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 206 landslides, the timing of occurrence was determined to within one day for 64 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. For those landslides affecting catchwaters and construction sites, none of them resulted in any significant direct or indirect consequences. 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 distribution of different facility groups affected by major landslides is presented in Table 3.4. Further descriptions of some selected notable landslides of 2010 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 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.

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 123 landslides (59.7%) involved less than 5 m^3 of material. There were 15 major (with a failure volume of 50 m^3 or more) landslides.

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 house)	3 (0)	0 (0)	19 (0)	22 (0)
Registered Squatter Dwellings	0 (0)	0 (0)	33 (2)	33 (2)
Roads	5 (0)	1 (1)	13 (0)	19 (1)
Transportation Facilities (e.g. railways, tramways, etc.)	0 (0)	0 (0)	0 (0)	0 (0)
Pedestrian Pavements/Footways	0 (0)	0 (0)	0 (0)	0 (0)
Minor Footpaths/Access Paths/ Access road	6 (0)	2(1)	68 (9)	76 (10)
Construction Sites	2 (0)	1 (1)	2 (0)	5 (1)
Open Areas	6 (0)	0 (0)	22 (1)	28 (1)
Catchwaters	0 (0)	0 (0)	2 (0)	2 (0)
Others (e.g. carparks, parks, playgrounds, gardens, backyards, etc.)	5 (1)	0 (0)	21 (1)	26 (2)
Nil	1 (0)	0 (0)	4 (0)	5 (0)
Total	28 (1)	4 (3)	184 (13)	216 (17)

Legend:

4 (3) Four landslides of which three were major failures (i.e. failure volume ≥ 50 m^3)

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

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)	1 (2)	0	2	0	1	0	0
Cut Slopes	Soil	1 (2)	2 (5)	0	4	0	3	0	0
	Soil/Rock	0 (0)	0 (0)	0	0	0	0	0	0
	Rock	0 (0)	0 (0)	0	0	0	0	0	0
Retaining Walls		0 (0)	3 (9)	0	0	0	3	0	0
Natural Hillside		0 (0)	0 (0)	0	1	0	5	0	0
Registered Disturbed Terrain		0 (0)	0 (0)	0	0	0	0	0	0
Total		1 (2)	6 (16)	0	7	0	12	0	0

Legend:

1 (1) 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	Facilities Group Affected by Major Landslides (Group No.)						
	1a	1b	2a	2b	3	4	5
All Major Landslides	0	2	0	1	1	9	4
Major Landslides on Man-made Slopes	0	2	0	1	1	4	2
Major Landslides on Registered Disturbed Terrain	0	0	0	0	0	0	0
Major Landslides on Natural Hillsides	0	0	0	0	0	5	2

Notes: (1) Facility groups are classified in accordance with the GEO Technical Note No. 15 (GEO, 2007).
(2) A given landslide may affect more than one type of facility.

Table 3.5 Breakdown of Landslides by Type of Slope Failure

Type of Slope Failure		Number	Percentage (%)
Fill Slopes		10 (2)	4.9
Cut Slopes	Soil	103 (5)	50.0
	Soil/Rock	23 (1)	11.1
	Rock	4 (0)	1.9
Retaining Walls		15 (0)	7.3
Natural Hillsides		41 (7)	19.9
Registered Disturbed Terrain		10 (0)	4.9
Total		206 (15)	100.0

Legend:

23 (1) Twenty three landslides, one of which was major failure

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.

Table 3.6 Landslides Volume Distribution with Respect to Geographical Locations

Volume of Failure (m^3)	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
< 5	19	0	104	123 (59.7%)
≥ 5 to < 10	3	0	21	24 (11.7%)
≥ 10 to < 20	2	0	17	19 (9.2%)
≥ 20 to < 50	2	1	22	25 (12.1%)
≥ 50 to < 200	1	2	9	12 (5.8%)
≥ 200 to < 500	0	0	3	3 (1.5%)
≥ 500 to < 1000	0	0	0	0 (0%)
≥ 1000	0	0	0	0 (0%)
Total	27	3	176	206 (100%)

Legend:

12 (5.8%) Twelve landslides, which amount to 5.8% of the total 206 genuine landslides reported to the Government

Note: (1) Fifteen landslides involved a failure volume ≥ 50 m^3.

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

Volume of Failure (m^3)	Fill Slope	Cut Slope			Retaining Wall	Natural Hillside	Disturbed Terrain	Total
		Soil	Soil/Rock	Rock				
< 5	4	66	16	3	10	20	4	123 (59.7%)
≥ 5 to < 10	1	13	3	0	3	3	1	24 (11.7%)
≥ 10 to < 20	1	8	2	1	1	3	3	19 (9.2%)
≥ 20 to < 50	2	11	1	0	1	8	2	25 (12.1%)
≥ 50 to < 200	2	3	1	0	0	6	0	12 (5.8%)
≥ 200 to < 500	0	2	0	0	0	1	0	3 (1.5%)
≥ 500 to < 1000	0	0	0	0	0	0	0	0 (0%)
≥ 1000	0	0	0	0	0	0	0	0 (0%)
Total	10	103	23	4	15	41	10	206 (100%)

Legend:

12 (5.8%) Twelve landslides, which amount to 5.8% of the total 206 genuine landslides reported to the Government

4 Notable Landslides

4.1 General

Of the 206 genuine landslides reported to the Government in 2010, three incidents are described in more detail below. These three incidents have been selected on the basis of their consequences or scale of failure.

4.2 The 22 July 2010 Landslide on Slope No. 11NW-B/FR5 below Pak Wan Street, Sham Shui Po (Incident No. 2010/07/0971)

At 18:45 on 22 July 2010 when both the Black Rainstorm and Landslip Warning Signals were in effect, a 150 m^3 landslide was reported to have occurred at the upper portion of a fill slope (No. 11NW-B/FR5) below a bend of Pak Wan Street. The landslide undermined a section of the pedestrian pavement of Pak Wan Street, exposing several utilities. Debris of the landslide reached the fence wall of Faith Lutheran School at the slope toe. One lane of Pak Wan Street was temporarily closed. No injury or casualty was reported as a result of the landslide.

The fill slope involved in the landslide was within an active construction site under Highways Department (HyD Contract No. HY/2007/05). Improvement works were being carried out under HyD's Preventive Maintenance Programme at the time of the 2010 failure. The resident site staff observed a significant overland flow onto the slope from Pak Wan Street immediately prior to the landslide.

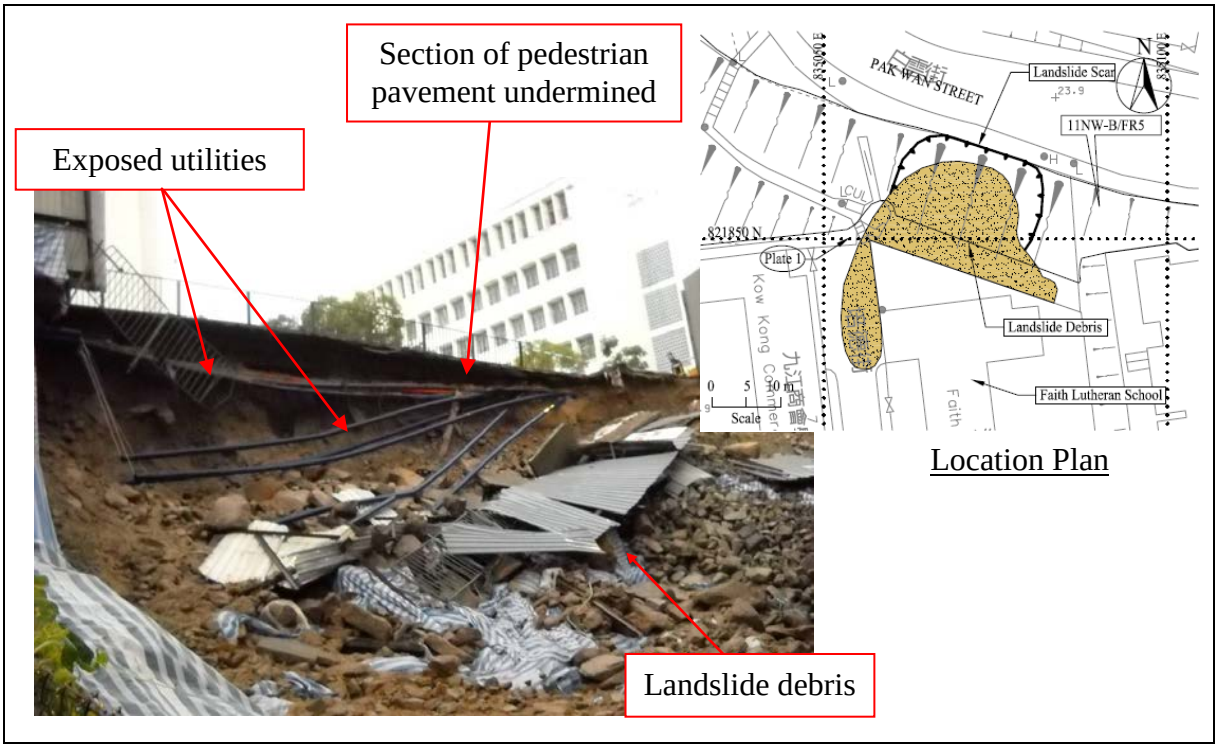


Figure 4.1 General View of the 22 July 2010 Landslide on Slope No. 11NW-B/FR5, below Pak Wan Street, Sham Shui Po (Incident No. 2010/07/0971)

4.3 The 22 July 2010 Landslide adjacent to Slope No. 7SW-D/F314 between House Nos. 52 and 62, Tin Sum Pak Tin Tsuen, Shatin (Incident No. 2010/07/0976)

At about 19:30 on 22 July 2010 when both the Black Rainstorm Warning and Landslip Warning were in effect, a 100 m^3 landslide was reported to have occurred adjacent to a fill slope (No. 7SW-D/F314), Tin Sum Pak Tin Tsuen, Shatin. The landslide undermined part of a vacant structure and a section of a footpath at the slope crest. A squatter dwelling immediately adjacent to the landslide scar at slope toe was also affected. The squatter dwelling was temporarily evacuated, and the damaged footpath at the slope crest was temporarily closed. No injury or casualty was reported following the occurrence of the landslide.

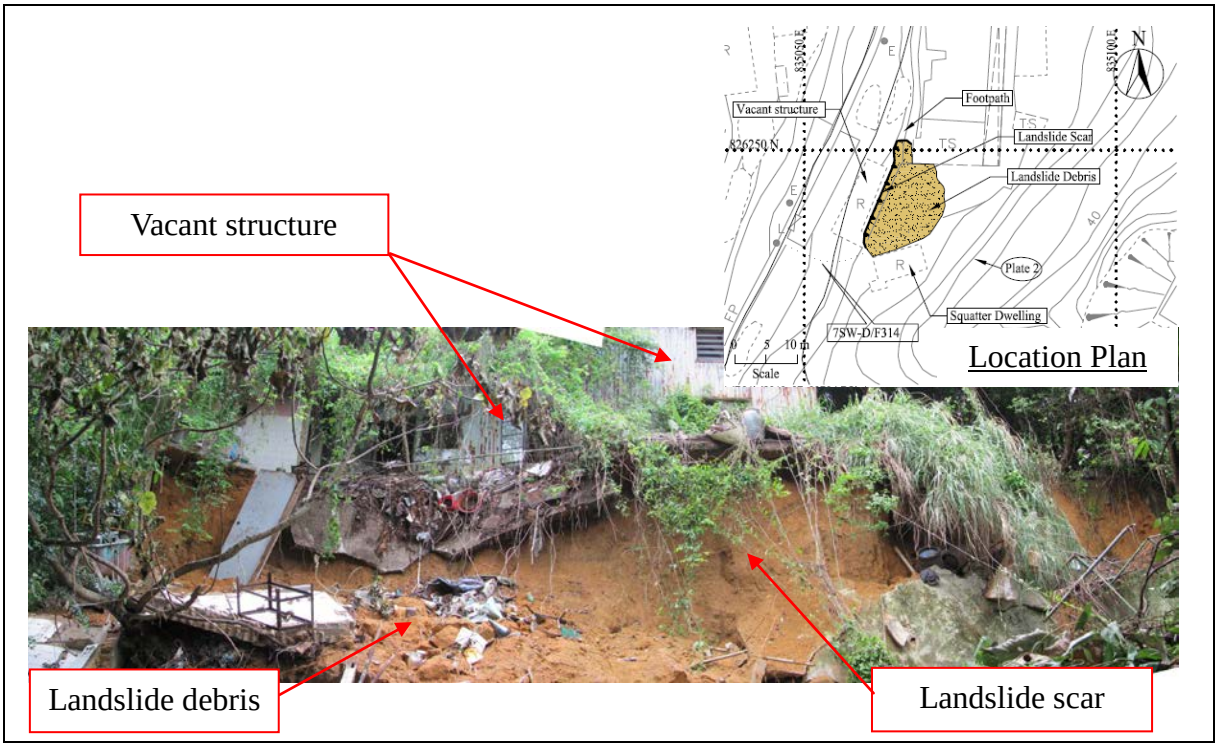


Figure 4.2 General View of the 22 July 2010 Landslide adjacent to Slope No. 7SW-D/F314, Tin Sum Pak Tin Tsuen, Shatin (Incident No. 2010/07/0976)

4.4 The 22 July 2010 Landslide on Slope No. 7SW-C/C990 in Shek Lei Hang Village, Kwai Chung (Incident No. 2010/07/0982)

On 22 July 2010, a 80 m^3 landslide was reported to have occurred at a cut slope (No. 7SW-C/C990) in Shek Lei Hang Village, Kwai Chung. The exact time of the landslide was however not known. The landslide involved both the eastern portion of the slope and the adjacent natural hillside. Debris from the landslide was largely deposited on the verge of a footpath at the toe of the western slope portion. Some of the landslide debris was deposited on the back alley behind a squatter dwelling at the slope toe. No injury or casualty was reported as a result of the landslide.

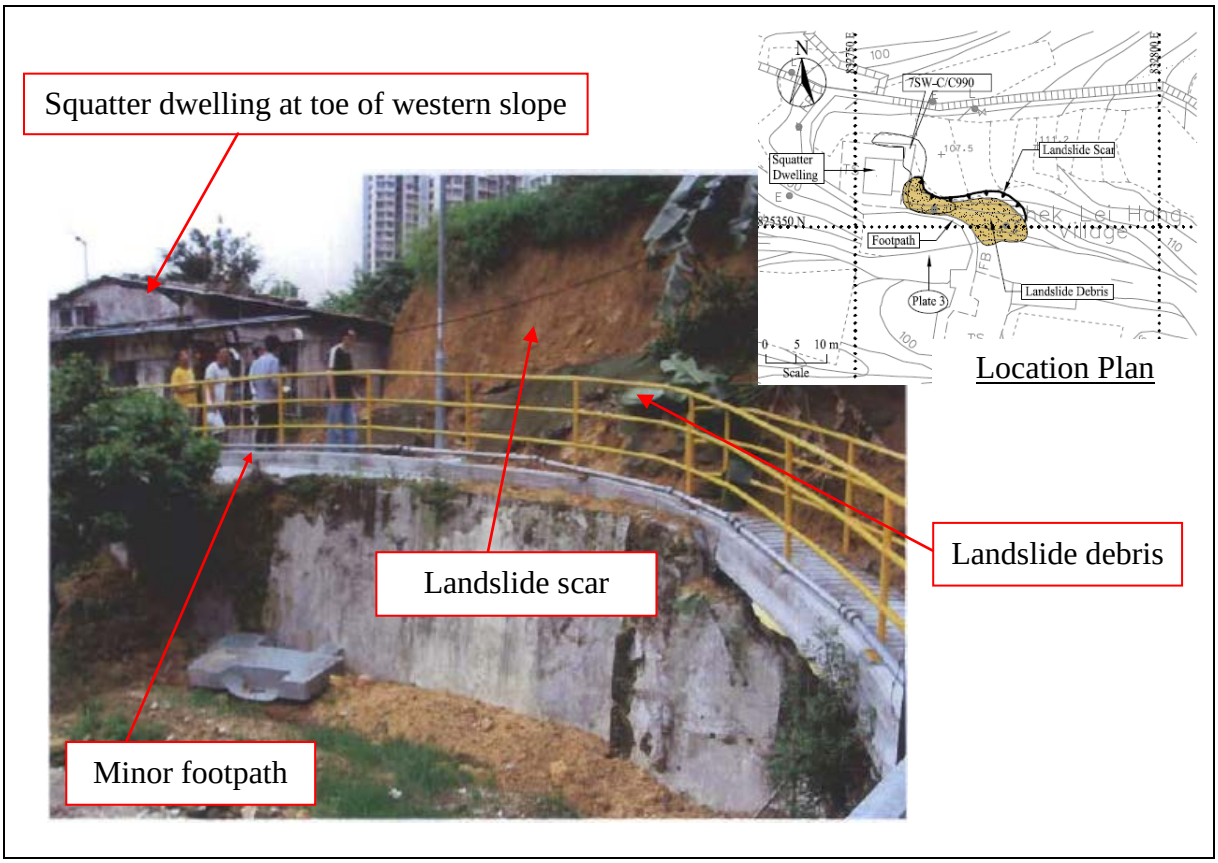


Figure 4.3 General View of the 22 July 2010 Landslide on Slope No. 7SW-C/C990, Shek Lei Hang Village, Kwai Chung (Incident No. 2010/07/0982)

5 Conclusion

Rainfall recorded at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 2,371.7 mm in 2010, close to the mean value of 2,382.7 mm between 1971 and 2000. In 2010, three Landslip Warnings were issued on 22 July, 28 July and 21 September 2010. Two Black Rainstorm Warnings were issued on 22 July and 28 July 2010. Seven Red Rainstorm Warnings were issued between 22 July and 21 September 2010 and 17 Amber Rainstorm Warnings between 7 May and 21 September 2010. Of the 206 genuine landslides, 15 were major failures, 149 were minor failures and 42 were very minor failures with negligible consequences.

Thirteen landslides in 2010 resulted in notable consequences. Of these landslides, one led to permanent evacuation of a squatter dwelling, three led to temporary evacuation of squatter dwellings, two affected residential structures but did not result in any evacuation, and seven resulted in temporary closure of roads. Other landslides in 2010 affected a 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 2010 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 (2011). *Monthly Weather Summary December 2010*. Hong Kong Observatory, Hong Kong, 23 p.

Appendix A

Some Selected Rainfall Parameters for the 20 Rainstorms with Daily Rainfall Exceeding 50 mm

List of Tables

Table A1 Some Selected Rainfall Parameters for the 20 Rainstorms with Daily Rainfall Exceeding 50 mm in 2010 (Sheet 1 of 3)

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	7-8 February 2010	10.0	N50	12.0	K04, N50	16.0	K04	27.0	H01
2	29-30 April 2010	7.0	N26	10.5	N26	13.5	N17, N26	24.0	N51
3	7-10 May 2010	15.5	H23	26.5	H23	35.5	N49	46.0	N49
4	19-21 May 2010	15.0	N39	24.0	H05	33.0	H05	42.5	N14
5	29-31 May 2010	15.5	N02	24.0	N19, N43	31.5	N19	53.0	N19
6	2-3 June 2010	6.0	N20	9.0	N20, N22	11.5	N20	16.0	N20
7	9-11 June 2010	12.5	N31	22.0	H14, N31	32.0	N30	51.0	N30
8	23-29 June 2010	15.0	N34	24.0	H16	31.5	H16	49.5	N48
9	16-18 July 2010	12.5	H12, N15, N47	22.5	H16	30.5	N47	45.0	N47
10	21-25 July 2010	17.5	N35	33.5	N35	44.0	N06	77.5	N40
11	27-29 July 2010	16.0	N16	27.5	N16	37.5	N16	73.5	N21
12	5-8 August 2010	12.5	N43, N44	23.0	N43, N44	33.0	N43	54.5	N47
13	11-12 August 2010	11.5	N09	20.0	N09	25.0	N09	35.5	N02
14	16-21 August 2010	15.5	N19	27.0	N19	32.5	N19	37.5	N24
15	23-24 August 2010	13.0	H26	19.5	N03	24.0	N40	31.0	N37, N40
16	26-29 August 2010	16.5	N32	29.5	N32	40.0	N32	69.5	N32
17	3-6 September 2010	16.5	N21	29.5	N21	42.0	N21	58.0	N21
18	8-13 September 2010	19.5	H29	33.5	H29	46.5	H29	71.0	N06
19	20-22 September 2010	13.0	H16, H20, N07	24.5	H16	33.5	H23	56.5	H23
20	11-12 October 2010	9.0	H18	17.0	H18	24.0	H18	35.5	H18

Table A1 Some Selected Rainfall Parameters for the 20 Rainstorms with Daily Rainfall Exceeding 50 mm in 2010 (Sheet 2 of 3)

Rainstorm		1-hr		2-hr		4-hr		5-hr		6-hr	
		Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station
1	7-8 February 2010	45.0	H01	60.5	K04	72.0	H01	73.0	H01	75.5	H01
2	29-30 April 2010	39.0	N51	48.5	N51	60.5	N51	66.5	N51	68.5	N51
3	7-10 May 2010	48.5	N49	49.0	N49	69.5	N12, N33	71.5	N12, N33	73.0	N12, N33
4	19-21 May 2010	49.0	N14	72.5	H05	76.0	H05	77.0	H05	100.5	H05
5	29-31 May 2010	85.5	N48	137.0	N13	225.0	N13	240.0	N13	241.0	N13
6	2-3 June 2010	19.5	N20	22.5	N28	28.0	N28	32.5	N16	35.0	N16
7	9-11 June 2010	85.5	N30	97.0	N30	105.5	N30	108.0	N30	115.5	N30
8	23-29 June 2010	79.5	N48	93.5	N48	103.5	N48	105.5	N48	115.5	N48
9	16-18 July 2010	57.5	N47	67.5	N45	80.0	H01	81.0	H01	81.0	H01
10	21-25 July 2010	139.5	N40	233.5	N40	261.0	N40	261.0	N40	261.0	N40
11	27-29 July 2010	131.0	N21	168.0	N21	175.5	N21	177.0	N21	177.5	N21
12	5-8 August 2010	78.0	N47	81.5	N25	93.0	H02	93.0	H02	93.0	H02
13	11-12 August 2010	61.0	N02	79.5	N02	92.0	N02	104.5	N02	104.5	N02
14	16-21 August 2010	42.5	N24	62.5	K08	62.5	K08	62.5	K08	63.0	K08
15	23-24 August 2010	33.0	N37, N40	33.0	N37, N40	42.5	N37	42.5	N37	55.0	N06
16	26-29 August 2010	97.0	N31	105.5	N31	106.0	N31	106.0	N31	106.0	N31
17	3-6 September 2010	75.0	N22	100.5	N21	155.0	N21	181.0	N21	209.5	N21
18	8-13 September 2010	102.5	N25	120.0	N25	146.5	H21	147.5	H21	150.5	H21
19	20-22 September 2010	82.0	H12	128.0	H10, H16	143.0	H16	148.0	H16	151.5	H16
20	11-12 October 2010	44.5	H18	52.0	H18	58.5	H14	83.0	H18	87.5	H18

Table A1 Some Selected Rainfall Parameters for the 20 Rainstorms with Daily Rainfall Exceeding 50 mm in 2010 (Sheet 3 of 3)

Rainstorm		8-hr		12-hr		18-hr		24-hr		48-hr	
		Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station	Max. rainfall (mm)	Raingauge Station
1	7-8 February 2010	86.5	H01	98.5	H12	117.5	H12	117.5	H12	119.0	H12
2	29-30 April 2010	77.0	N51	85.5	N51	86.5	N51	87.0	N19	87.5	N19
3	7-10 May 2010	74.0	N12	74.5	N12	76.0	N32	77.0	N32	80.0	N32
4	19-21 May 2010	101.0	H05	101.0	H05	119.5	H05	120.0	H05	120.0	H05
5	29-31 May 2010	241.0	N13	242.0	N13	242.0	N13	259.0	N13	259.5	N13
6	2-3 June 2010	38.5	N16	46.0	N19	54.0	N20	62.0	N20	72.5	N19
7	9-11 June 2010	128.5	N30	130.0	N30	134.5	N30	143.0	N30	169.0	N30
8	23-29 June 2010	138.0	N48	177.5	N48	181.0	N48	204.5	N48	331.5	N48
9	16-18 July 2010	81.0	H01	81.0	H01	106.0	N47	127.5	N47	157.0	H01
10	21-25 July 2010	261.5	N40	267.0	N40	283.0	N40	286.5	N40	315.0	N40
11	27-29 July 2010	178.5	N21	181.0	N13	189.0	N13	264.0	N13	272.5	N13
12	5-8 August 2010	93.0	H02	93.5	H02	93.5	H02	93.5	H02	98.0	H12
13	11-12 August 2010	104.5	N02	104.5	N02	104.5	N02	104.5	N02	125.5	N02
14	16-21 August 2010	63.0	K08	75.5	H26	79.0	H26	100.0	H26	109.0	H28
15	23-24 August 2010	61.0	N06	61.5	N06	62.5	N06	66.5	N06	66.5	N06
16	26-29 August 2010	106.0	N31	106.0	N31	106.0	N31	106.0	N31	106.0	N31
17	3-6 September 2010	230.5	N21	254.5	N21	257.0	N21	263.0	N21	282.0	N21
18	8-13 September 2010	153.0	H21	173.5	H21	182.5	H21	185.5	H21	276.5	H08
19	20-22 September 2010	183.5	N43	226.0	H16	242.5	H12	270.5	H16	304.5	H16
20	11-12 October 2010	88.0	H18	88.0	H18	90.0	H18	93.0	H18	97.0	H18

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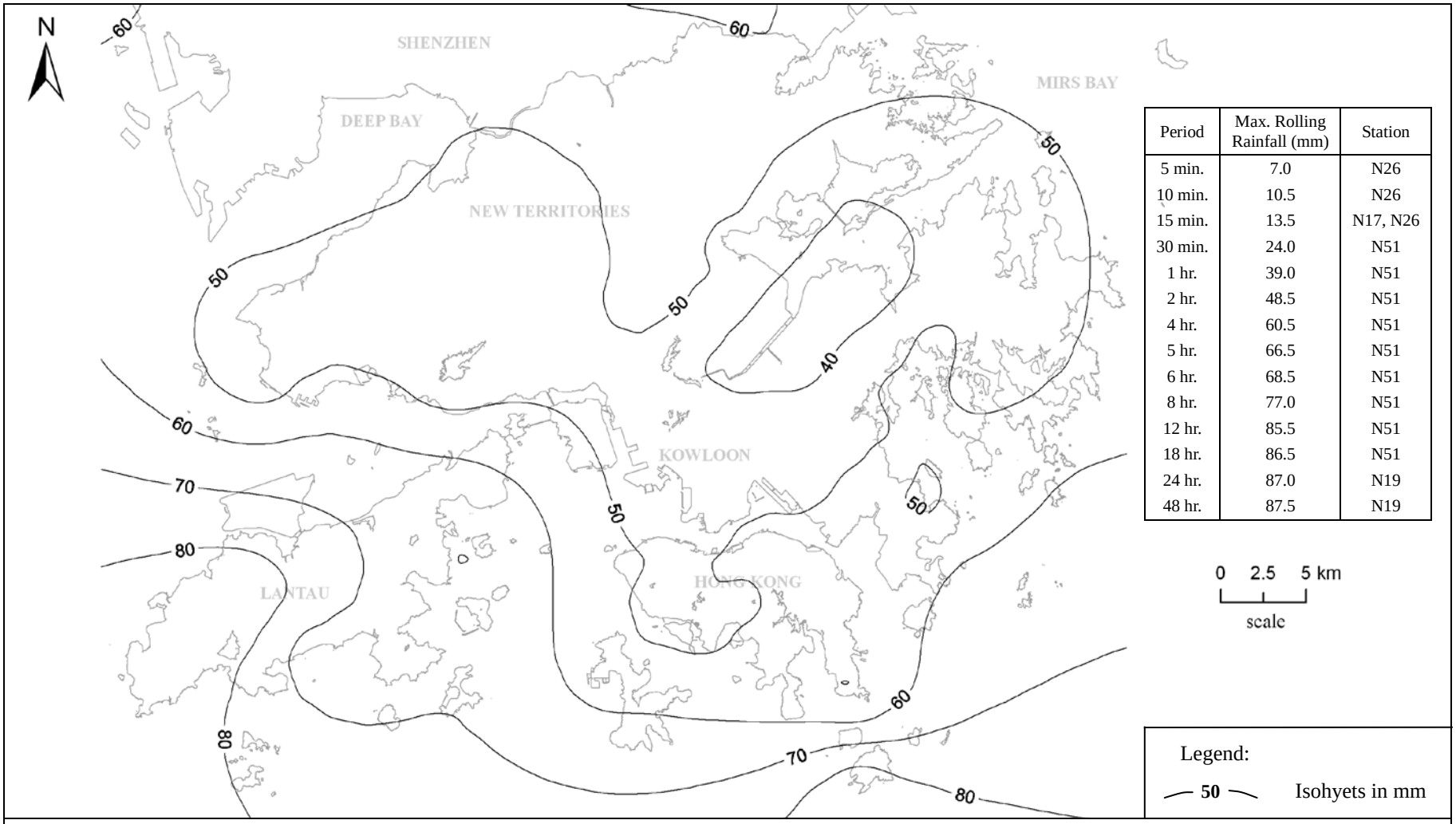
Period	Max. Rolling Rainfall (mm)	Station
5 min	10.0	N50
10 min	12.0	K04, N50
15 min	16.0	K04
30 min	27.0	H01
1 hr	45.0	H01
2 hr	60.5	K04
4 hr	72.0	H01
5 hr	73.0	H01
6 hr	75.5	H01
8 hr	86.5	H01
12 hr	98.5	H12
18 hr	117.5	H12
24 hr	117.5	H12
48 hr	119.0	H12

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) A genuine landslide reported to have occurred within the period between 7 February and 8 February 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

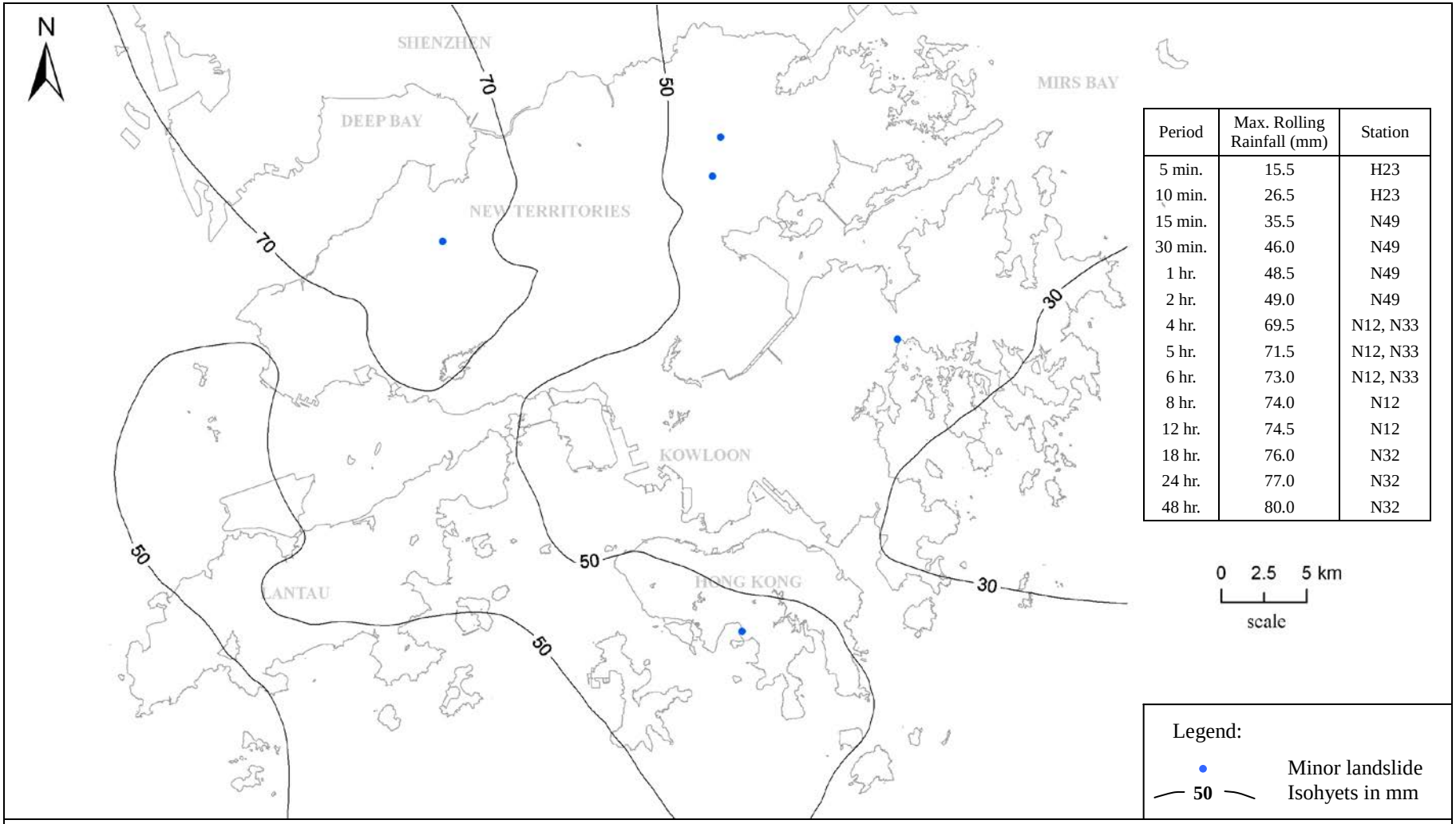
Figure A1 Maximum Rolling 24-hour Rainfall Distribution for the Period between 7 February (00:00) and 8 February 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	7.0	N26
10 min.	10.5	N26
15 min.	13.5	N17, N26
30 min.	24.0	N51
1 hr.	39.0	N51
2 hr.	48.5	N51
4 hr.	60.5	N51
5 hr.	66.5	N51
6 hr.	68.5	N51
8 hr.	77.0	N51
12 hr.	85.5	N51
18 hr.	86.5	N51
24 hr.	87.0	N19
48 hr.	87.5	N19

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) No genuine landslide was reported to have occurred within the period between 29 April and 30 April 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

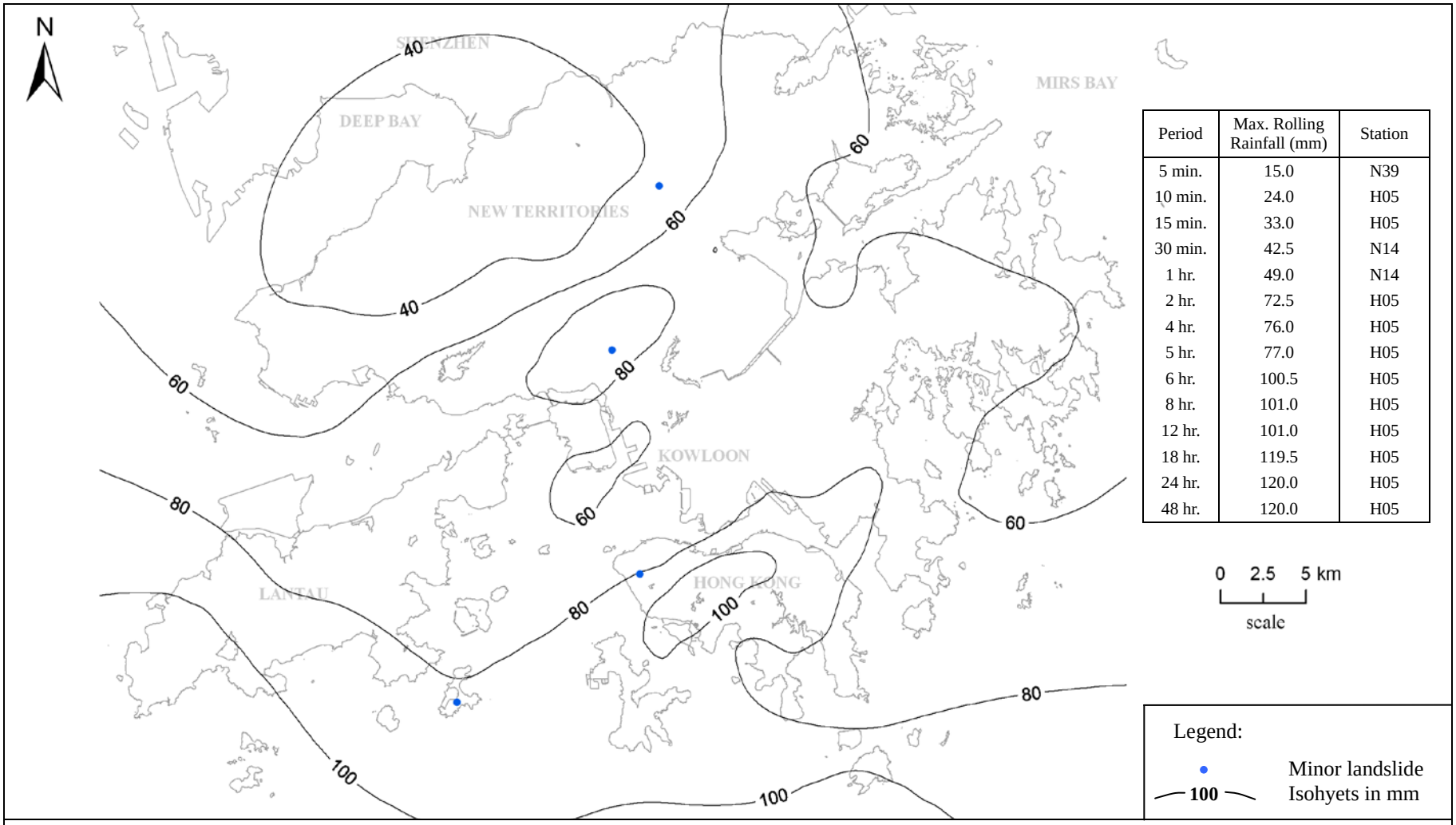
Figure A2 Maximum Rolling 24-hour Rainfall Distribution for the Period between 29 April (00:00) and 30 April 2010 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	15.5	H23
10 min.	26.5	H23
15 min.	35.5	N49
30 min.	46.0	N49
1 hr.	48.5	N49
2 hr.	49.0	N49
4 hr.	69.5	N12, N33
5 hr.	71.5	N12, N33
6 hr.	73.0	N12, N33
8 hr.	74.0	N12
12 hr.	74.5	N12
18 hr.	76.0	N32
24 hr.	77.0	N32
48 hr.	80.0	N32

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Five genuine landslides reported to have occurred within the period between 7 May and 10 May 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

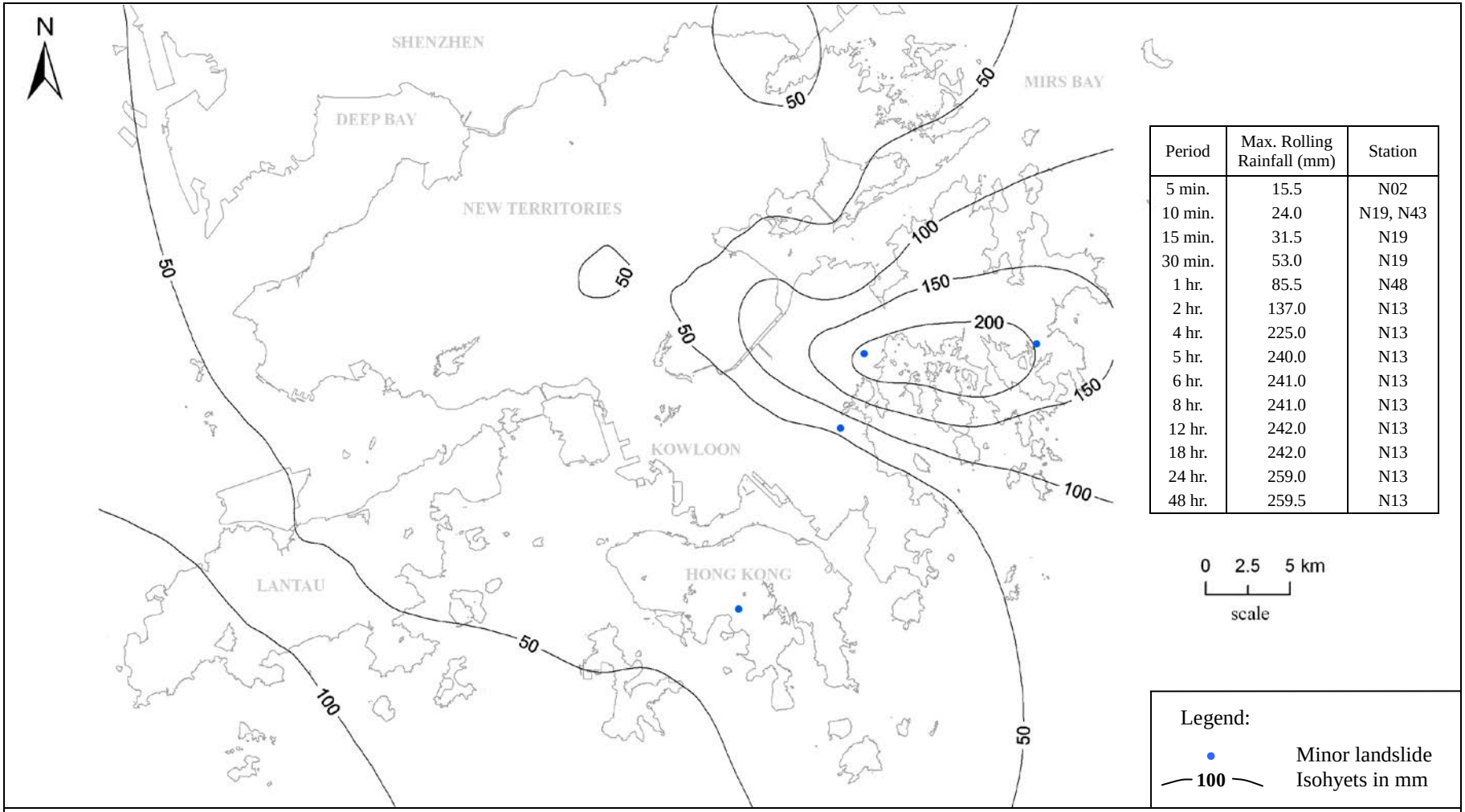
Figure A3 Maximum Rolling 24-hour Rainfall Distribution for the Period between 7 May (00:00) and 10 May 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	15.0	N39
10 min.	24.0	H05
15 min.	33.0	H05
30 min.	42.5	N14
1 hr.	49.0	N14
2 hr.	72.5	H05
4 hr.	76.0	H05
5 hr.	77.0	H05
6 hr.	100.5	H05
8 hr.	101.0	H05
12 hr.	101.0	H05
18 hr.	119.5	H05
24 hr.	120.0	H05
48 hr.	120.0	H05

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Four genuine landslides reported to have occurred within the period between 19 May and 21 May 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

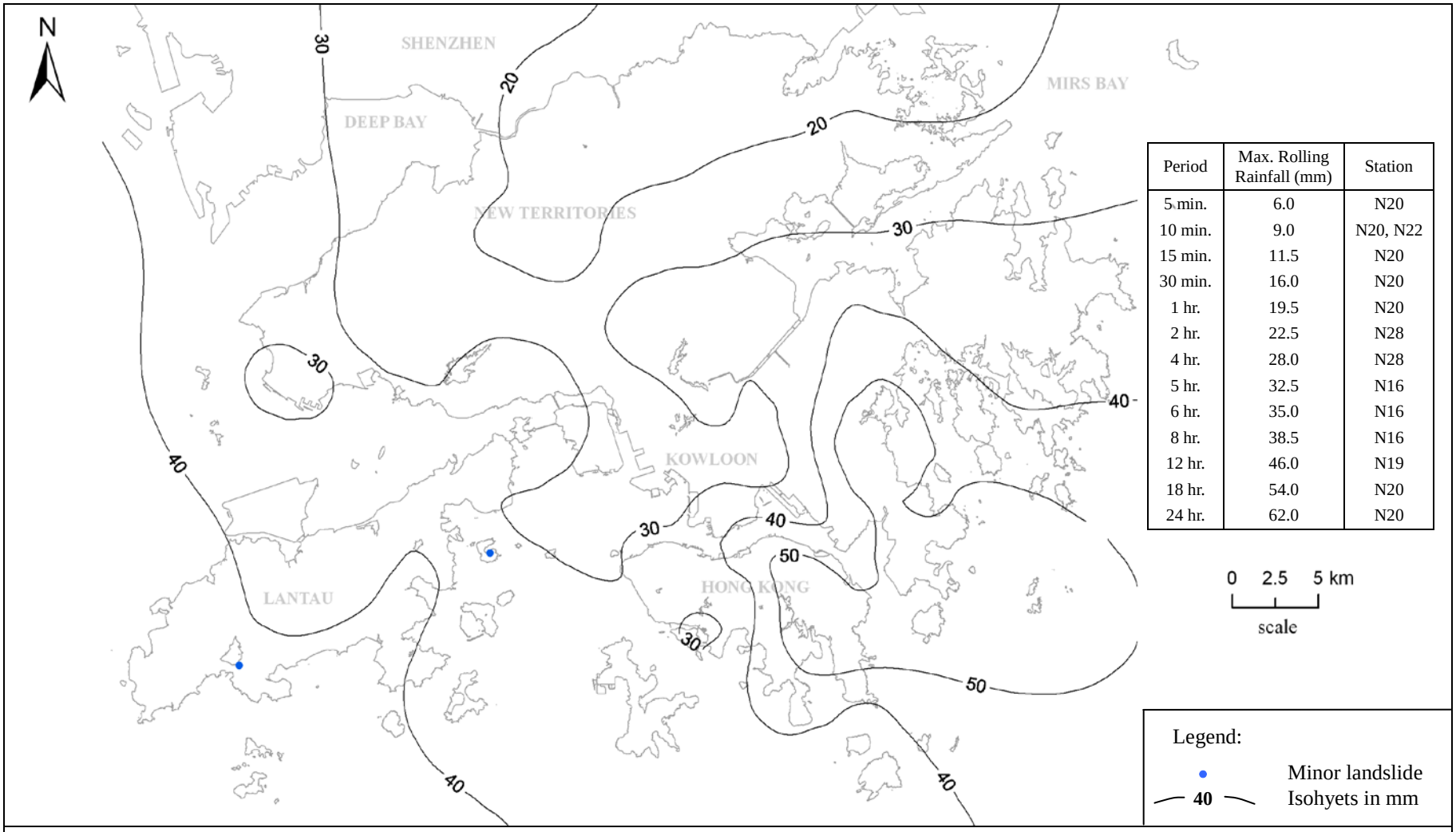
Figure A4 Maximum Rolling 24-hour Rainfall Distribution for the Period between 19 May (00:00) and 21 May 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	15.5	N02
10 min.	24.0	N19, N43
15 min.	31.5	N19
30 min.	53.0	N19
1 hr.	85.5	N48
2 hr.	137.0	N13
4 hr.	225.0	N13
5 hr.	240.0	N13
6 hr.	241.0	N13
8 hr.	241.0	N13
12 hr.	242.0	N13
18 hr.	242.0	N13
24 hr.	259.0	N13
48 hr.	259.5	N13

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Four genuine landslides reported to have occurred within the period between 29 May and 31 May 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

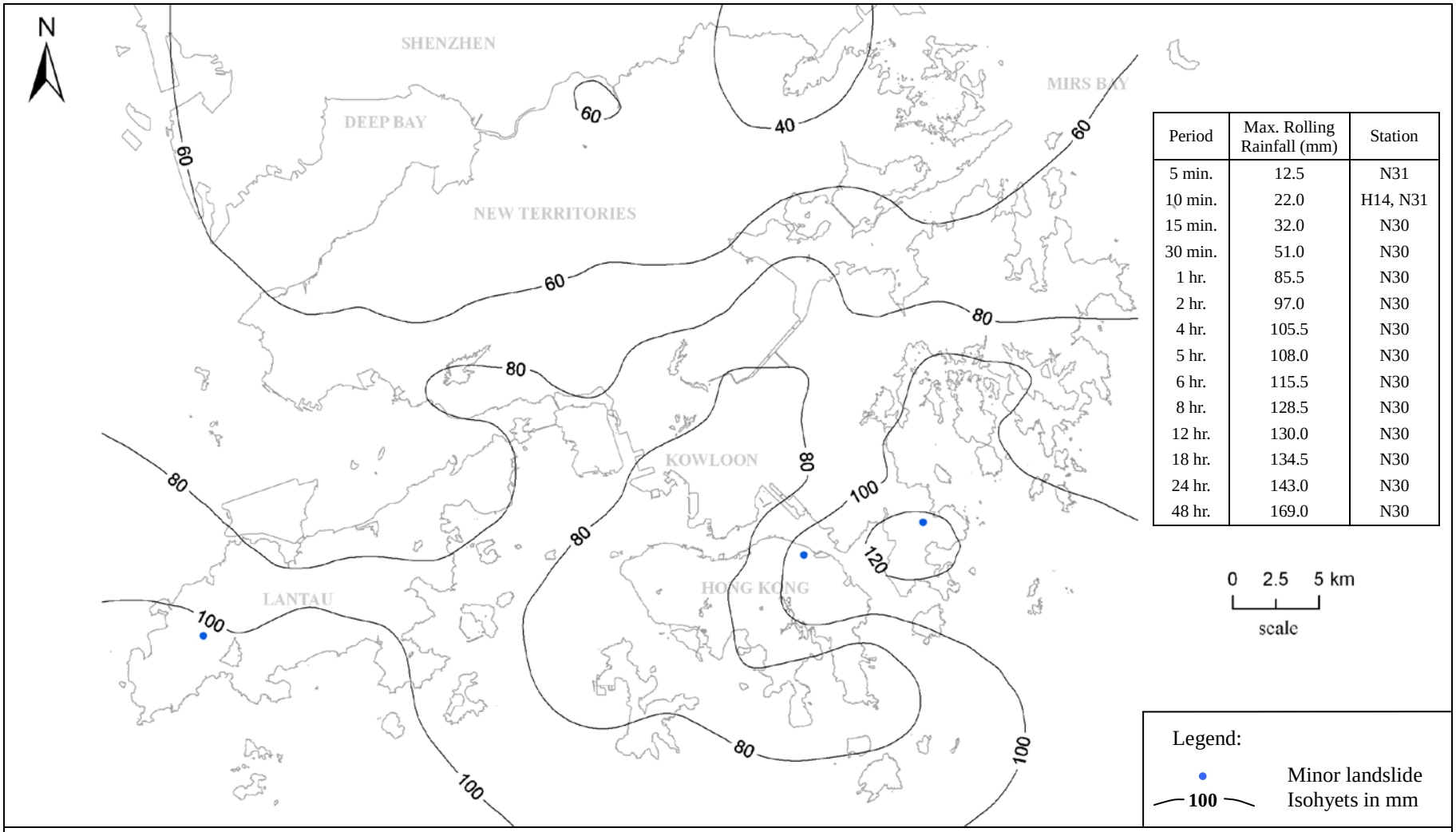
Figure A5 Maximum Rolling 24-hour Rainfall Distribution for the Period between 29 May (00:00) and 31 May 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	6.0	N20
10 min.	9.0	N20, N22
15 min.	11.5	N20
30 min.	16.0	N20
1 hr.	19.5	N20
2 hr.	22.5	N28
4 hr.	28.0	N28
5 hr.	32.5	N16
6 hr.	35.0	N16
8 hr.	38.5	N16
12 hr.	46.0	N19
18 hr.	54.0	N20
24 hr.	62.0	N20

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Two genuine landslides reported to have occurred within the period between 2 June and 3 June 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

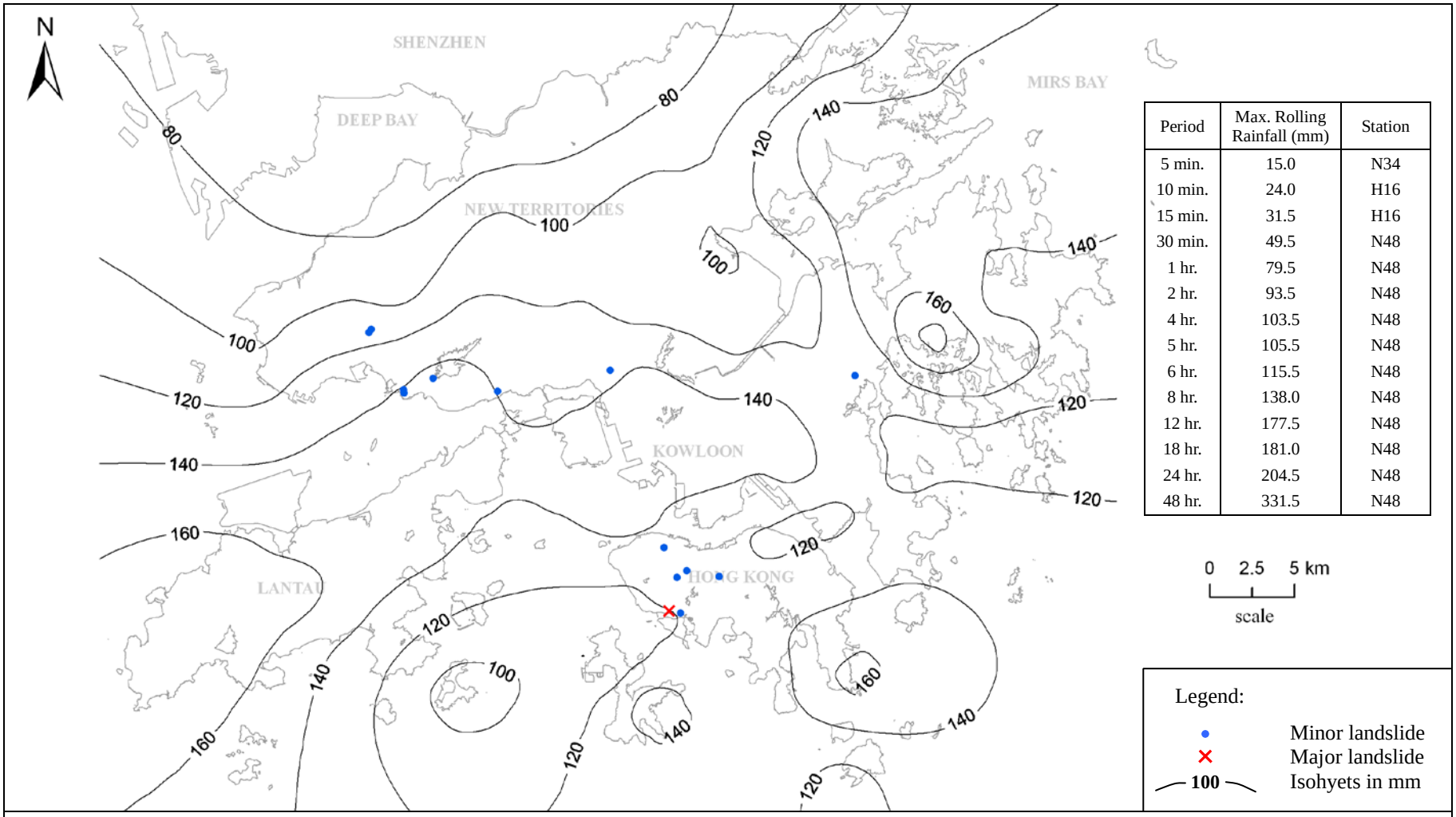
Figure A6 Maximum Rolling 24-hour Rainfall Distribution for the Period between 2 June (00:00) and 3 June 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	12.5	N31
10 min.	22.0	H14, N31
15 min.	32.0	N30
30 min.	51.0	N30
1 hr.	85.5	N30
2 hr.	97.0	N30
4 hr.	105.5	N30
5 hr.	108.0	N30
6 hr.	115.5	N30
8 hr.	128.5	N30
12 hr.	130.0	N30
18 hr.	134.5	N30
24 hr.	143.0	N30
48 hr.	169.0	N30

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Three genuine landslides reported to have occurred within the period between 9 June and 11 June 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

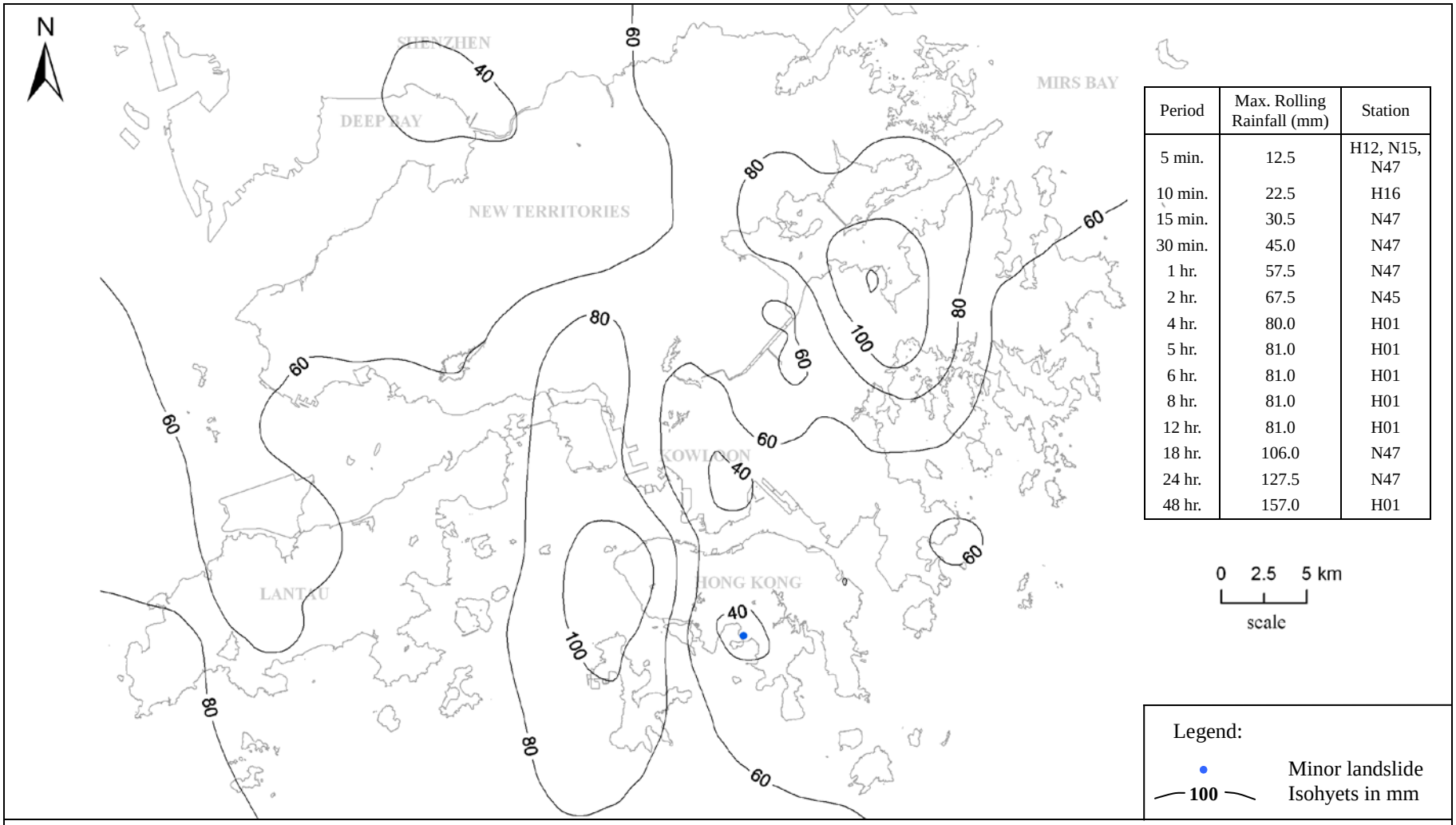
Figure A7 Maximum Rolling 24-hour Rainfall Distribution for the Period between 9 June (00:00) and 11 June 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	15.0	N34
10 min.	24.0	H16
15 min.	31.5	H16
30 min.	49.5	N48
1 hr.	79.5	N48
2 hr.	93.5	N48
4 hr.	103.5	N48
5 hr.	105.5	N48
6 hr.	115.5	N48
8 hr.	138.0	N48
12 hr.	177.5	N48
18 hr.	181.0	N48
24 hr.	204.5	N48
48 hr.	331.5	N48

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Fourteen genuine landslides reported to have occurred within the period between 23 June and 29 June 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

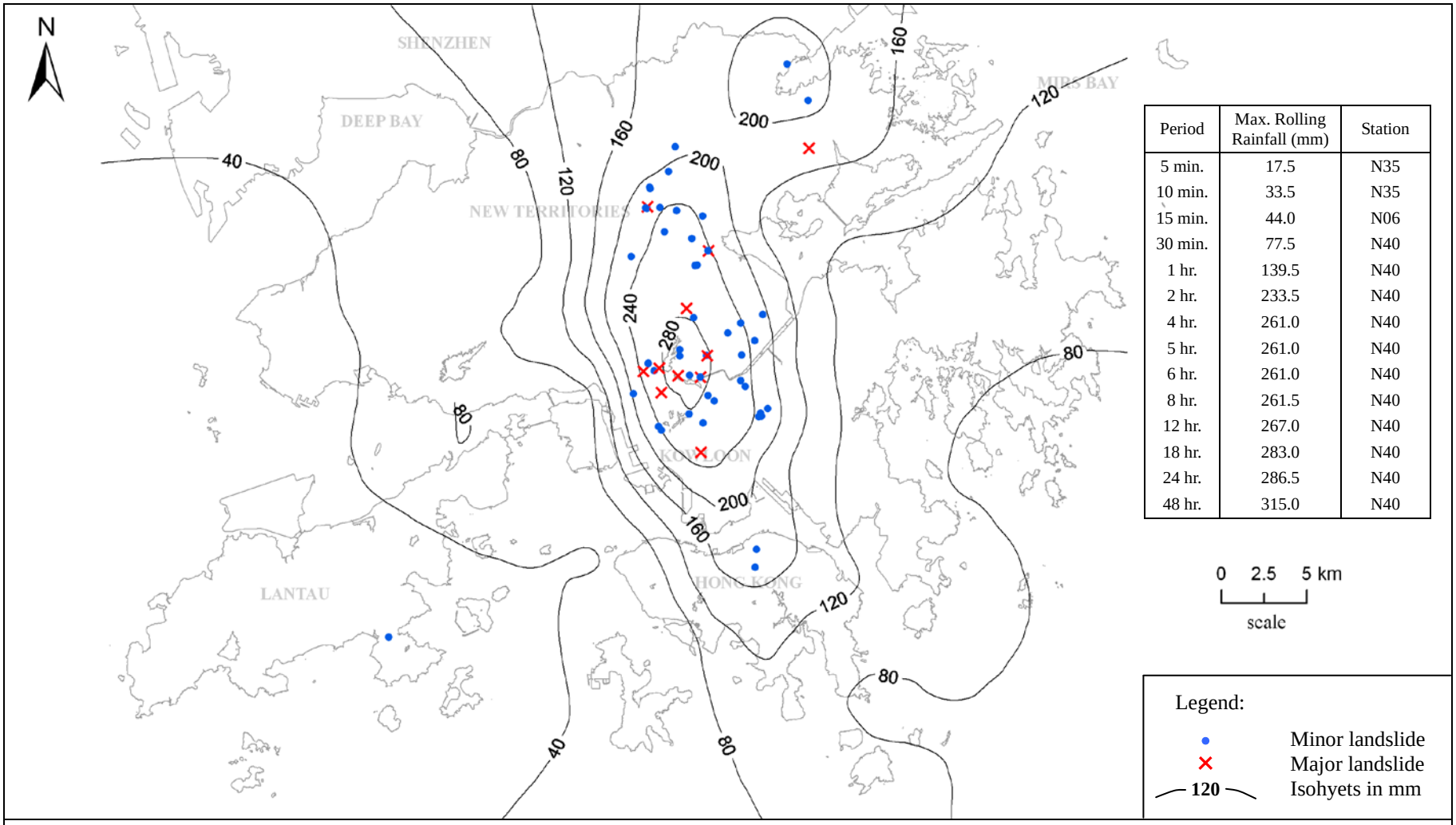
Figure A8 Maximum Rolling 24-hour Rainfall Distribution for the Period between 23 June (00:00) and 29 June 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	12.5	H12, N15, N47
10 min.	22.5	H16
15 min.	30.5	N47
30 min.	45.0	N47
1 hr.	57.5	N47
2 hr.	67.5	N45
4 hr.	80.0	H01
5 hr.	81.0	H01
6 hr.	81.0	H01
8 hr.	81.0	H01
12 hr.	81.0	H01
18 hr.	106.0	N47
24 hr.	127.5	N47
48 hr.	157.0	H01

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) A genuine landslide reported to have occurred within the period between 16 July and 18 July 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

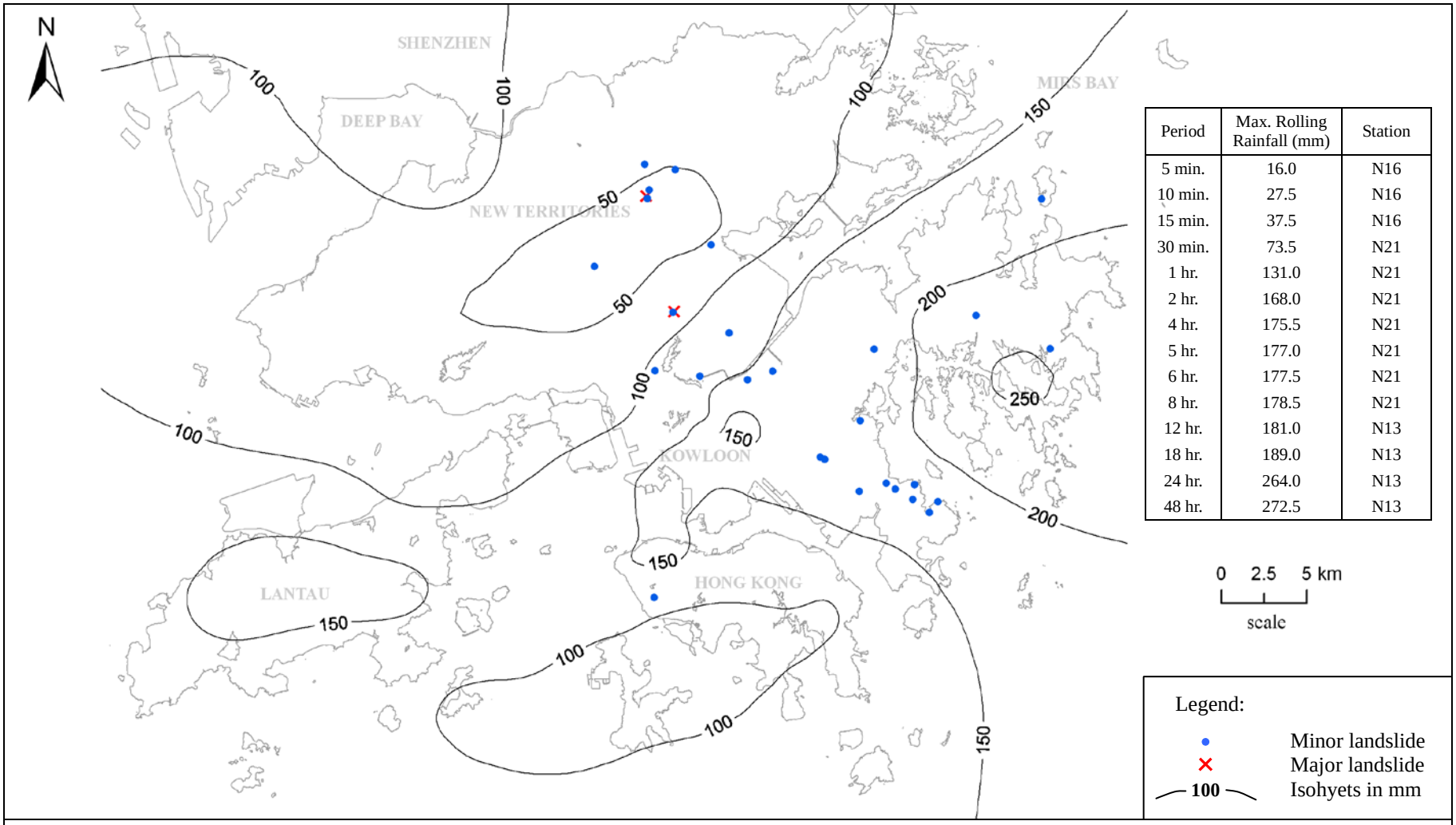
Figure A9 Maximum Rolling 24-hour Rainfall Distribution for the Period between 16 July (00:00) and 18 July 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	17.5	N35
10 min.	33.5	N35
15 min.	44.0	N06
30 min.	77.5	N40
1 hr.	139.5	N40
2 hr.	233.5	N40
4 hr.	261.0	N40
5 hr.	261.0	N40
6 hr.	261.0	N40
8 hr.	261.5	N40
12 hr.	267.0	N40
18 hr.	283.0	N40
24 hr.	286.5	N40
48 hr.	315.0	N40

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Fifty-eight genuine landslides reported to have occurred within the period between 21 July and 25 July 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

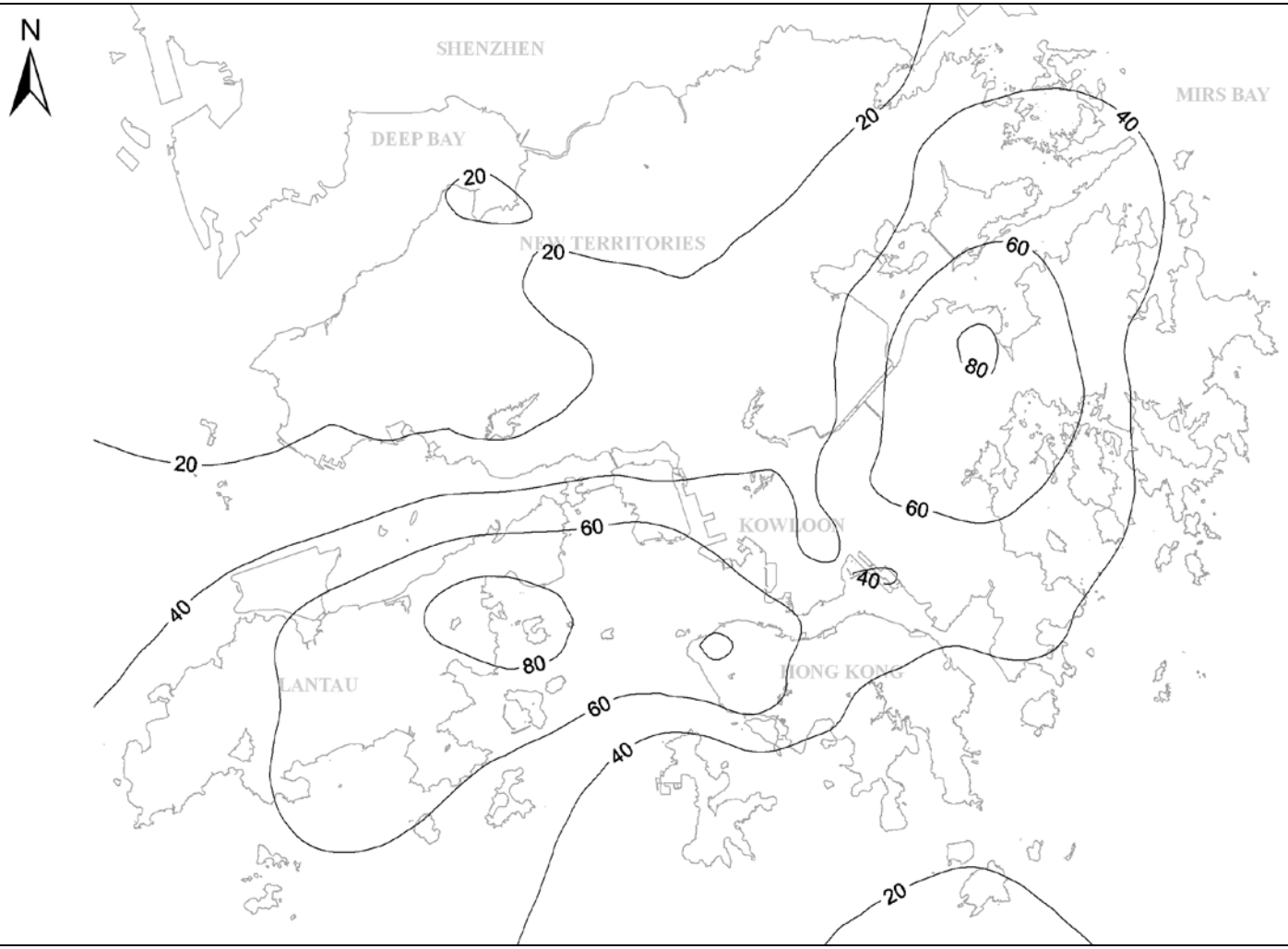
Figure A10 Maximum Rolling 24-hour Rainfall Distribution for the Period between 21 July (00:00) and 25 July 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	16.0	N16
10 min.	27.5	N16
15 min.	37.5	N16
30 min.	73.5	N21
1 hr.	131.0	N21
2 hr.	168.0	N21
4 hr.	175.5	N21
5 hr.	177.0	N21
6 hr.	177.5	N21
8 hr.	178.5	N21
12 hr.	181.0	N13
18 hr.	189.0	N13
24 hr.	264.0	N13
48 hr.	272.5	N13

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Twenty-nine genuine landslides reported to have occurred within the period between 27 July and 29 July 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

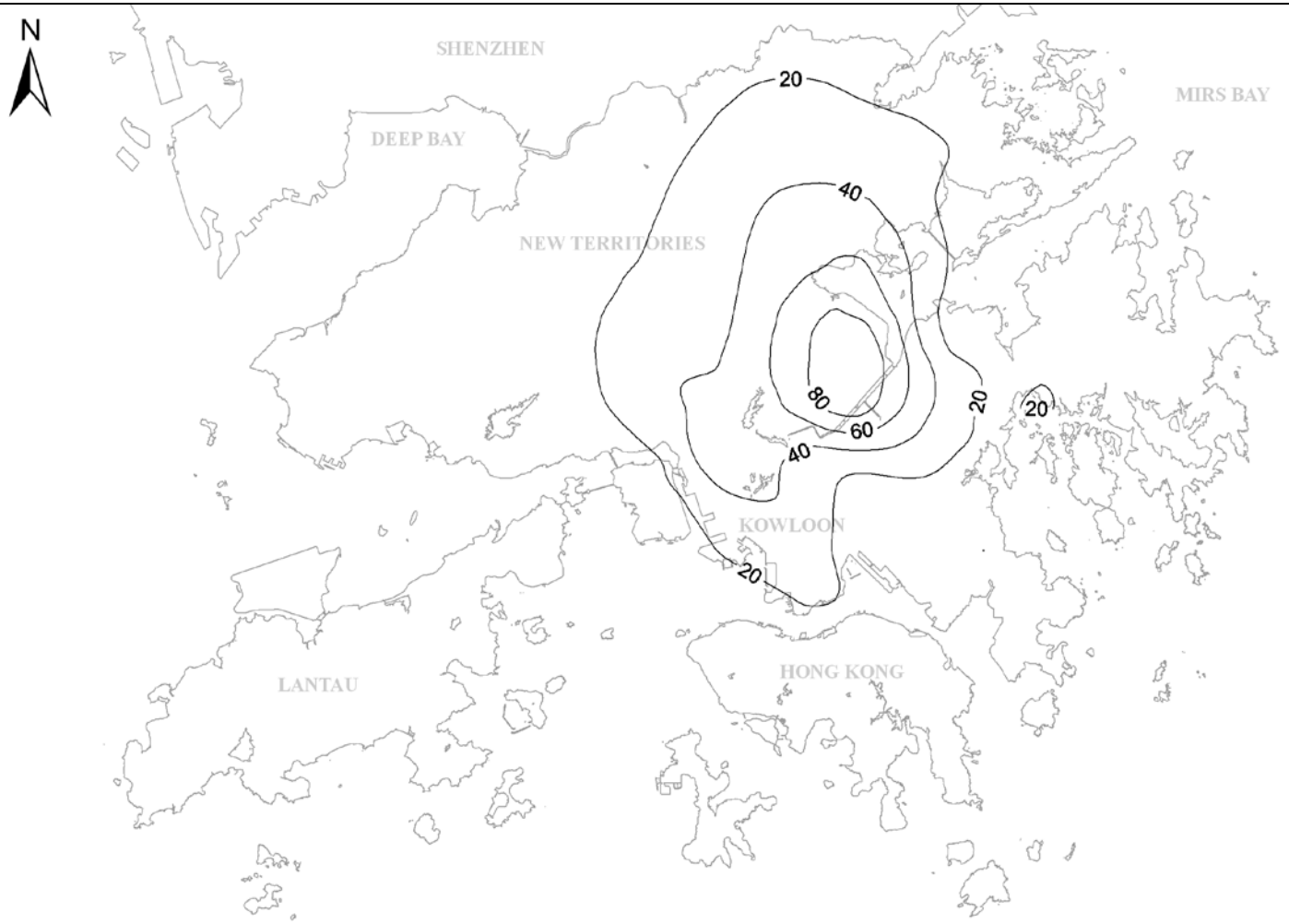
Figure A11 Maximum Rolling 24-hour Rainfall Distribution for the Period between 27 July (00:00) and 29 July 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	12.5	N43, N44
10 min.	23.0	N43, N44
15 min.	33.0	N43
30 min.	54.5	N47
1 hr.	78.0	N47
2 hr.	81.5	N25
4 hr.	93.0	H02
5 hr.	93.0	H02
6 hr.	93.0	H02
8 hr.	93.0	H02
12 hr.	93.5	H02
18 hr.	93.5	H02
24 hr.	93.5	H02
48 hr.	98.0	H12

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) No genuine landslide was reported to have occurred within the period between 5 August and 8 August 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

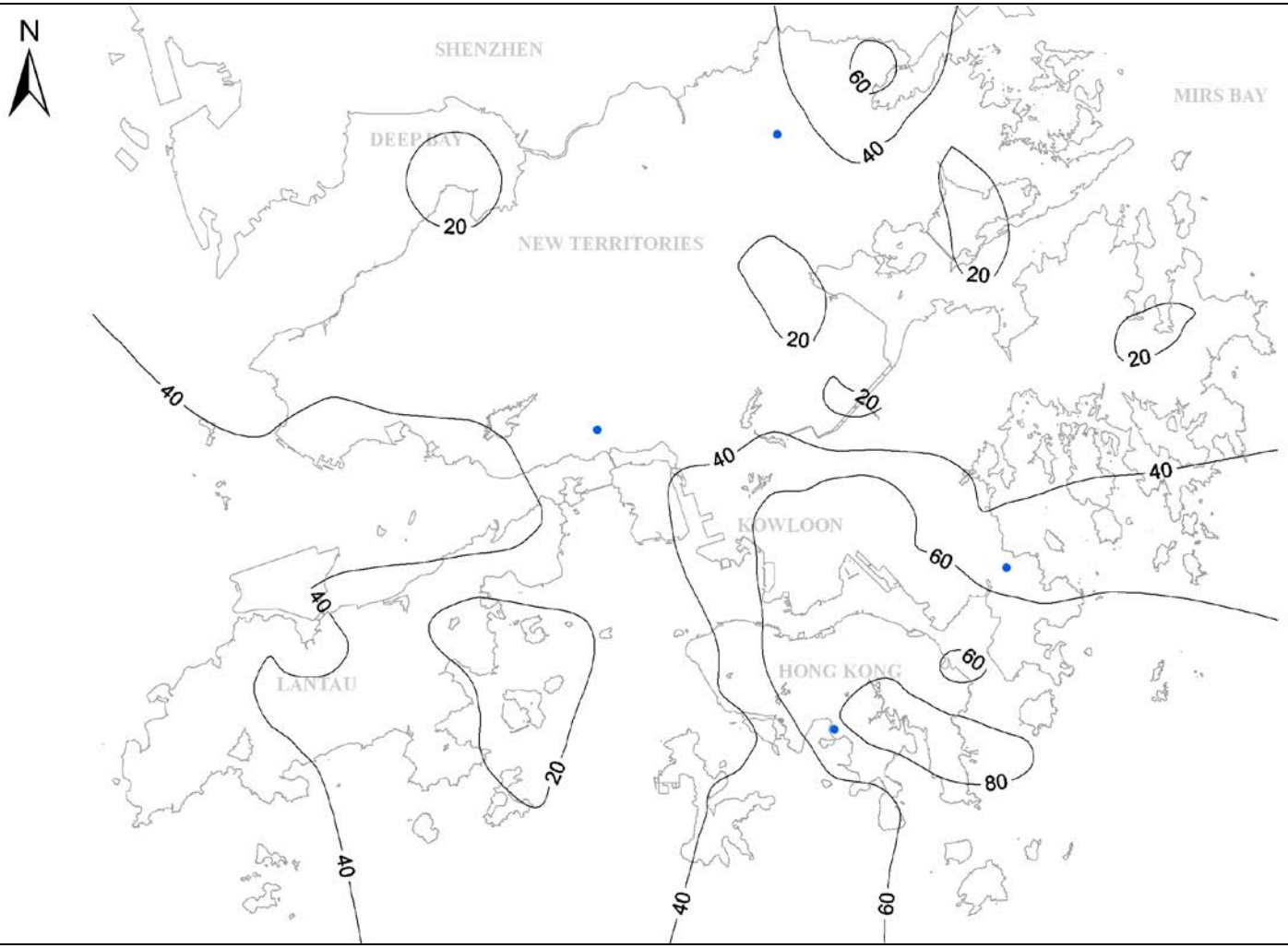
Figure A12 Maximum Rolling 24-hour Rainfall Distribution for the Period between 5 August (00:00) and 8 August 2010 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	11.5	N09
10 min.	20.0	N09
15 min.	25.0	N09
30 min.	35.5	N02
1 hr.	61.0	N02
2 hr.	79.5	N02
4 hr.	92.0	N02
5 hr.	104.5	N02
6 hr.	104.5	N02
8 hr.	104.5	N02
12 hr.	104.5	N02
18 hr.	104.5	N02
24 hr.	104.5	N02
48 hr.	125.5	N02

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) No genuine landslide was reported to have occurred within the period between 11 August and 12 August 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

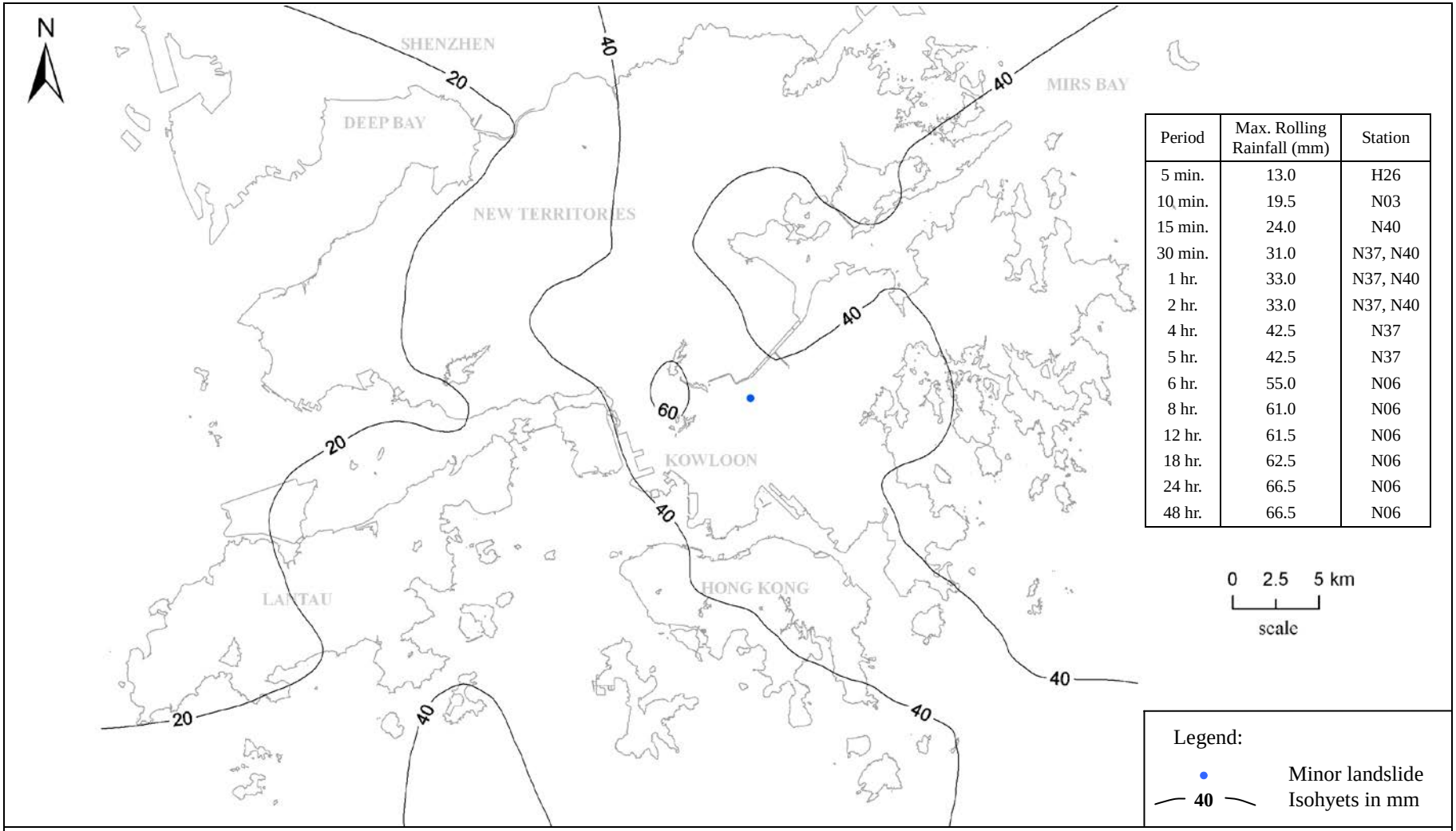
Figure A13 Maximum Rolling 24-hour Rainfall Distribution for the Period between 11 August (00:00) and 12 August 2010 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	15.5	N19
10 min.	27.0	N19
15 min.	32.5	N19
30 min.	37.5	N24
1 hr.	42.5	N24
2 hr.	62.5	K08
4 hr.	62.5	K08
5 hr.	62.5	K08
6 hr.	63.0	K08
8 hr.	63.0	K08
12 hr.	75.5	H26
18 hr.	79.0	H26
24 hr.	100.0	H26
48 hr.	109.0	H28

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Four genuine landslides reported to have occurred within the period between 16 August and 21 August 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

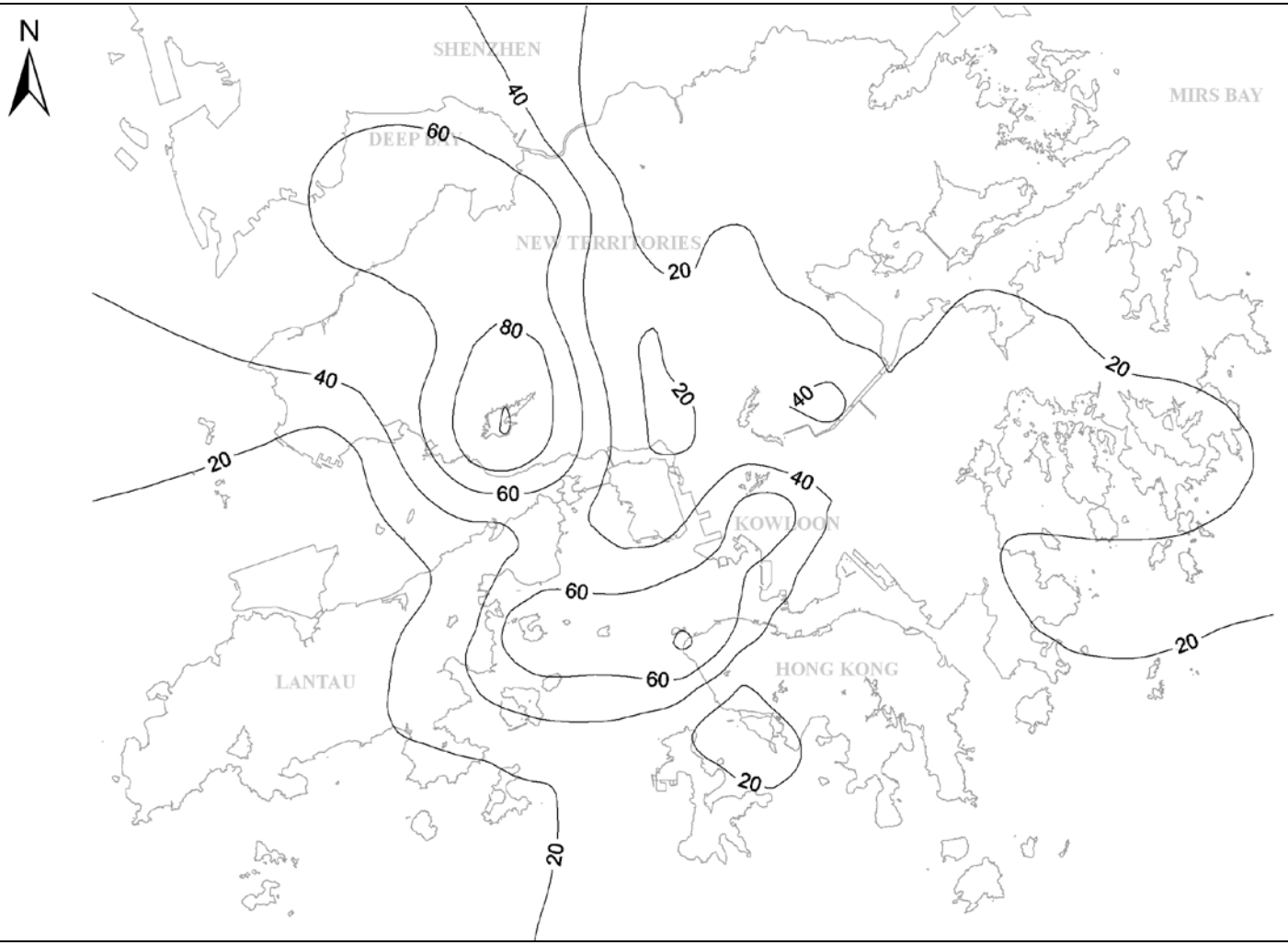
Figure A14 Maximum Rolling 24-hour Rainfall Distribution for the Period between 16 August (00:00) and 21 August 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	13.0	H26
10 min.	19.5	N03
15 min.	24.0	N40
30 min.	31.0	N37, N40
1 hr.	33.0	N37, N40
2 hr.	33.0	N37, N40
4 hr.	42.5	N37
5 hr.	42.5	N37
6 hr.	55.0	N06
8 hr.	61.0	N06
12 hr.	61.5	N06
18 hr.	62.5	N06
24 hr.	66.5	N06
48 hr.	66.5	N06

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) A genuine landslide reported to have occurred within the period between 23 August and 24 August 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

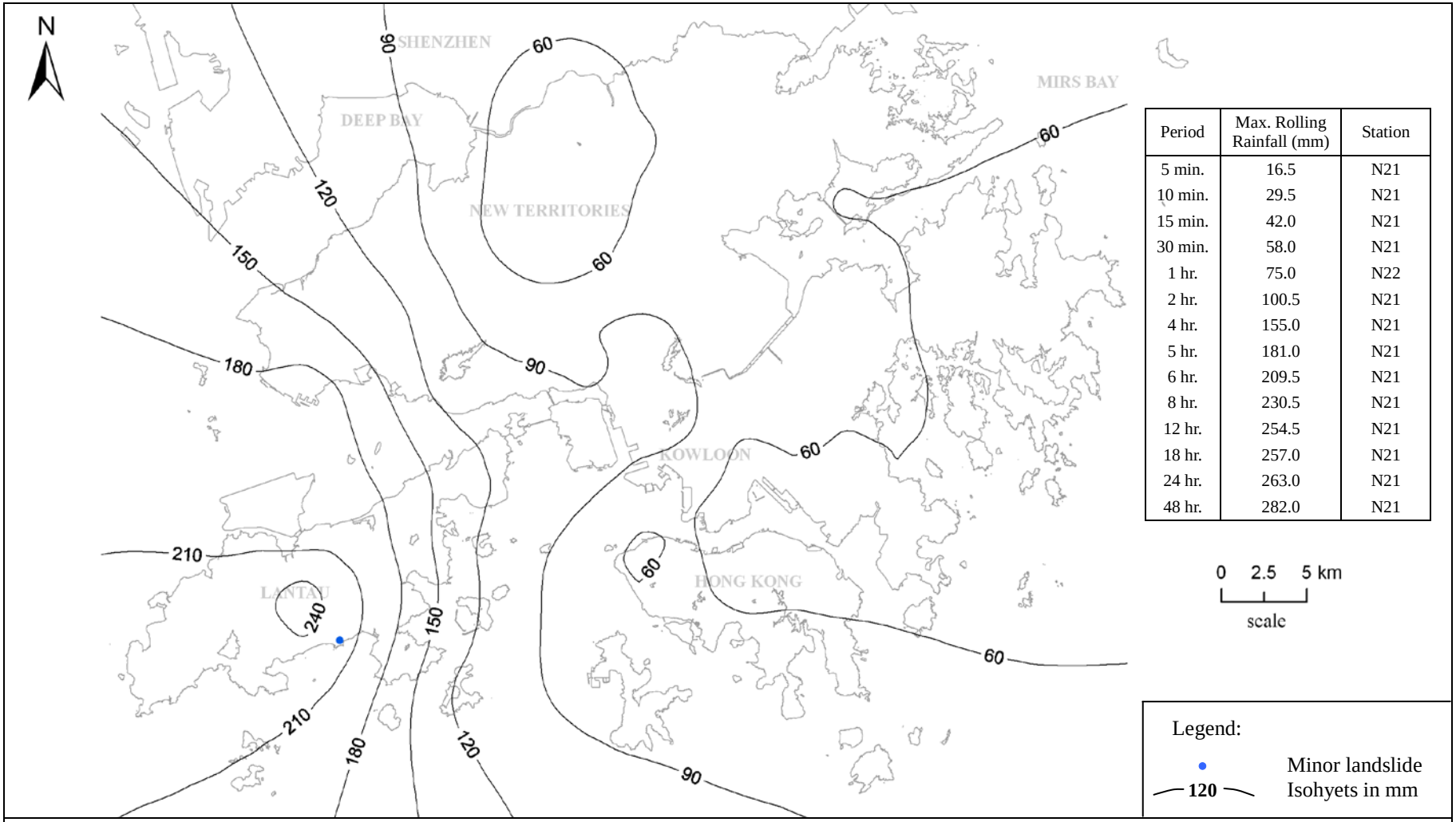
Figure A15 Maximum Rolling 24-hour Rainfall Distribution for the Period between 23 August (00:00) and 24 August 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	16.5	N32
10 min.	29.5	N32
15 min.	40.0	N32
30 min.	69.5	N32
1 hr.	97.0	N31
2 hr.	105.5	N31
4 hr.	106.0	N31
5 hr.	106.0	N31
6 hr.	106.0	N31
8 hr.	106.0	N31
12 hr.	106.0	N31
18 hr.	106.0	N31
24 hr.	106.0	N31
48 hr.	106.0	N31

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) No genuine landslide was reported to have occurred within the period between 26 August and 29 August 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

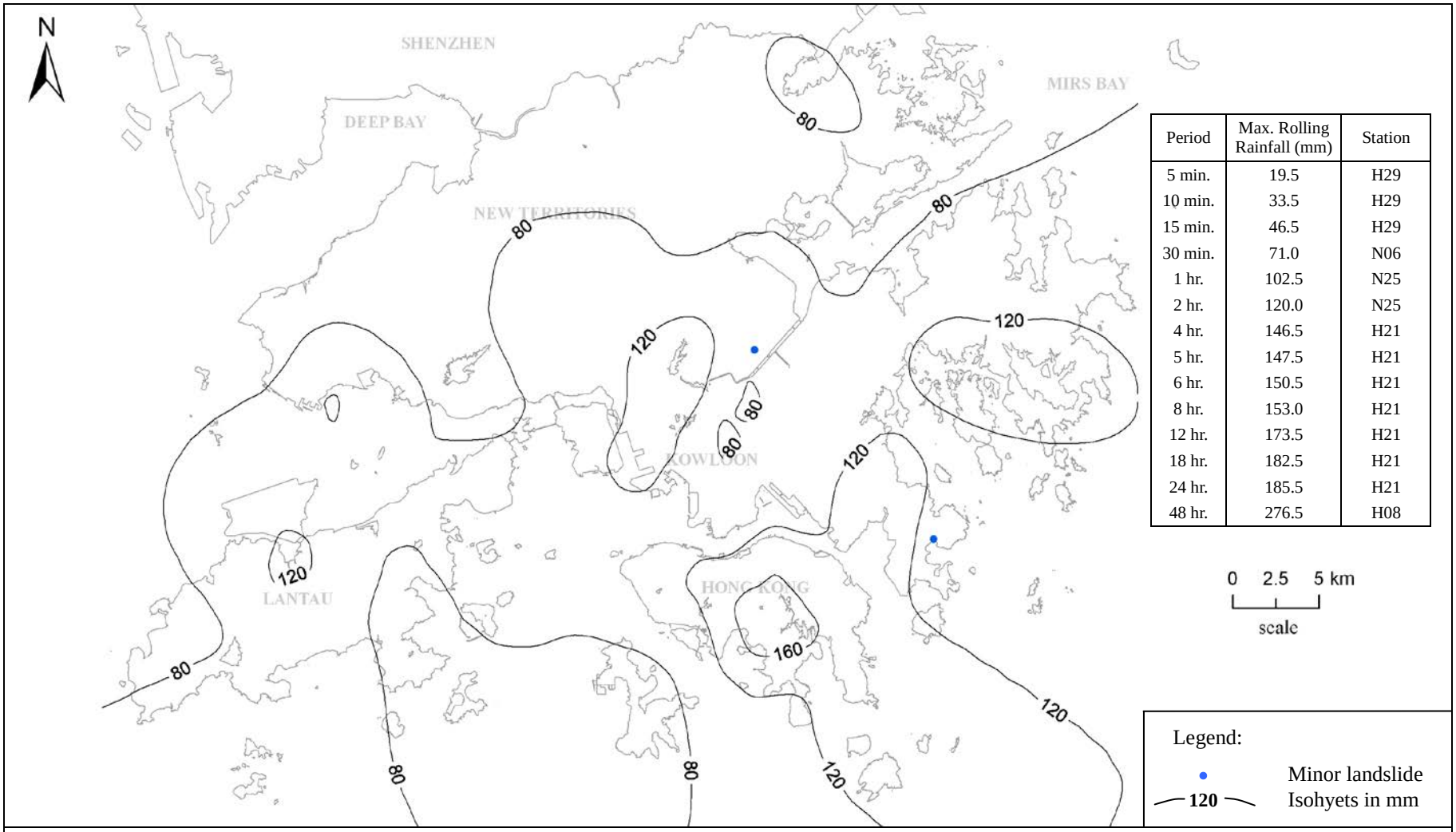
Figure A16 Maximum Rolling 24-hour Rainfall Distribution for the Period between 26 August (00:00) and 29 August 2010 (24:00)



Period	Max. Rolling Rainfall (mm)	Station
5 min.	16.5	N21
10 min.	29.5	N21
15 min.	42.0	N21
30 min.	58.0	N21
1 hr.	75.0	N22
2 hr.	100.5	N21
4 hr.	155.0	N21
5 hr.	181.0	N21
6 hr.	209.5	N21
8 hr.	230.5	N21
12 hr.	254.5	N21
18 hr.	257.0	N21
24 hr.	263.0	N21
48 hr.	282.0	N21

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) A genuine landslide reported to have occurred within the period between 3 September and 6 September 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

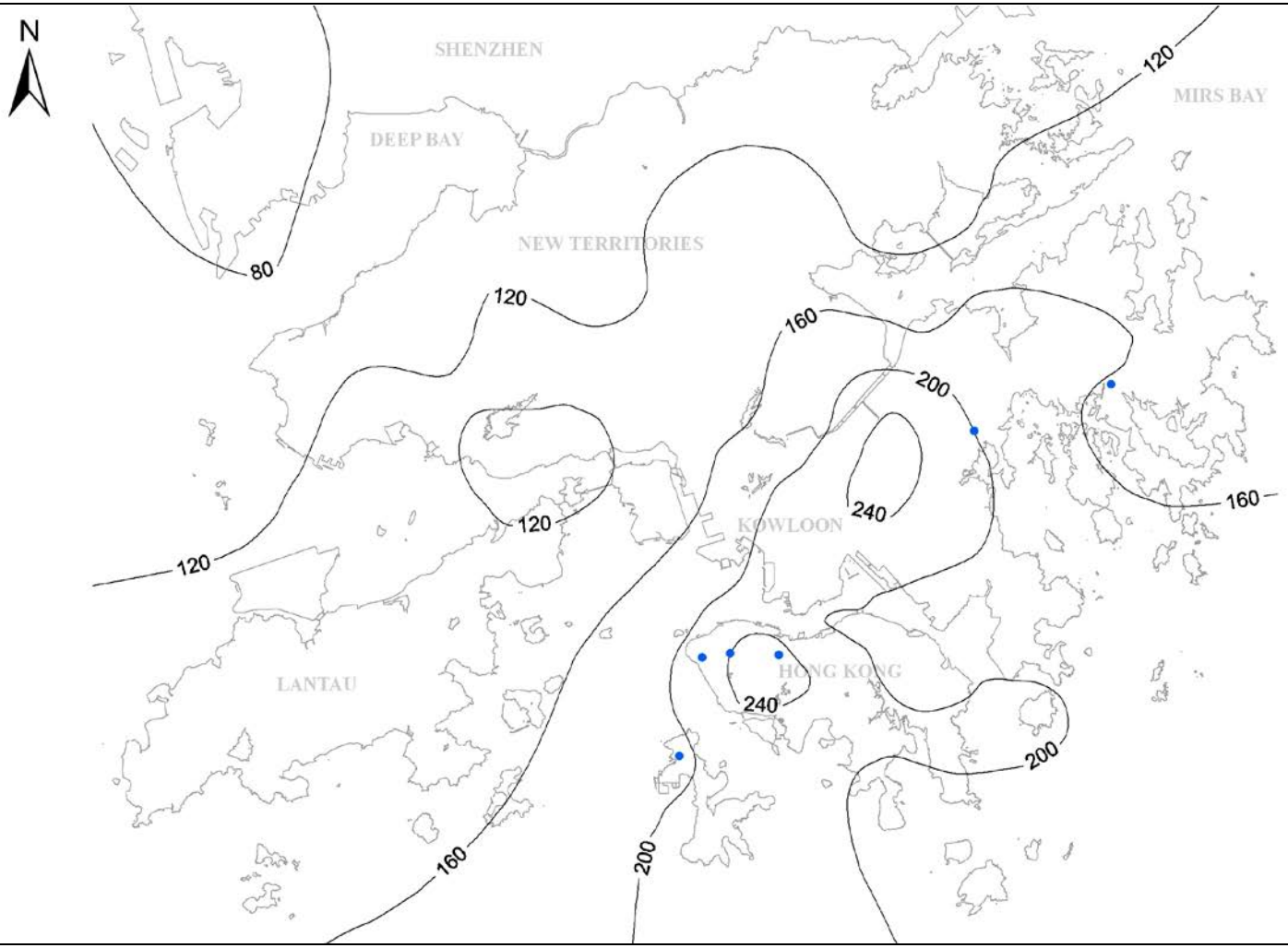
Figure A17 Maximum Rolling 24-hour Rainfall Distribution for the Period between 3 September (00:00) and 6 September 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	19.5	H29
10 min.	33.5	H29
15 min.	46.5	H29
30 min.	71.0	N06
1 hr.	102.5	N25
2 hr.	120.0	N25
4 hr.	146.5	H21
5 hr.	147.5	H21
6 hr.	150.5	H21
8 hr.	153.0	H21
12 hr.	173.5	H21
18 hr.	182.5	H21
24 hr.	185.5	H21
48 hr.	276.5	H08

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Two genuine landslides reported to have occurred within the period between 8 September and 13 September 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

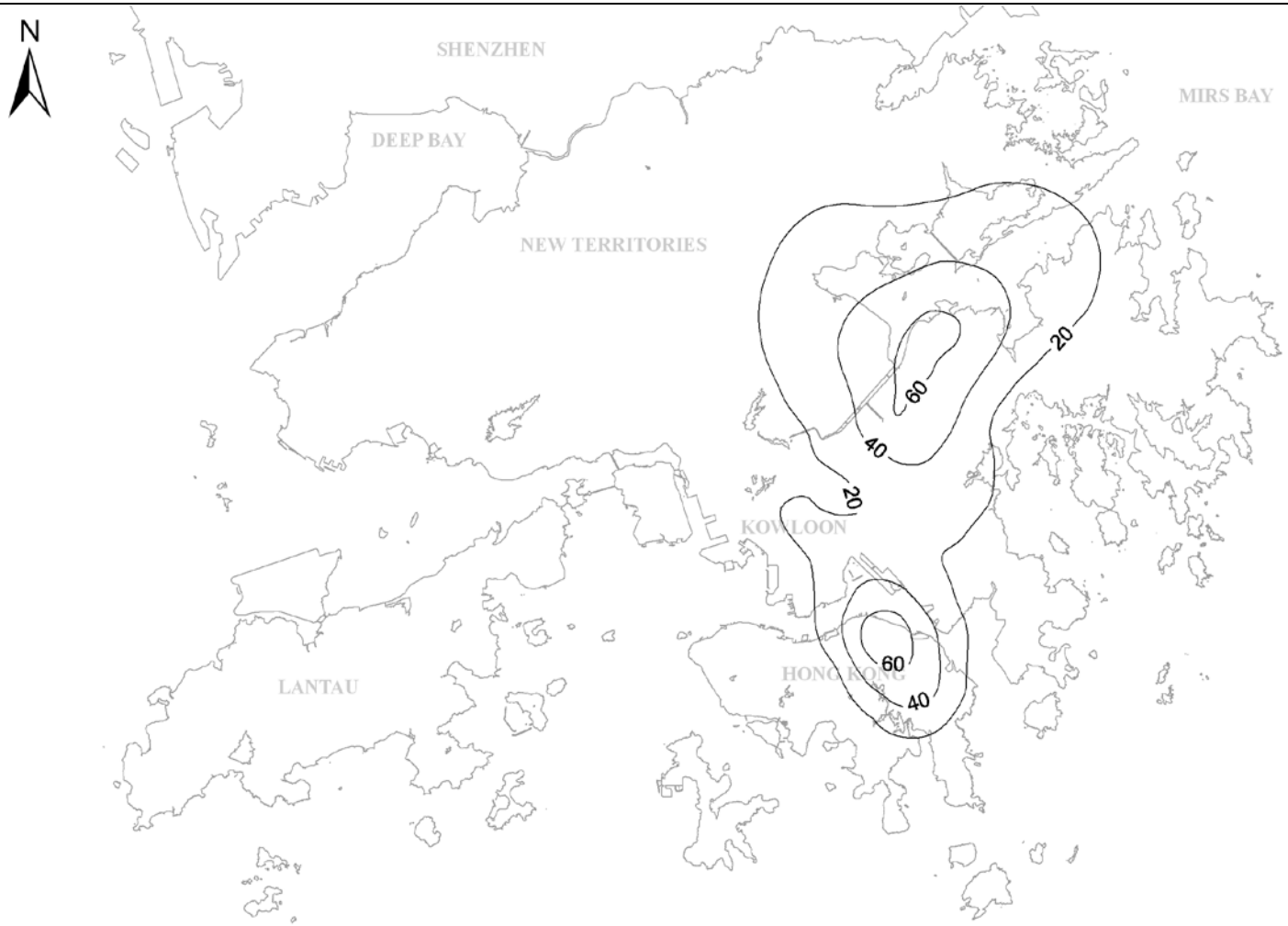
Figure A18 Maximum Rolling 24-hour Rainfall Distribution for the Period between 8 September (00:00) and 13 September 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	13.0	H16, H20, N07
10 min.	24.5	H16
15 min.	33.5	N23
30 min.	56.5	N23
1 hr.	82.0	H12
2 hr.	128.0	H10, H16
4 hr.	143.0	H16
5 hr.	148.0	H16
6 hr.	151.5	H16
8 hr.	183.5	N43
12 hr.	226.0	H16
18 hr.	242.5	H12
24 hr.	270.5	H16
48 hr.	304.5	H16

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) Six genuine landslides reported to have occurred within the period between 20 September and 22 September 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A19 Maximum Rolling 24-hour Rainfall Distribution for the Period between 20 September (00:00) and 22 September 2010 (24:00) and Locations of Landslides



Period	Max. Rolling Rainfall (mm)	Station
5 min.	9.0	H18
10 min.	17.0	H18
15 min.	24.0	H18
30 min.	35.5	H18
1 hr.	44.5	H18
2 hr.	52.0	H18
4 hr.	58.5	H14
5 hr.	83.0	H18
6 hr.	87.5	H18
8 hr.	88.0	H18
12 hr.	88.0	H18
18 hr.	90.0	H18
24 hr.	93.0	H18
48 hr.	97.0	H18

Notes:
(1) Isohyets are based on the GEO and HKO raingauges.
(2) No genuine landslide was reported to have occurred within the period between 11 October and 12 October 2010.
(3) Please refer to Figure 2.1 for locations of raingauge stations.

Figure A20 Maximum Rolling 24-hour Rainfall Distribution for the Period between 11 October (00:00) and 12 October 2010 (24:00)

Appendix B

List of Landslide Incidents Reported to the Government

List of Tables

Table B1 List of Major Landslide Incidents

Incident No.	Location	Feature Registration No.	Failure			Facility Affected	Consequence
			Date (Time)	Feature Type	Scale (m^3)		
2010/06/0963	Section 78 Aberdeen Chinese Permanent Cemetery	11SW-C/C750	30/6 (00:15)	Soil cut	50	Others (Cemetery)	
2010/07/0971	Opposite Block 2, Pak Tin Estate, Shek Kip Mei, Kowloon	11NW-B/FR5	22/7 (18:45)	Fill	150	Road and construction site	1 lane of Pak Wan Street temporarily closed
2010/07/0976	Between house Nos. 62 and 52, Tin Sum Pak Tin Tsuen, Shatin	7SW-D/F314	22/7 (19:30)	Fill	100	Squatter dwelling and minor footpath	1 squatter dwelling voluntarily vacated. Minor footpath temporarily closed
2010/07/0977	Adjacent to slope No. 7SW-C/C131, opposite to Block 3 of Lei Muk Shue Estate, Tsuen Wan	Natural hillside	22/7 (20:36)	Natural hillside	390	Minor footpath	Minor footpath temporarily closed
2010/07/0982	Shek Lei Hang Village, Kwai Chung	7SW-C/C990	22/7	Soil cut	80	Squatter dwelling	-
2010/07/0984	South-east of slope No. 7SW-C/F275, Tsuen Wan	Natural hillside	22/7	Natural hillside	80	Minor footpath	-
2010/07/0987	Lower Shing Mun Road	Natural hillside	23/7	Natural hillside	120	Access road	Access road temporarily closed
2010/07/0995	House No. 123, Pak Tin Area, Shatin	7SW-B/C556	23/7	Soil/rock cut	75	Open area	-
2010/08/1037	Near feature No. 3SW-C/C870 at Wo Hop Shek Cemetery	Natural hillside	27/7 (09:00)	Natural hillside	105	Minor footpath	-
2010/11/1078	Below Kwun Yum Temple, Wong Tai Sin	Natural hillside	Unknown	Natural hillside	80	Minor footpath	-
2010/12/1083	Country Trail at Ngau Kwu Leng, Lam Tsuen, Tai Po	3SW-C/C536	22/7 (09:00)	Soil cut	200	Minor footpath	-
AFCD/2010/ 07/0005	Shing Mun Forest Track - Tai Shing Stream Section, Shing Mun Country Park	7NW-D/C287	22/7	Soil cut	90	Minor footpath	-
AFCD/2010/ 07/0006	Near Wang Shan Keuk Ha Tsuen, Pat Sin Leng Country Park	Natural hillside	22/7	Natural hillside	70	Minor footpath	-
AFCD/2010/ 07/0007	Shing Mun Forest Track - Tai Shing Stream Section, Shing Mun Country Park	Natural hillside	28/7	Natural hillside	80	Minor footpath	-
(Incident reported by DSD)	Adjoining Tai Po River to the south of Wan Tau Tong Estate, Tai Po	7NW-B/C183	22/7	Soil cut	200	Others (river)	-

Table B2 List of Landslide Incidents in Hong Kong Island (Sheet 1 of 3)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/03/0937	Shau Kei Wan High Level Fresh Water Service Reservoir No.2, Yiu Hing Road	11SE-A/C348	12/3	Police	12/3	Rock cut	12.5 (rock fall)	Open area	-
2010/05/0939#	45 Island Road, Repulse Bay	15NE-A/CR684	8/5	Private	8/5 (9:00)	Soil cut/ retaining wall	2.5	Open area	-
2010/05/0940	Queen Mary Hospital, Pok Fu Lam	11SW-C/C76	20/5	Public	20/5	Soil/rock cut	0.06 (rock fall)	Others (Carpark)	-
2010/06/0944	Near 37 Repulse Bay Road	11SE-C/C3	30/5	Police	30/5	Rock cut	0.57 (rock fall)	Road	-
2010/06/0947	1-10 Sai Wan Terrace, Sai Wan Ho	11SE-A/CR450	10/6	Police	10/6 (3:30)	Soil cut/ retaining wall	40	Construction site and open area	-
2010/06/0953	19 Severn Road, the Peak	11SW-D/C497	26/6	FSD	26/6 (13:10)	Soil/rock cut	1	Access Road	-
2010/06/0956	19 Gough Hill Road, the Peak	11SW-D/C2049	27/6	Public	27/6	Soil/rock cut	1	Road	-
2010/06/0961	Aberdeen Harbour Mansion's podium, 64 Aberdeen Main Road	Natural hillside	28/6	Police	27/6 (22:00)	Natural hillside	0.01 (boulder fall)	Building	Canopy damaged
2010/06/0962	Playground of Lingnan Primary School, Tung Shan Terrace	Unregisterable (1.22 m high rubble wall)	28/6	HyD	28/6 (13:50)	Retaining wall	0.3 (detachment of rubble wall)	Others (School Playground)	-

Table B2 List of Landslide Incidents in Hong Kong Island (Sheet 2 of 3)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/06/0963	Section 78 Aberdeen Chinese Permanent Cemetery	11SW-C/C750	30/6	Public	30/6 (00:15)	Soil cut	50	Others (Cemetery)	-
2010/07/0968	Somerset, 67 Repulse Bay Road	15NE-A/C233	20/7	Police	20/7 (11:15)	Soil/rock cut	0.01 (rock fall)	Open area	Car damaged
2010/07/0978	Construction Site of Eastern Portal of Hong Kong West Drainage Tunnel (DSD Contract No. DC/2007/10)	Natural hillside	23/7	DSD	22/7 (18:00)	Natural hillside	10	Construction site	-
2010/07/1001	Block A & B, Evelyn Tower, 38 Cloud View Road, North Point	11SE-A/CR46	28/7	Private	22/7 (18:00)	Soil/rock cut	9	Building	-
2010/08/1033#	Behind Hut No. 100AB Pokfulam Village	11SW-C/CR1001	3/8	DLO	28/7 (15:30)	Soil cut	0.2	Others (toe planter)	-
2010/08/1041	21 South Bay Road, Repulse Bay	15NE-A/C383	11/8	Public	Unknown	Soil/rock cut	0.3	Access Road	-
2010/09/1050	63 Repulse Bay Road	15NE-A/CR29	30/8	Private	17/8 (17:00)	Soil/rock cut	0.003 (boulder fall)	Road	-
2010/09/1054	Near 27 South Bay Road, Repulse Bay	15NE-A/C375	10/9	Private	Unknown	Soil cut	1.1	Road	-
2010/09/1055	Above slope No. 11SW-C/C212, 37 Mount Davis Road	Natural hillside	21/9	HyD	21/9 (6:40)	Natural hillside	0.2	Road	1 lane of Mount Davis Road temporarily closed

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

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/09/1057	Bowen Road, near junction with elevated road of Borrett Road	Natural hillside[@]	21/9	BD	21/9 (6:00)	Natural hillside	30	Building	The backyard and car park (at G/F) of a residential building flooded with muddy water
2010/09/1058	Hatton Road, Lung Fu Shan	11SW-A/C691	22/9	HyD	21/9 (16:30)	Soil/rock cut	5	Access Road	-
2010/09/1060[#]	Near lamp post no. 44919, Pak Fuk Road, North Point	11SE-A/C710	20/9	Public	Unknown	Soil/rock cut	1	Minor footpath	-
2010/09/1062[#]	Monmouth Path, Wan Chai	11SW-B/C339	22/9	Public	Unknown	Soil cut	-	Nil	-
2010/11/1079	Near lamp post no. 33678, Wan Tsui Road, Chai Wan	11SE-D/C49	9/11	Public	7/11	Soil/rock cut	0.3 (rock fall)	Others (planter area)	-
2010/12/1085	Harlech Road, the Peak	11SW-C/C307	12/12	Public	12/12	Soil/rock cut	0.3 (rock fall)	Access Road	-
ArchSD/S/2010/02/0002	Chung Hom Kok Road, Stanley	15NE-C/C78	2/3	ArchSD	10/2	Soil/rock cut	0.13 (rock fall)	Access road	-
ArchSD/SKW&IS-S/2010/02/0003[#]	Hong Kong Museum of Coastal Defence, Shau Kei Wan	11SE-B/CR272	2/3	ArchSD	25/2	Soil/rock cut	0.018 (rock fall)	Open area	-
ArchSD/ML/2010/06/0003	Caine Road Garden, Mid-Levels	11SW-A/C23	28/6	ArchSD	28/6	Soil cut	9	Open area	-

Legend:

Very minor landslide with negligible consequence (see Section 1 of the report for definition)
@ Feature registered as No. 11SW-B/DT5 subsequent to the incident

Table B3 List of Landslide Incidents in Kowloon

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/07/0971	Opposite Block 2, Pak Tin Estate, Shek Kip Mei, Kowloon	11NW-B/FR5	22/7	Police	22/7 (18:45)	Fill	150	Road and construction site	1 lane of Pak Wan Street temporarily closed
2010/07/0990	Access road to Kwun Yum Temple adjacent to Shatin Pass Road, Wong Tai Sin	11NE-A/C287	23/7	FSD	23/7	Soil cut	25^+	Access road	-
2010/11/1078	Below Kwun Yum Temple, Wong Tai Sin	Natural hillside	27/10	Public	Unknown	Natural hillside	80	Minor footpath	-

Legend:

\+ Failure volume estimated by GEO's landslide investigation consultants

Table B4 List of Landslide Incidents in the New Territories (Sheet 1 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/02/0933	Sai Sha Road, Sai Kung	8SW-A/FR7	28/1	HyD	27/1 (23:30)	Fill	8	Road	-
2010/03/0935	South of House 85, Ma Yau Tong Vilage, Sai Kung	Unregisterable (2 m high soil cut slope)	11/2	ICC	11/2	Soil cut	1	Building (Village house)	-
2010/06/0943	Chui Tung Au, Sai Kung	Natural hillside	31/5	ICC	31/5 (15:30)	Natural hillside	40	Minor footpath	Minor footpath temporarily closed
2010/06/0945	Near House No. 31 at Kap Pin Long Middle Lane, Sai Kung	8SW-A/CR143	4/6	Public	30/5 (14:00)	Soil cut	1.5	Building (Village house)	-
2010/06/0946	Near House No. 1, Ta Ku Ling San Tsuen, Sai Kung	Unregisterable (2.5 m high soil cut slope)	7/6	Public	31/5	Soil cut	6	Squatter dwellings	-
2010/06/0949	Opposite of lamp post N2424, Clear Water Bay Road	Unregistered (> 3 m high soil cut)	10/6	HyD	10/6	Soil cut	5	Road	1 lane of Clear Water Bay Road temporarily closed
2010/06/0950	House No. 6, Pak Tam Au Village, Sai Kung North	Natural hillside	15/6	DLO	14/6 (17:00)	Natural hillside	2	Building (Village house)	-
2010/06/0951	Behind No. 49 Kam Shan Village, Tai Po	Unregistered (> 3 m high CR feature)	8/6	DLO	1/1 (00:00)	Retaining wall	0.5	0	-
2010/06/0954	140B Chung Kok Terrace, Fu Yung Shan, Tusen Wan	7SW-C/C604	27/6	Police	26/6 (23:45)	Soil cut	0.5	Access road	Access road temporarily closed

Table B4 List of Landslide Incidents in the New Territories (Sheet 2 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/06/0955	No. 103, Tseng Tau Chung Tusen, Tuen Mun	Unregisterable (2.2 m high soil cut slope)	28/6	Police	28/6	Soil cut	0.25	Squatter dwellings	2 squatter dwellings temporarily evacuated
2010/06/0957	House No. 18A Pai Min Kok Tsuen, Tsuen Wan	6SE-C/CR597	27/6	Police	27/6 (09:30)	Masonry Wall	1	Access road	Access road temporarily closed
2010/06/0958	Back of House No. 9A, Pik Uk San Tsuen	11NE-B/C677	27/6	Unknown	Unknown	Soil cut	24	Building (Village house)	-
2010/06/0959	House No. 38, Siu Lam San Tsuen, Tuen Mun	Unregisterable (2.3 m high soil cut slope)	28/6	FSD	28/6 (13:45)	Soil cut	2	Squatter dwellings	-
2010/06/0960	House 77B1, Tseng Tau Chung Tsuen, Tuen Mun	Unregisterable (2.3 m high retaining wall)	28/6	DLO	28/6 (16:00)	Retaining wall	1	Squatter dwellings	3 squatter dwellings temporarily evacuated
2010/06/0964	Near slope No. 6SW-D/C595, Tuen Mun	Natural hillside	30/6	LandsD	28/6 (10:00)	Natural hillside	10	Squatter dwellings	-
2010/07/0966	Near No. 87 Tai Chung Hau Village, Sai Kung	Unregisterable (1.7 m high masonry wall)	2/7	Public	30/6 (09:00)	Retaining wall	8	Minor footpath	-
2010/07/0967#	Evergreen Villa, 8B Tai Po Tsai Village, Yan Yee Road, Sai Kung	Natural hillside	9/7	Public	8/7	Natural hillside	2	Open area	-
2010/07/0969#	Near the end of Yu Chui Street, Tuen Mun	Unregisterable (1.3 m high soil cut slope)	22/7	Public	29/6 (15:30)	Soil cut	0.2	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 3 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/07/0972	Near house No. 1 Hin Tin Tsuen, Shatin	7SW-D/C845	22/7	ICC	22/7 (19:15)	Soil cut	0.5	Squatter dwelling	-
2010/07/0975	Tai Po Road near Piper Hill, Shatin	11NW-B/C762	22/7	Public	22/7 (20:00)	Soil cut	7^+	Road and construction site	1 lane of Tai Po Road temporarily closed
2010/07/0976	Between house Nos. 62 and 52, Tin Sum Pak Tin Tsuen, Shatin	7SW-D/F314	22/7	Police	22/7 (19:30)	Fill	100	Squatter dwelling and minor footpath	1 squatter dwelling temporarily evacuated. Minor footpath temporarily closed
2010/07/0977	Adjacent to slope No. 7SW-C/C131, opposite to Block 3 of Lei Muk Shue Estate, Tsuen Wan	Natural hillside	22/7	Police	22/7 (20:36)	Natural hillside	390	Minor footpath	Minor footpath temporarily closed
2010/07/0980#	50 m West of Town Centre, Hong Lok Yuen, Tai Po	7NW-A/C11	23/7	Police	23/7 (09:30)	Soil cut	2	Minor footpath	-
2010/07/0981#	Beside a natural stream course, Nos. 47-53, Lower Shing Mun Village	Natural hillside	23/7	Public	22/7	Natural hillside	4	Others (natural stream course)	-
2010/07/0982	Shek Lei Hang Village, Kwai Chung	7SW-C/C990	23/7	LandsD	22/7	Soil cut	80	Squatter dwellings	-
2010/07/0983	Cheung Hang Village, Cheung Yuen Road, Lai Chi Kok	11NW-A/C287	23/7	Public	22/7	Soil/rock cut	0.7	Road	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 4 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/07/0984	South-east of slope No. 7SW-C/F275, Tsuen Wan	Natural hillside	23/7	LandsD	22/7	Natural hillside	80	Minor footpath	-
2010/07/0985#	Opposite to Chin Kwai House of Kwai Chung Estate	7SW-C/C320	23/7	Public	22/7	Soil cut	3.7	Open area	-
2010/07/0986	Pak Tin Tsuen,Tin Sum	7SW-D/C854	23/7	Police	22/7 (19:30)	Soil cut	40	Minor footpath	Minor footpath temporarily closed
2010/07/0987	Lower Shing Mun Road	Natural hillside	23/7	ICC	23/7	Natural hillside	120	Access road	Access road temporarily closed
2010/07/0988	Lower Shing Mun Road	7SW-D/C804	23/7	Public	23/7 (14:00)	Soil cut	40	Road	-
2010/07/0992#	No. 51A, Wo Hop Shek San Tsuen, Fanling	3SW-C/C416	23/7	Public	22/7 (18:00)	Soil cut	2.5	Minor footpath	-
2010/07/0993#	Cheung Hang Village, Lai Chi Kok	11NW-A/C310	23/7	Public	22/7	Soil cut	3.5	Minor footpath	-
2010/07/0994	Pak Tin Area 2 house No. 123, Shatin	Natural hillside	26/7	Public	23/7	Natural hillside	32	Open area	-
2010/07/0995	House No. 123, Pak Tin Area, Shatin	7SW-B/C556	26/7	Public	23/7	Soil/rock cut	75	Open area	-
2010/07/0996	Behind No. 105 San Uk Ka, Wun Yiu	7NW-D/DT1	23/7	Public	23/7 (14:20)	Disturbed terrain	8	Others (natural stream course)	-
2010/07/0997	Shep Yi Wat near Shatin Pass Road, Tsz Wan Shan	7SE-C/C126	24/7	Public	24/7	Soil cut	1	Others (verge)	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 5 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/07/0998	Mau Tat, Shatin	Natural hillside	26/7	DLO	22/7	Natural hillside	20	Minor footpath	-
2010/07/0999	Wong Chuk Yeung Village Path, Shatin - L/P No. VA8829	Unregisterable (0.8 m high retaining wall)	23/7	DO	23/7 (16:00)	Retaining wall	3	Squatter dwellings and minor footpath	-
2010/07/1000	Wong Chuk Yeung Tsuen Path, opposite L/P No. VA8833	7SW-B/C754	27/7	GEO	27/7 (09:00)	Soil cut	1	Access road	-
2010/07/1002	80 Ng Tung Chai Village (Lot 623 in DD10), Tai Po	7NW-A/C247	28/7	Police	22/7 (18:00)	Soil cut	3	Access road	-
2010/07/1003	Wo Hop Shek Cemetery, Fanling	3SW-C/DT77	25/7	ArchSD	22/7	Disturbed terrain	37	Others (cemetery)	-
2010/07/1006	Opposite to Mang Kung Uk, Clear Water Bay Road, Sai Kung	12NW-C/C247	28/7	FSD	28/7 (16:06)	Soil cut	0.5	Road	-
2010/07/1007	Along the access path of Sai Wan Village, Sai Kung	Natural hillside	28/7	FSD	28/7	Natural hillside	40	Access road	-
2010/07/1008	Po Lam Road South near Haven of Hope Hospital	11NE-D/C571	28/7	HyD	28/7 (16:06)	Soil cut	1.5	Road	-
2010/07/1009#	Tai Hung Hou Village No. 115, Sai Kung	Natural hillside	28/7	FSD	28/7 (18:00)	Natural hillside	1.5	Minor footpath	-
2010/07/1010	No. 88A, G/F, Nam Shan Village, Sai Kung	8SW-A/CR189	28/7	FSD	28/7 (18:00)	Retaining wall	1	Building (Village house)	-
2010/07/1014	Access Road leading to Lady Maclehose Holiday Village	8SW-B/C229	28/7	ArchSD	28/7 (15:15)	Soil cut	15	Access road	Access road temporarily closed

Table B4 List of Landslide Incidents in the New Territories (Sheet 6 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/07/1015#	House Nos. 8-18, Chap Wai Kon, Shatin	7SE-C/C664	28/7	Police	28/7 (15:00)	Soil cut	0.5	Open area	-
2010/07/1016	East of No.7 Keng Hau Road, Off Tai Po Road-Shatin Height, Tai Wai	7SW-D/DT51	23/7	ICC	23/7	Disturbed terrain	30	Building (Village house)	-
2010/07/1017	Hang Hau Road, TKO	12NW-C/C91	28/7	Public	28/7 (15:45)	Soil cut	15	Road	1 lane of Hang Hau Road temporarily closed
2010/07/1018#	Near 405A Shun Him Tong, Fanling	3SW-A/C208	26/7	DO	22/7 (18:00)	Retaining Wall	1.5	Minor footpath	-
2010/07/1019	Behind House Nos. 47-53, Lower Shing Mun Village	Unregisterable (2.7 m high soil cut slope)	29/7	Public	28/7	Soil cut	2.5	Squatter dwelling	-
2010/07/1020	Hang Hau Wing Lung Road	Natural hillside	28/7	Public	28/7 (15:30)	Natural hillside	1	Road	-
2010/07/1021	Tsang Tai Uk, Shatin	7SE-C/C213	30/7	BD	29/7	Soil cut	5	Building	-
2010/07/1022	House 104, 104A, Shatin Tau Old Village, Tai Wai	7SW-D/C898	23/7	ICC	22/7	Soil cut	7.5	Squatter dwelling	-
2010/07/1023	Behind House 29A, Wong Chuk Yuen Sheung Tsuen, Pat Heung, Yuen Long	Unregisterable (1.5 m high soil cut slope)	28/7	ICC	28/7	Soil cut	2	Building (Village house)	-
2010/08/1024	No. 303 Wo Hop Shek Village, North	Unregisterable (2 m high soil cut slope)	30/7	Public	28/7 (18:00)	Soil cut	1	Building	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 7 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/08/1025	Near L/P No. VA2628, Yiu Dau Ping, Fo Tan	Natural hillside	27/7	Police	23/7 (09:15)	Natural hillside	5	Others (burial urn)	-
2010/08/1026	Lung Wo Village, Sai Kung	11NE-B/R55	29/7	HyD	28/7 (19:00)	Retaining Wall	8	Access road	Access road temporarily closed
2010/08/1027	Natural Stream above, Wo Yi Hop Lane	7SW-C/CR457	28/7	DSD	22/7	Soil cut	10^+	Others (Streamcourse)	-
2010/08/1028	Stream course above Wo Yi Hop Lane	7SW-A/DT28	28/7	DSD	22/7	Disturbed terrain	12^+	Squatter dwelling	-
2010/08/1029#	House No. 35, Ma Liu Village, Shatin	Natural hillside	24/7	Police	24/7 (09:00)	Natural hillside	3	Open area	-
2010/08/1030#	Near Yuen Yuen Institute, Lo Wai	7SW-A/CR67	30/7	Public	Unknown	Soil cut	3	Minor footpath	-
2010/08/1031	5A Ta Ku Ling San Tsuen (near Lamp Post No. VE1004)	Unregisterable (2.5 m high retaining wall)	28/7	DLO	Unknown	Retaining wall	5	Squatter dwellings	-
2010/08/1032#	House No. 91, Fo Tan Village, Shatin	Unregistered (> 3 m high soil cut)	30/7	LandsD	23/7 (15:15)	Soil cut	3	Open area	-
2010/08/1034	Beacon Hill Radar Station, Lung Yan Road	11NW-B/C469	29/7	ArchSD	22/7	Soil cut	7	Access road	-
2010/08/1035	House 108, Sheng Yeung, Sai Kung	Unregisterable (4 m high fill slope)	30/7	LandsD	29/7	Fill	10	Open area	-
2010/08/1036#	House 77, Shatin Tau New Village, Shatin	Natural hillside	4/8	DLO	22/7	Natural hillside	2	Open area	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 8 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/08/1037	Near Feature No. 3SW-C/C870 at Wo Hop Shek Cemetery	Natural hillside	9/8	ArchSD	27/7 (09:00)	Natural hillside	105	Minor footpath	-
2010/08/1038#	Near House 155 Che Keng Tuk	8SW-C/F39	3/8	Public	3/8 (12:00)	Fill	0.1	Minor footpath	-
2010/08/1039	Pak Tin Tsuen, Tin Sum, Tai Wai	7SW-D/C853	10/8	Public	30/7	Soil cut	10	Open area	-
2010/08/1040	Fan Kam Road, Ying Pun, North	2SE-D/C359	12/8	LandsD	4/8 (09:00)	Soil cut	5.5	Open area	-
2010/08/1042#	House No. 272, Pai Tau Village, Shatin	Unregisterable (2.3 m high soil cut slope)	10/8	DLO	4/8 (09:00)	Soil cut	1	Open area	-
2010/08/1043	Opposite feature no. 7SW-A/C274	Natural hillside	16/8	AFCD	Unknown	Natural hillside	30	Access road	-
2010/08/1044	Wo Yi Hop Tsuen, Tsuen Wan	7SW-A/C184	2/8	LandsD	Unknown	Soil cut	1.5	Squatter dwellings	-
2010/08/1045	To the south of slope no. 7SW-A/C150 (near Lamppost W3729), Lo Wai	Unregisterable (2.7 m high soil cut slope)	20/8	Public	Unknown	Soil cut	1	Access road	-
2010/08/1046	In Front of No. 36, Shatin Tau New Village, Shatin, N.T.	Natural hillside	25/8	ICC	25/8 (12:00)	Natural hillside	8	Open area	-
2010/08/1047	House No.36, Yung Shu Village, Tap Mun	Unregisterable (1.8 m high soil cut slope)	24/8	LandsD	28/7 (16:30)	Soil cut	0.5	Squatter dwellings	-
2010/09/1049	Kuk Liu, Shatin	Natural hillside	2/9	DLO	20/8	Natural hillside	20	Minor footpath	Minor footpath temporarily closed

Table B4 List of Landslide Incidents in the New Territories (Sheet 9 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/09/1051#	Pat Tsz Wo Village, Fo Tan	7SE-A/C41	2/9	DO	2/9 (09:00)	Soil cut	5	Open area	-
2010/09/1053	Tai Wan Tau Road, Sai Kung	Natural hillside	10/9	Police	10/9 (06:00)	Natural hillside	0.3 (Boulder fall)	Road	-
2010/09/1059	Staircase to Sam Shing Temple, Tsuen Mun	6SW-A/R11	22/9	Police	Unknown	Retaining wall	30	Minor footpath	-
2010/09/1061	Tai Mong Tsai Road, Sai Kung	8SW-B/C155	21/9	Public	20/9 (23:00)	Soil cut	25	Road and construction site	1 lane of Tai Mong Tsai Road temporarily closed
2010/09/1063	Southeast of No. 240 Pak Kong New Village	Natural hillside	21/9	Public	21/9 (10:00)	Natural hillside	20	Minor footpath	-
2010/09/1064#	Wo Tong Kong, Sai Kung	Natural hillside	19/8	Public	19/8 (01:00)	Natural hillside	3	Nil	-
2010/10/1069#	Adjacent the SE end of 7SW-D/C864, near Lee Uk Village, Shatin Tau Road, Tai Wai	Unregisterable (1.9 m high soil cut slope)	6/10	Public	6/10 (10:00)	Soil cut	1.7	Minor footpath	-
2010/10/1070	Ying Pun, Fanling	3SW-C/CR614	6/10	LandsD	27/9 (10:00)	Soil cut	2	Squatter dwellings and minor footpath	-
2010/10/1071#	Near L/P No. VE4584, Tseng Tau, Sai Kung North	Unregistered (> 3 m high soil cut)	5/10	DLO	1/10 (11:15)	Soil cut	1	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 10 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/10/1072#	Sam Tseng San Tsuen near Lamppost No. VA5824, to the west of slope no. 6SE-C/C337	Unregisterable (1.6 m high fill slope)	4/10	DLO	Unknown	Fill	1	Minor footpath	-
2010/10/1073	House No. 344, Ha Wo Che village, Shatin	Unregisterable (1.2 m high soil cut slope)	4/10	LandsD	10/9 (17:00)	Soil cut	0.5	Squatter dwellings	1 squatter dwelling permanently evacuated (NDC Cat. 1 Clearance No. ST/377)
2010/10/1074	Behind No. 46 Mui Shue Hang, Tai Po	Unregisterable (2.8 m high combined soil cut slope and retaining wall feature)	17/9	Public	1/8 (00:15)	Soil cut	1	Building	-
2010/10/1075	Behind House No. 60 Tong To Village, Sha Tau Kok	Unregisterable (< 3 m high soil cut slope)	22/9	DLO	22/7 (09:00)	Soil cut	2	Others (alleyway)	-
2010/11/1076	Behine house no. 119D, Pak Tin, Shatin	7SW-B/C558	27/10	Public	22/7	Soil cut	3	Squatter dwellings	-
2010/11/1077#	Sai Lam Temple, Sheung Wo Che Village, Shatin	7SW-B/C362	27/10	DLO	23/7 (12:30)	Soil cut	0.5	Open area	-
2010/11/1080	West of Lot 541 in D. D. 19 at She Shan Tsuen, Lam Tsuen, Tai Po	Natural hillside	8/10	DO	22/7 (09:00)	Natural hillside	3	Squatter dwellings	-
2010/11/1081	Route Twist, Tsuen Wan	6SE-B/C160	8/11	HyD	Unknown	Soil cut	5	Open area & access road	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 11 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/12/1082	Country Trail at Ngau Kwu Leng, Lam Tsuen, Tai Po	3SW-C/C537	3/12	LandsD	22/7 (09:00)	Soil cut	10	Minor footpath	-
2010/12/1083	Country Trail at Ngau Kwu Leng, Lam Tsuen, Tai Po	3SW-C/C536	3/12	LandsD	22/7 (09:00)	Soil cut	200	Minor footpath	-
2010/12/1084#	Country Trial at Ngau Kwu Leng, Lam Tsuen, Tai Po	3SW-C/C534	3/12	LandsD	22/7 (09:00)	Soil cut	4	Minor footpath	-
2010/12/1086	House No. 173, Ha Wo Che Village, Shatin	Unregistered (> 3 m high soil cut)	16/12	LandsD	9/12 (14:30)	Soil cut	2	Building (Village house)	-
2010/12/1087	Lot 916 in D.D. 226, House 31H, Tseng Lan Shue	Unregisterable (2.5 m high combined soil cut slope and retaining wall feature)	22/12	FSD	22/12 (17:00)	Retaining wall	12	Building	-
2011/03/1093	Near 1A, San Uk Ka Village, Tai Po	Natural hillside	16/2/ 2011	DLO	22/7 (09:00)	Natural hillside	2	Road	-
2011/03/1094	Southeast of No. 87 Kam Shan, Tai Po	Natural hillside	16/2/ 2011	DLO	22/7 (09:00)	Natural hillside	2	Building (Village house)	-
LandsD/N/2010/ 03/0001	Yung Shue Au, Sha Tau kok	3NE-B/C1	12/1	LandsD	Unknown	Soil cut	10	Others (ruined structure)	-
ArchSD/F/2010/ 02/0001	Wo Hop Shek Cemetery	3SW-C/C79	11/2	ArchSD	3/2	Soil cut	9	Open area	-
LandsD/N/2010/ 03/0002	Ying Pui Tsuen, Sheung Shui	Unregisterable (< 3 m high soil cut slope)	26/2	LandsD	Unknown	Soil cut	1	Squatter dwellings	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 12 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
WSD/2010/2/1/K	Lion Rock High Level No. 2 Fresh Water Service Reservior	11NW-B/C559	11/2	WSD	Unknown	Soil cut	0.6	Catchwater	-
LandsD/TP/2010/ 03/0001#	Kai Ling Ha Lo Wai, Sai Kung	Unregisterable (approx. 2 m high soil cut slope)	19/3	LandsD	Unknown	Soil cut	2	Minor footpath	-
ArchSD/TP/2010/ 05/0001#	Cloudy Hill Jeep Track, Fanling	3SW-D/C127	13/5	ArchSD	10/5	Soil/rock Cut	1.5	Minor footpath	-
ArchSD/F/2010/ 07/0010	Wo Hop Shek Cemetery	3SW-C/C83	12/8	ArchSD	19/5	Soil cut	1.5	Others (grave)	-
AFCD/2010/ 05/0001	Chuen Lung Forest Tack, Tai Mo Shan Country Park	6SE-B/C138	4/8	AFCD	19/5	Soil cut	7	Minor footpath	-
HyD/NTW/2010/ 05/0016	UGL near Lot No. 184 sA in DD120, Yuen Long	Natural Hillside	13/8	HyD	Around early May-10	Natural hillside	$< 5^+$	Building (Village house)	-
HyD/NTE/2010/ 05/0008	Hak Tau Road near Lamp Post CD1071	3SW-B/C155	10/5	HyD	10/5	Rock cut	2	Access road	-
LandsD/SK/2010/ 05/0001	No. 12B, Tai Wan, Sai Kung	8SW-A/CR227	5/8	LandsD	May-10	Soil cut	0.03	Others (Alleyway)	-
WSD/2010/ 5/2/NTE	Sai Kung Sai Wan Road, High Island Reservoir	8SE-A/C47	28/5	WSD	28/5 (10:39)	Soil cut	0.3	Access road	-
ArchSD/F/2010/ 07/0001	Wo Hop Shek Cemetery, Fanling	3SW-C/C339	29/7	ArchSD	22/7	Soil cut	7	Open area	-
ArchSD/F/2010/ 07/0003	Fanling Police Tactical Unit near Slope No. 3SW-C/C243	Unregisterable (< 3 m high soil cut slope)	28/7	ArchSD	27/7	Soil cut	3	Building	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 13 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
ArchSD/F/2010/ 07/0005	Wo Hop Shek Cemetery, Fanling	3SW-C/C779	6/8	ArchSD	28/7	Soil cut	4	Access road	-
ArchSD/F/2010/ 07/0006	Wo Hop Shek Cemetery, Fanling	3SW-C/DT78	6/8	ArchSD	28/7	Disturbed terrain	10	Others (grave)	-
ArchSD/TP/2010/ 07/0007#	East of Slope No. 7NW-B/C599, Tai Po	Natural Hillside	6/8	ArchSD	29/7	Natural hillside	5	Open area	-
AFCD/2010/ 07/0002	Shing Mun Forest Track - reservoir Section, Shing Mun Country Park	7SW-B/C452	26/7	AFCD	22/7	Soil cut	40	Minor footpath	-
AFCD/2010/ 07/0003	Shing Mun Forest Track - Arboretum Section, Shing Mun Country Park	7SW-B/C575	26/7	AFCD	22/7	Soil cut	35	Minor footpath	-
AFCD/2010/ 07/0004	Shing Mun Forest Track - Reservoir Section, Shing Mun Country Park	7SW-B/C472	26/7	AFCD	22/7	Soil cut	30	Minor footpath	-
AFCD/2010/ 07/0005	Shing Mun Forest Track - Tai Shing Stream Section, Shing Mun Country Park	7NW-D/C287	26/7	AFCD	22/7	Soil cut	90	Minor footpath	-
AFCD/2010/ 07/0006	Near Wang Shan Keuk Ha Tsuen, Pat Sin Leng Country Park	Natural hillside	26/7	AFCD	22/7	Natural hillside	70	Minor footpath	-
AFCD/2010/ 07/0007	Shing Mun Forest Track - Tai Shing Stream Section, Shing Mun Country Park	Natural hillside	30/7	AFCD	28/7	Natural hillside	80	Minor footpath	-
AFCD/2010/ 07/0008	Shing Mun Forest Track - tai Shing Stream Section, Shing Mun Country Park	Natural hillside	30/7	AFCD	28/7	Natural hillside	15	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 14 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
(Incident reported by DSD)	Adjoining Tai Po River to the south of Wan Tau Tong Estate, Tai Po	7NW-B/C183	20/10	DSD	22/7	Soil cut	200	Others (river)	-
(Incident reported by DSD)	Abutting Tai Po River	7NW-B/C226	20/10	DSD	22/7	Soil cut	10	Others (river)	-
HyD/K/2010/ 07/0007#	Shatin Pass Road	11NE-A/C288	30/7	HyD	22/7 (16:00 - 19:00)	Soil cut	< 5	Nil	-
LandsD/2010/ TW&KT/07/001	Shung Mun Reservoir, Kwai Chung	7SW-C/C841	28/7	LandsD	Unknown	Soil cut	10^+	Minor footpath	-
LandsD/SK/2010/ 07/0001	No. 4 Nam Wai, Sai Kung	Unregisterable (1.6 m high soil cut slope)	29/7	LandsD	29/7	Soil cut	0.75	Building (Village house)	-
LandsD/SK/2010/ 07/0002	No. 6 Tan Shan, Sai Kung	11NE-B/C984	29/7	LandsD	29/7	Soil cut	23	Squatter dwelling	-
LandsD/SK/2010/ 07/0003#	Lung Ha Wan Road, Sai Kung	12NW-D/C3	29/7	LandsD	29/7	Soil/rock cut	5	Minor footpath	-
LandsD/SK/2010/ 07/0004	No. 79 Kap Pin Long, Sai Kung	Unregisterable (1.5 m high soil cut slope)	6/10	LandsD	July-10	Soil cut	1	Squatter dwellings	-
LandsD/N2010/ 07/0002#	Barbeccue Site at Bride's Pool Road, Lamp Post EB0816	3NE-D/C109	12/8	LandsD	26/7	Soil/rock cut	3	Open area	-
LandsD/ST/2010/ 07/0001	200 m East of Fung Shing Court, Shatin	7SE-C/DT15	23/7	LandsD	Unknown	Disturbed terrain	2	Squatter dwellings	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 15 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
LandsD/ST/2010/07/0002#	Uphill side of To Fung Shan Road	Unregisterable (< 3 m high soil cut slope)	26/7	LandsD	Unknown	Soil cut	0.5	Minor footpath	-
LandsD/ST/2010/07/0004	Tai Wai, Shatin	7SW-D/DT47	26/7	LandsD	Unknown	Disturbed terrain	1	Squatter dwellings	-
LandsD/ST/2010/07/0008	15 Kwei Tei Tsuen, Shatin	7SE-A/C560	29/7	LandsD	Unknown	Soil cut	2	Squatter dwellings	-
LandsD/ST/2010/07/0009#	No. 78 Pei Tau Village, Shatin	7SW-B/CR733	29/7	LandsD	Unknown	Soil cut	2	Minor footpath	-
LandsD/ST/2010/07/0010#	Ha Pun Shan Tsuen, Ma On Shan	7NE-D/C173	26/7	LandsD	Unknown	Soil cut	1	Minor footpath	-
LandsD/ST/2010/07/0012#	Lower Shing Mun Road	7SW-D/C808	29/7	LandsD	Unknown	Soil/rock cut	2	Minor footpath	-
LandsD/ST/2010/07/0014#	Pak Tin Area 2 and Area 3, Shatin	7SW-B/C515	26/7	LandsD	Unknown	Soil/rock cut	2	Minor footpath	-
LandsD/TP2010/07/0001	House No. 27 Che Tei Village, Tai Po	3SW-C/CR754	3/8	LandsD	22/7	Soil cut	3	Squatter dwelling	-
LandsD/TP2010/07/0002	House No. 25 Cho Ma Wu, Tai Po	Unregisterable (2 m high soil cut slope)	3/8	LandsD	23/7	Soil cut	1.5	Squatter dwelling	-
ArchSD/F/2010/07/0009	Wo Hop Shek Cemetery	3SW-C/DT94	12/8	ArchSD	2/8	Disturbed terrain	2	Others (grave)	-
ArchSD/F/2010/07/0011	Wo Hop Shek Cemetery	3SW-C/C679	12/8	ArchSD	2/8	Soil cut	3	Others (grave)	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 16 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
LandsD/SK/2010/08/0001	No. 13 Sam Long, Sai Kung	11NE-B/C490	3/8	LandsD	2/8	Soil cut	1	Squatter dwellings	-
LandsD/N2010/08/0002	Ko Po North Tsuen, near Lamp Posts AD2421 & VA6536	3SW-B/R26	18/8	LandsD	17/8	Retaining wall	1	Other (ruined structure)	-
LandsD/ST/2010/08/0001	Near Pak Tin Area 2, Shatin	7SW-B/R108	11/8	LandsD	Unknown	Retaining wall	2	Building and access road	-
LandsD/TP2010/08/0001#	Behind House No. 15 Lai Chi Hang near Lamp Post V3778	7NW-D/C208	16/8	LandsD	4/8	Soil cut	1	Open area	-
WSD/2010/8/1/K	Near Route & South Portal Building, Butterfly Valley	11NW-A/F351	10/8	WSD	Unknown	Fill	22.5	Nil (debris deposited on slope)	-
LandsD/SK/2010/09/0001#	Luk Mei Tsuen Road, Sai Kung	7SE-D/C28	6/10	LandsD	September-2010	Soil cut	1	Minor footpath	-
ArchSD/F/2010/12/0001	Wo Hop Shek Cemetery, Fanling	3SW-C/DT80	25/11	ArchSD	Unknown	Disturbed terrain	4	Others (cemetery)	-
ArchSD/F/2010/12/0002	Wo Hop Shek Cemetery, Fanling	3SW-C/DT93	25/11	ArchSD	Unknown	Disturbed terrain	15	Others (cemetery)	-
ArchSD/F/2010/12/0003	Wo Hop Shek Cemetery, Fanling	3SW-C/C120	25/11	ArchSD	Unknown	Soil cut	3	Others (cemetery)	-
HyD/NTW/2010/11/0047	Near LP FA7133 in DD116, Shek Tong Tsuen, Yuen Long	Natural Hillside	7/12	DLO	30/11	Natural hillside	2	Access road	-
WSD/2010/12/1/NTW	Near Shing Mun Catchwater near SMOF 5 & 6, Tsuen Wan	Unregisterable (4 m high fill slope)	13/12	WSD	Unknown	Fill	4	Access road	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 17 of 17)

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		

Legend:

#	Very minor landslide with negligible consequence (see Section 1 of the report for definition)
+	Failure volume estimated by GEO's landslide investigation consultants

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

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/01/0932	House No. 106, Shek Tsai Po Street, Tai O	Natural hillside	19/1	Public	Unknown	Natural hillside	1	Squatter dwelling	-
2010/03/0936	House No. 39, Tai Lung Tsuen, Peng Chau	Unregisterable (2.5 m high soil cut slope)	11/3	Public	Unknown	Soil cut	0.2	Squatter dwelling	-
2010/05/0941	Below the Store Room at CCC Cheung Chau Church Kam Kong Primary School, Cheung Chau	Unregisterable (< 3 m high masonry wall)	21/5	Police	21/5 (19:45)	Masonry wall	3	Minor footpath & Squatter dwelling	Minor footpath temporarily closed
2010/06/0942#	Along South Lantau Road, near Shek Pik Reservoir, Lantau	13NE-A/C102	2/6	HyD	2/6 (10:00)	Soil cut	1	Others (Toe planter)	-
2010/06/0948	Tai O Road, Lantau	13NW-B/F140	9/6	FSD	9/6 (22:45)	Fill	0.06 (boulder fall)	Road	1 lane of Tai O Road temporarily closed.
2010/07/0965	Tsz Hing Monastery, Lantau	13NW-B/C353	23/6	Public	Unknown	Soil/rock cut	20	Open area	-
2010/07/0991	Near lamp post No. V7619 behind Miu Wo Building, Mui Wo, Lantau	Natural hillside	23/7	Police	Not given	Natural hillside	0.5 (boulder fall)	Minor footpath	Minor footpath temporarily closed
2010/09/1052	Behind House Nos. 31 & 32, Cheung Sha Sheung Tsuen, Lantau	Unregisterable (2 m high soil cut slope)	4/9	BD	4/9	Soil cut	1	Building (Village house)	-
2010/09/1056	House No. 31 Yung Shue Long New Village, Yung Shue Wan, Lamma Island	14NE-B/C166	21/9	Public	21/9 (6:00)	Soil cut	4	Building (Village house)	-

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

Incident No.	Location	Feature Registration No.	Reported		Failure			Facility Affected	Consequence
			Date	From	Date (Time)	Feature Type	Scale (m^3)		
2010/09/1065	Keung Shan Road, Lantau	13NW-B/C114	14/9	HyD	Not given	Rock cut	0.5 (rock fall)	Minor footpath	-
ArchSD/Is-S/2010/04/0001	Hei Ling Chau Addiction Treatment Centre & Hei Ling Chau Correctional Institution	10SW-D/C111	27/4	ArchSD	22/4	Soil/rock cut	14	Minor footpath	-
ArchSD/Is-S/2010/04/0002	Hei Ling Chau Addiction Treatment Centre & Hei Ling Chau Correctional Institution	10SW-D/C112	27/4	ArchSD	22/4	Soil/rock cut	10	Minor footpath	-
ArchSD/L/2010/06/0001	Near slope No. 13NW-B/C109, Lantau	Natural hillside	18/6	ArchSD	14/6	Natural hillside	0.5 (boulder fall)	Nil	-
HyD/NTE/2010/06/0011	House No. 61, Tung Wan Chung Village, Peng Chau	Natural hillside	19/7	HyD	4/6	Natural hillside	2 (boulder fall)	Squatter dwelling	-
WSD/2010/5/1/HKI	2800 m Southwest of Tai Long Wan Tsuen and the natural hillside, Tai Long Wan, Lantau	13NW-C/F7	10/5	WSD	Unknown	Fill	30	Catchwater	-
AFCD/2010/07/0001	Shap Long Campsite, Chi Ma Wan Country Trail, Lantau South Country Park	14NW-A/C40	23/7	AFCD	22/7	Soil cut	25	Others (Trail)	-

Legend:

Very minor landslide with negligible consequence (see Section 1 of the report for definition)

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GEOTECHNICAL MANUALS

Geotechnical Manual for Slopes, 2nd Edition (1984), 302 p. (English Version), (Reprinted, 2011).

斜坡岩土工程手冊(1998)，308頁(1984年英文版的中文譯本)。

Highway Slope Manual (2000), 114 p.

GEOGUIDES

Geoguide 1	Guide to Retaining Wall Design, 2nd Edition (1993), 258 p. (Reprinted, 2007).
Geoguide 2	Guide to Site Investigation (1987), 359 p. (Reprinted, 2000).
Geoguide 3	Guide to Rock and Soil Descriptions (1988), 186 p. (Reprinted, 2000).
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岩土指南第五冊	斜坡維修指南，第三版(2003)，120頁(中文版)。
Geoguide 6	Guide to Reinforced Fill Structure and Slope Design (2002), 236 p.
Geoguide 7	Guide to Soil Nail Design and Construction (2008), 97 p.

GEOSPECS

Geospec 1	Model Specification for Prestressed Ground Anchors, 2nd Edition (1989), 164 p. (Reprinted, 1997).
Geospec 3	Model Specification for Soil Testing (2001), 340 p.

GEO PUBLICATIONS

GCO Publication No. 1/90	Review of Design Methods for Excavations (1990), 187 p. (Reprinted, 2002).
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GEO Publication No. 1/2007	Engineering Geological Practice in Hong Kong (2007), 278 p.
GEO Publication No. 1/2009	Prescriptive Measures for Man-Made Slopes and Retaining Walls (2009), 76 p.
GEO Publication No. 1/2011	Technical Guidelines on Landscape Treatment for Slopes (2011), 217 p.

GEOLOGICAL PUBLICATIONS

The Quaternary Geology of Hong Kong, by J.A. Fyfe, R. Shaw, S.D.G. Campbell, K.W. Lai & P.A. Kirk (2000), 210 p. plus 6 maps.

The Pre-Quaternary Geology of Hong Kong, by R.J. Sewell, S.D.G. Campbell, C.J.N. Fletcher, K.W. Lai & P.A. Kirk (2000), 181 p. plus 4 maps.

TECHNICAL GUIDANCE NOTES

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