

Factual Report on Hong Kong Rainfall and Landslides in 2019

GEO Report No. 349

V.S.F. Kong, R.C.T. Wai & E.K.H. Chu

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

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Preface

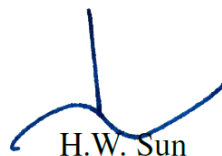
In keeping with our policy of releasing information which may be of general interest to the geotechnical profession and the public, we make available selected internal reports in a series of publications termed the GEO Report series. The GEO Reports can be downloaded from the website of the Civil Engineering and Development Department (<http://www.cedd.gov.hk>) on the Internet.



Raymond WM Cheung
Head, Geotechnical Engineering Office
March 2022

Foreword

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2019. Details of the landslides were obtained from records of landslide incidents reported to the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD). Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and 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.

A handwritten signature in blue ink, consisting of a stylized 'S' shape with a vertical line extending upwards from the top curve.

H.W. Sun
Chief Geotechnical Engineer/LPM2

Abstract

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2019. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from records of landslide incidents reported to the GEO. Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and the GEO's landslide investigation consultants, namely Fugro (Hong Kong) Limited and AECOM Asia Company Limited.

Rainfall recorded in 2019 at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 2396.2 mm, near the mean annual rainfall of 2398.5 mm recorded between 1981 and 2010. No Black Rainstorm Warning was issued in 2019. Three Red Rainstorm Warnings and 37 Amber Rainstorm Warnings were issued between 20 April and 26 August 2019, and between 19 February and 14 October 2019 respectively.

Two Landslip Warnings were issued between 31 July and 2 August and on 26 August 2019. A total of 157 incidents were reported to the Government in 2019. Of these, 131 were classified as genuine landslides and one of them was designated as major failure (i.e. with a failure volume of 50 m³ or more, or where a fatality has occurred).

There were ten landslides in 2019 with notable consequences. Of these landslides, one led to damage of the windows of a squatter dwelling, one resulted in damage of a storage structure and one resulted in partial collapse of a brick wall of a residential building. The remaining seven landslides resulted in temporary closure of roads. Other landslides in 2019 primarily affected footpaths or minor access roads, catchwaters, open areas and a construction site without any significant direct or indirect consequence. No fatality was reported as a result of the landslides.

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1 Introduction

This report summarises the factual information on rainfall and reported landslides in Hong Kong throughout 2019. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from records of landslide incidents reported to the GEO. Supplementary information was collected from the Agriculture, Fisheries and Conservation Department (AFCD), Architectural Services Department (ArchSD), Drainage Services Department (DSD), Highways Department (HyD), Housing Department (HD), Lands Department (LandsD), Water Supplies Department (WSD), and the GEO's landslide investigation consultants, namely Fugro (Hong Kong) Limited and AECOM Asia Company Limited under Agreement Nos. CE 28/2018 (GE) and CE 29/2018 (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, or natural hillside, 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 $\geq 50 \text{ m}^3$, or where a fatality has occurred. A 'very minor' landslide is defined as a failure that is small in scale (i.e. $\leq 5 \text{ m}^3$ for failures involving soil, or $\leq 0.1 \text{ m}^3$ for rockfalls/boulder falls) and does not give rise to any significant public nuisance or notable consequences (e.g. casualty, near-miss, evacuation of buildings or squatter dwellings, road closure, etc.). Landslides that are not classified as 'major' or 'very minor' are taken as 'minor'.

2 Rainfall

2.1 The Raingauge System

The GEO, in collaboration with the HKO, operates an automatic raingauge system that transmits rainfall data through mobile networks to the GEO and the HKO at 1-minute and 5-minute intervals respectively. The system comprises 90 GEO raingauges and 31 raingauges owned by the HKO and other government departments. The GEO raingauges are of the tipping-bucket type, tipping for every 0.5 mm of rainfall. The locations of the automatic raingauges are shown in Figure 2.1.

2.2 Rainfall Records

The rainfall data from the raingauge system are checked, verified and stored by the GEO in a database, from which they can be extracted for analysis. This report presents a selection of rainfall parameters for the whole year of 2019, as well as individual months and individual rainstorms.

The weather in 2019, as described by the HKO (2020), is excerpted as follows:

"The annual total rainfall was 2396.2 millimetres, near the 1981-2010 normal of 2398.5 millimetres (or about 8 percent above the 1961-1990 normal). Three red rainstorm warnings were issued by the Hong Kong Observatory in 2019. There was no black rainstorm warning issued in the year. 2019 was a thundery year in Hong Kong with thunderstorms reported on 59 days, which is 20.4 days above the annual normal of 38.6 days and one of the highest since records began in 1947."

"A total of 28 tropical cyclones occurred over the western North Pacific and the South China Sea in 2019, less than the long-term (1961-2010) average of about 30. There were 16 tropical cyclones reaching typhoon intensity or above during the year, slightly more than the long-term average of about 15, and seven of them reached super typhoon intensity (maximum 10-minute wind speed of 185 km/h or above near the centre). In Hong Kong, five tropical cyclones necessitated the issuance of tropical cyclone warning signals, slightly less than the long-term average of about six in a year. The No. 8 Gale or Storm Signal was issued during the passage of Wipha in July, while the No. 3 Strong Wind Signal was issued during the passages of Kajiki in September."

The following is excerpted 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 2019). Further details on the monthly weather are available on the HKO Website (<https://www.hko.gov.hk/en/wxinfo/pastwx/mws/mws.htm>).

"With the onset of an active southerly airstream over the coast of Guangdong, the weather of Hong Kong deteriorated with outbreaks of heavy showers and squally thunderstorms on the night of 18 April. The weather became even more unsettled in the next two days. There were heavy showers on 19 April with 75.8 millimetres of rainfall recorded at the Observatory, making it the wettest Good Friday on record. Rainfall even exceeded 100 millimetres over parts of the New Territories. On 20 April, a band of intense thunderstorm packed frequent lightning, heavy rain and severe squalls swept across Hong Kong in the afternoon and necessitated the issuance of the first Red Rainstorm Warning in the year. More than 40 millimetres of rainfall were generally recorded over the territory, and the rainfall even exceeded 70 millimetres over parts of the New Territories."

"An area of low pressure developed into a tropical cyclone over the northern part of the South China Sea on 30 July and was named Wipha. With Wipha moving towards Hainan Island, local weather deteriorated gradually and became windy with outbreaks of squally heavy showers and thunderstorms on the last two days of the month. The outer rainbands associated with Wipha brought more than 100 millimetres of rainfall to most parts of the territory on 31 July and the rainfall over Tseung Kwan O, Wong Tai Sin and Tai Wai even exceeded 200 millimetres."

"Under the influence of Wipha, it was windy with occasional gale force winds offshore and on high ground at first on 1 August in Hong Kong. Heavy squally showers and thunderstorms associated with the rainbands of Wipha also brought more than 100 millimetres of rainfall to most parts of the territory on 1-2 August and rainfall even exceeded 150 millimetres over parts of Lantau Island in these two days."

"Affected by the outer subsiding air of Bailu, it was generally fine and very hot with haze in Hong Kong on 24 August. Lashed by the outer rainbands associated with Bailu, there were occasional heavy squally showers and thunderstorms in Hong Kong on 25-26 August. More than 150 millimetres of rainfall were recorded over many places, and rainfall even exceeded 200 millimetres in the urban areas and parts of New Territories in these two days."

The rainfalls recorded at the HKO in the first and second quarters of 2019 are 259.9 mm (61% above the normal rainfall) and 849.5 mm (9% below the normal rainfall) respectively. The total rainfalls recorded in the third and last quarters are 1123.8 mm (1% below normal) and 163.0 mm (1% below normal) respectively. The annual rainfall for 2019 is 2396.2 mm, near the annual normal of 2398.5 mm recorded between 1981 and 2010. The cumulative rainfall for 2019 is compared with the highest, lowest and mean rainfall in Figure 2.2.

Figure 2.3 shows the monthly rainfall distribution in 2019. Figure 2.4 shows the annual rainfall distribution in 2019, together with the locations of the reported landslides.

2.3 Rainstorms in 2019

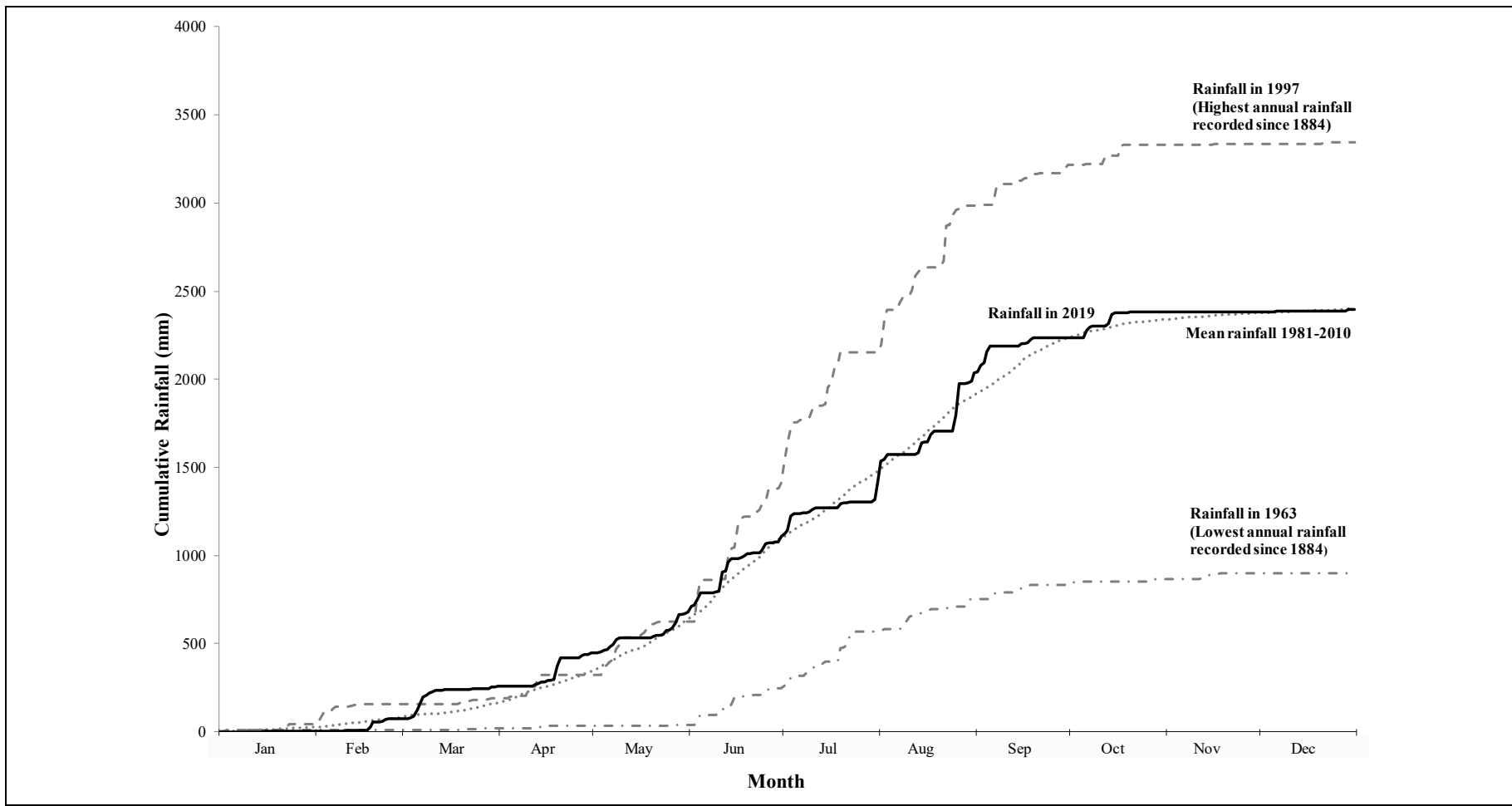
Table 2.1 tabulates the rainfall parameters for two rainstorms in 2019, during which Landslip Warnings were issued. The parameters include the maximum 24-hour, 4-hour and 1-hour rolling rainfalls (based on 5-minute rainfall data). Table 2.1 also includes the 4-day and 15-day antecedent rainfalls at the 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 two rainstorms are also shown in Table A1 of Appendix A.

Figures A1 to A2 of Appendix A show the isohyets of the maximum rolling 24-hour rainfalls during the above two rainstorms, together with the locations of reported landslides with incident dates or incident reported dates that can be attributed to the rainstorm events, and the locations and values of maximum rolling rainfalls for durations ranging from five minutes to 48 hours.

The rainstorms of 31 July to 2 August 2019 and 25 to 27 August 2019 caused 18 and 12 reported landslides respectively.

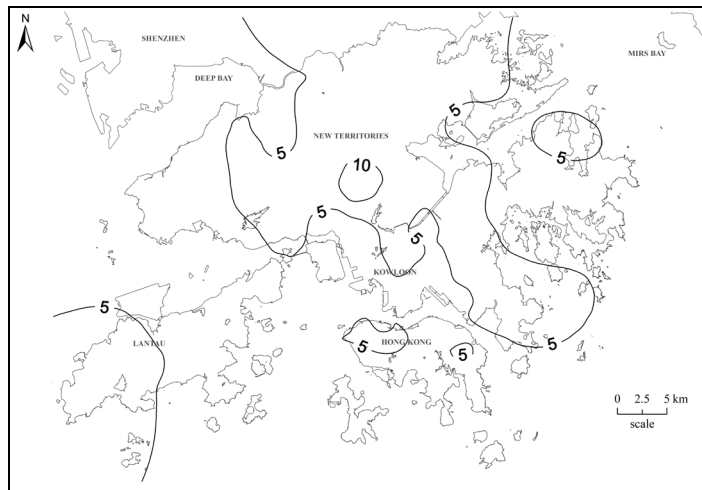
2.4 Warnings Issued by the Hong Kong Observatory

Table 2.2 summarises the details of the Flooding, Landslip, Tropical Cyclone and Rainstorm Warnings issued by the HKO in 2019. No Black Rainstorm Warning was issued in 2019. Three Red Rainstorm Warnings and 37 Amber Rainstorm Warnings were issued between 20 April and 26 August 2019, and between 19 February and 14 October respectively. Two Landslip Warnings were issued between 31 July and 2 August 2019, and on 26 August 2019.

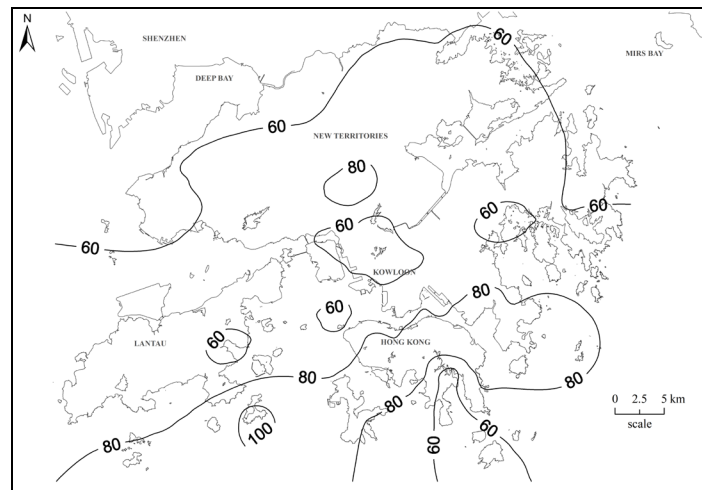


Note: Rainfall recorded at Hong Kong Observatory, Tsim Sha Tsui.

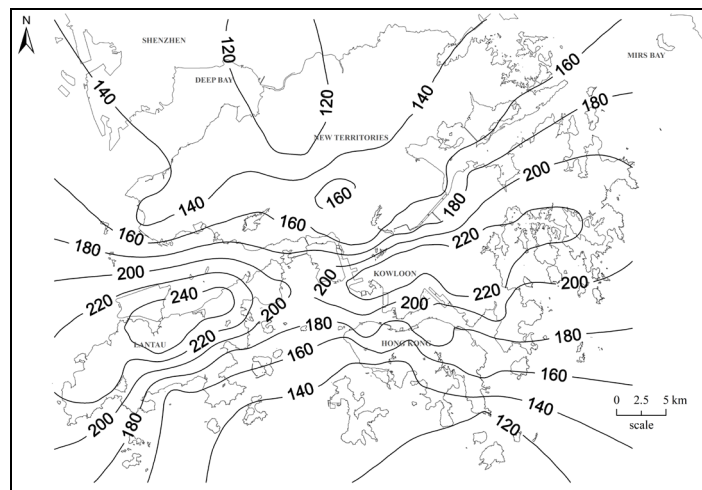
Figure 2.2 Cumulative Rainfall for 2019 at the Hong Kong Observatory and its Recorded Highest, Mean and Lowest Cumulative Rainfalls



January 2019



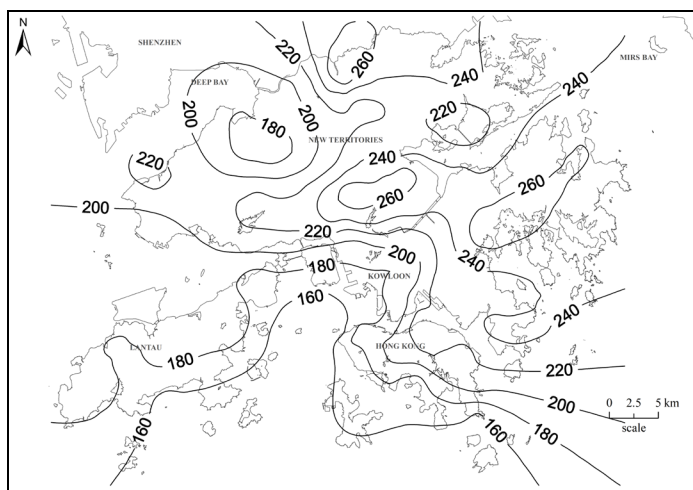
February 2019



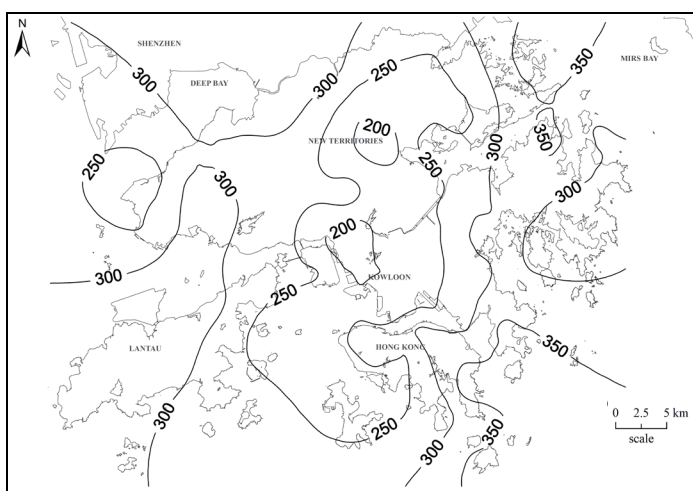
March 2019

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

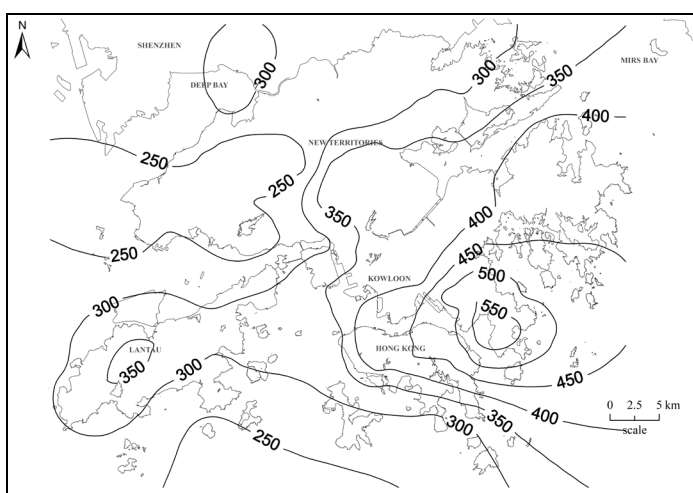
Figure 2.3 Monthly Rainfall Distribution in 2019 (Sheet 1 of 4)



April 2019



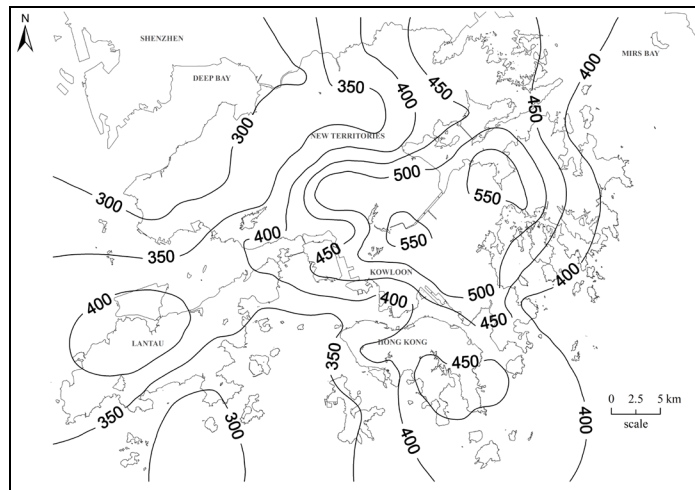
May 2019



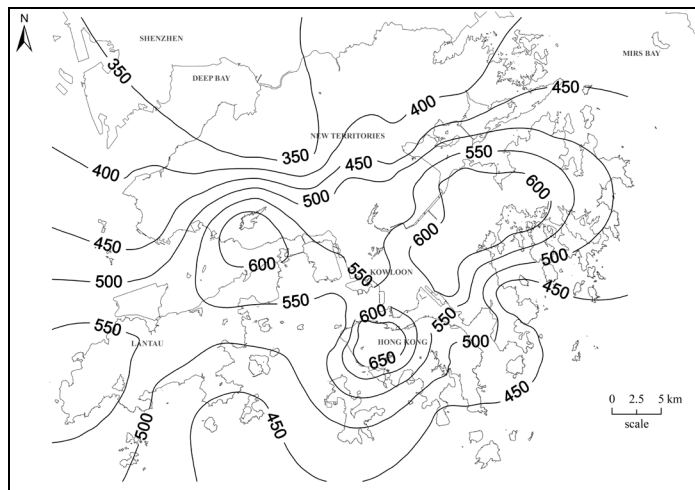
June 2019

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

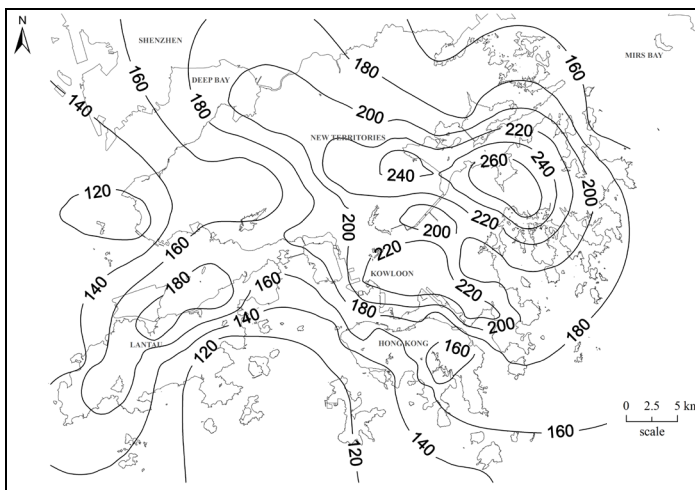
Figure 2.3 Monthly Rainfall Distribution in 2019 (Sheet 2 of 4)



July 2019



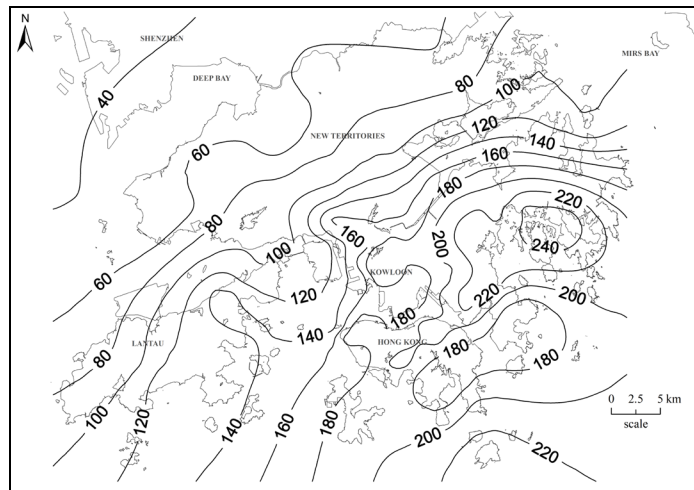
August 2019



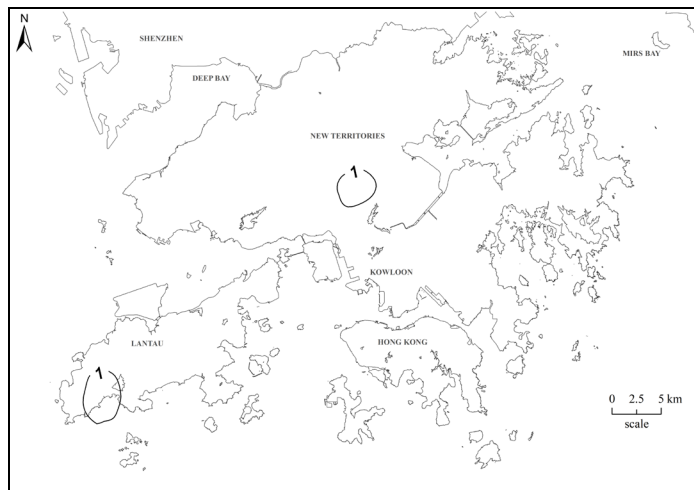
September 2019

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

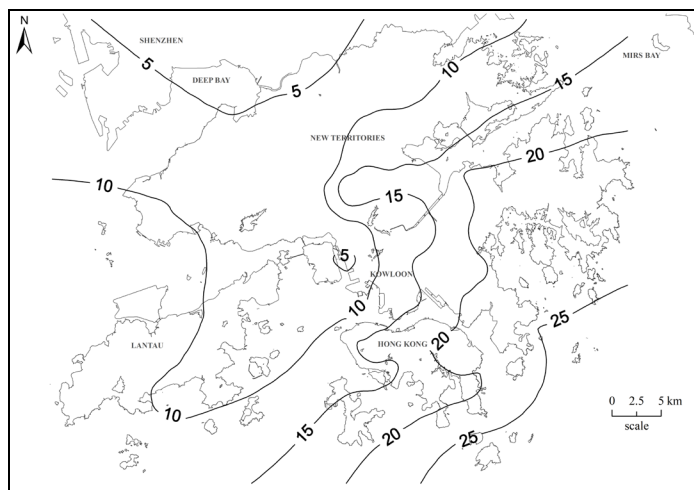
Figure 2.3 Monthly Rainfall Distribution in 2019 (Sheet 3 of 4)



October 2019



November 2019



December 2019

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

Figure 2.3 Monthly Rainfall Distribution in 2019 (Sheet 4 of 4)

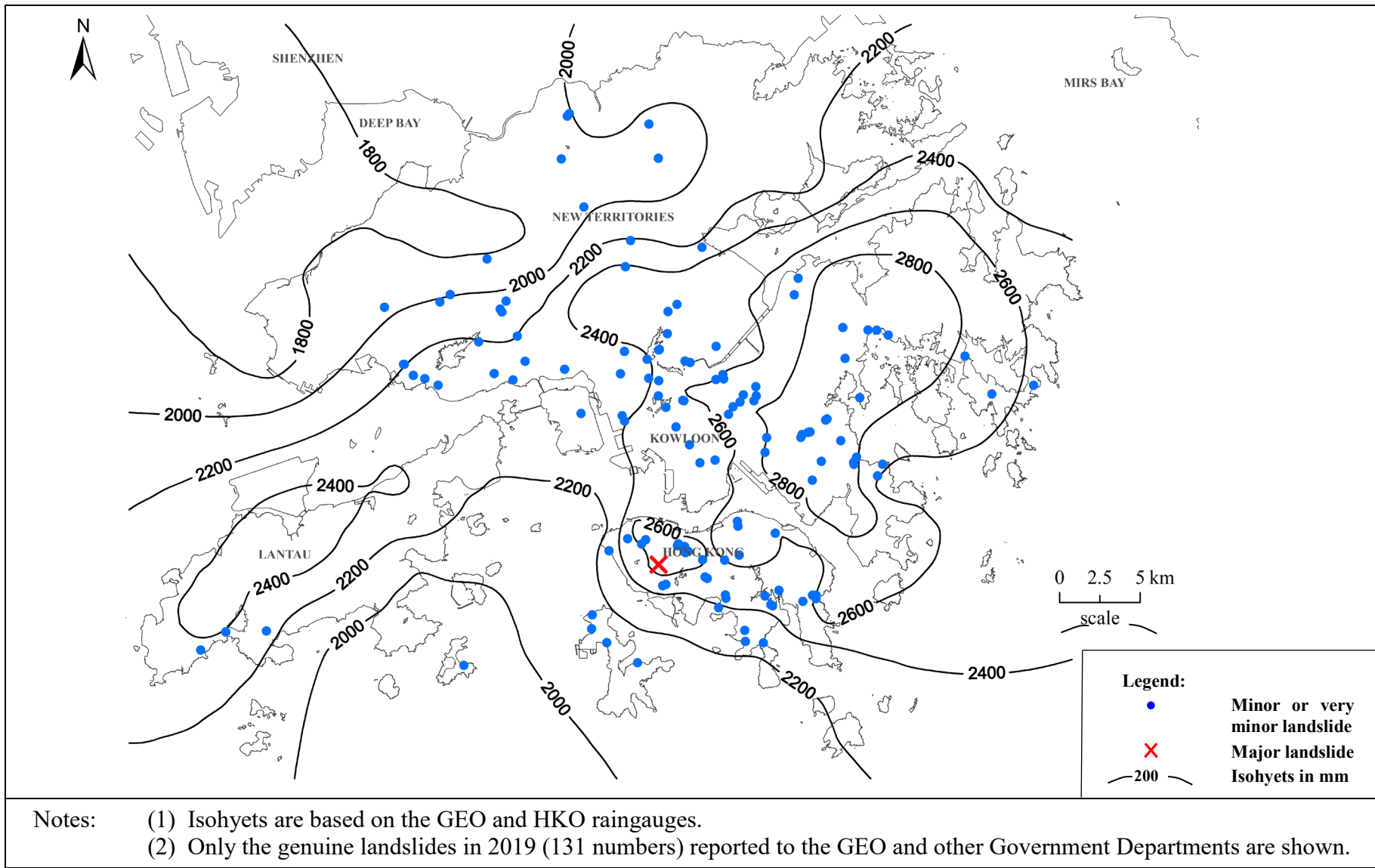


Figure 2.4 Annual Rainfall Distribution and Locations of Reported Landslides in 2019

Table 2.1 Rainfall and Landslides in 2019 and Selected Previous Major Rainstorms (Sheet 1 of 2)

Date of Rainstorm Event	Maximum Rainfall (mm) ⁽¹⁾								Number of Landslides Reported ⁽³⁾
	Hong Kong Observatory (HKO)					GEO Raingauges ⁽²⁾			
	24-hr	4-hr	1-hr	Antecedent		24-hr	4-hr	1-hr	
				4-day	15-day				
31 July - 2 August 2019	161.5	55.0	36.5	14.5	45.5	279.0 (N37)	143.5 (K07)	81.5 (N16)	18
25-27 August 2019	192.5	122.0	54.0	18.5	150.0	266.0 (H16)	156.0 (H16)	80.0 (H05)	12

- 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) The maximum rainfalls are selected from the 90 GEO Raingauges for the rainstorms. The GEO Raingauge reference number is shown in brackets.
 - (3) Reported landslides refer to those genuine landslides that can be attributed to the rainstorm events.

Table 2.1 Rainfall and Landslides in 2019 and Selected Previous Major Rainstorms (Sheet 2 of 2)

Date of Rainstorm Event	Maximum Rainfall (mm) ⁽¹⁾								Number of Landslides Reported ⁽³⁾
	Hong Kong Observatory (HKO)					GEO Raingauges ⁽²⁾			
	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) The maximum rainfalls are selected from all the available GEO Raingauges for the rainstorms. The GEO Raingauge reference number is shown in brackets.
 - (3) Reported landslides refer to those genuine landslides that can be attributed to the rainstorm events.

Table 2.2 Warnings Issued by the Hong Kong Observatory in 2019

Month	Monthly Total Rainfall (mm)	Dates on which Warnings ⁽¹⁾ were in Effect			
		Flooding ⁽²⁾	Landslip ⁽³⁾	Tropical Cyclone ⁽⁴⁾	Rainstorm
January	4.7	-	-	-	-
February	68.7	-	-	-	19 (Amber)
March	186.5	-	-	-	6 (Amber)
April	185.8	11, 20	-	-	11 (Amber), 18 (Amber), 19 (Amber), 20 (2 x Amber), 20 (Red), 27 (Amber)
May	234.6	-	-	-	20 (Amber), 21 (Amber), 26 (Amber), 27 (Amber), 28 (Amber)
June	429.1	-	-	-	1 (Amber), 4 (Amber), 11 (Amber), 13 (2 x Amber), 14 (Amber), 25 (Amber)
July	328.5	31	31	2-3 (1, MUN) 30-31 (1-8, WIPHA)	3 (Amber), 19 (2 x Amber), 20 (Amber), 31 (2 x Amber), 31 (Red)
August	596.4	-	1-2, 26	1-2 (1-3, WIPHA) 24-25 (1, BAILU) 28-29 (1, PODUL)	1 (Amber), 2 (Amber), 14 (Amber), 17 (Amber), 25 (3 x Amber), 26 (Amber), 26 (Red)
September	198.9	-	-	1-3 (1-3, KAJIKI)	2 (Amber)
October	149.5	-	-	-	6 (Amber), 14 (Amber)
November	0.0	-	-	-	-
December	13.5	-	-	-	-
Total	2396.2	3 Warnings	2 Warnings	5 Warnings	40 Warnings (37 x Amber & 3 x Red)

- Notes:
- (1) Warnings and signals were based on the information from the HKO.
 - (2) More than one Flooding 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 number hoisted is shown in the bracket followed by the name of the tropical cyclone.

3 Landslides

3.1 Landslides in 2019

Landslide incidents occurring in 2019 and reported to the GEO and other government departments are summarised in Table 3.1.

Table 3.1 Breakdown of Landslides in 2019 Reported to Government Departments

Department	Reported Number of Landslides	Genuine Landslides
Agriculture, Fisheries and Conservation Department	9 (0)	9 (0)
Architectural Services Department	0	0
Drainage Services Department	0	0
Geotechnical Engineering Office, Civil Engineering and Development Department	92 ⁽¹⁾	78 ⁽¹⁾
Highways Department	29 (17)	25 (17)
Housing Department	1 (0)	1 (0)
Lands Department	9 (0)	9 (0)
Water Supplies Department	34 (0)	26 (0)
Total	174 (17) ⁽²⁾	148 (17) ⁽²⁾

Legend:

29 (17) Twenty-nine incidents were reported to the government department concerned, 17 of which were also reported to the GEO separately by other parties (i.e. duplicate cases)

Notes: (1) A total of 92 landslide incidents that occurred in 2019 (discounting duplicate cases) were reported to the GEO, of which 78 were classified as genuine landslides.

(2) The number of reported landslide incidents that occurred in 2019 (discounting duplicate cases) is **157** [174 - 17]. The number of genuine landslides is **131** [148 - 17].

A total of 157 landslide incidents that occurred in 2019 were reported to various government departments. These include 92 incidents (discounting duplicate cases) reported to the GEO. Another 65 incidents were reported to other government departments (i.e. AFCD, HyD, HD, LandsD and WSD). Of these 157 reported incidents, 131 were genuine landslides (see details in Appendix B). The other reported incidents were non-landslide events such as tree falls.

Of the 131 genuine landslides, one (0.8%) was a major landslide (see Table B1 in Appendix B), 90 (68.7%) were minor landslides and 40 (30.5%) were very minor landslides with negligible consequences (see Section 1).

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

Wherever possible, the dates and times of the landslides were assessed by geotechnical professionals. Of the 131 landslides, the timing of occurrence was determined to within one day for 56 incidents based on the reported date of failure given in the incident reports. For the remaining landslide incidents, the timing of occurrence could not be ascertained due to lack of information or that the incidents were not reported to the GEO or other government departments until several days or even weeks after occurrence.

3.2 Consequence of Landslides

The consequence of landslides in terms of the types of facilities affected (e.g. buildings, roads, registered squatter dwellings, catchwaters, construction sites, etc.) in different regions is summarised in Table 3.2. In regard to the landslides with significant consequences (e.g. casualties, evacuation of buildings or squatter dwellings, temporary closure of roads, etc.), they are classified with respect to the types of slope failures, as shown in Table 3.3. The facility groups affected by the major landslides are presented in Table 3.4. Further descriptions of some selected notable landslides of 2019 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 four major types of slope failures, i.e. fill slopes, cut slopes, retaining walls and natural hillside. The breakdown of different types of slope failures is shown in Table 3.5.

Table 3.2 Breakdown of Landslides by Types of Affected Facilities

Types of Affected Facilities	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
Buildings (including village houses)	1 (0)	0	10 (0)	11 (0)
Registered Squatter Dwellings	0	0	11 (0)	11 (0)
Roads	13 (1)	3 (0)	6 (0)	22 (1)
Transportation Facilities (e.g. railways, tramways, etc.)	0	0	0	0
Pedestrian Pavements/Footways	3 (0)	3 (0)	5 (0)	11 (0)
Minor Footpaths/Access Paths/Access Roads	12 (1)	2 (0)	30 (0)	44 (1)
Construction Sites	1 (0)	0	0	1 (0)
Open Areas	4 (0)	0	4 (0)	8 (0)
Catchwaters	3 (0)	0	10 (0)	13 (0)
Others (e.g. carparks, parks, playgrounds, gardens, backyards, etc.)	2 (0)	0	3 (0)	5 (0)
Nil	0	0	11 (0)	11 (0)
Total	39 (2)	8 (0)	90 (0)	137 (2)

Legend:

13 (1) Thirteen landslides of which one was a major failure

Notes: (1) Incidents that were not genuine landslides have been excluded.
(2) A given landslide may affect more than one type of facility.
(3) 'Nil' refers to incidents where the landslide debris came to rest on the slopes, not affecting any facilities.

Table 3.3 Breakdown of Landslide Consequences by Types of Slope Failures

Types of Slope Failures		Number of Squatter Dwellings ⁽¹⁾ Evacuated		Number of Floors, Houses or Flats Evacuated or Partially Closed	Number of Incidents Involving Closure			Deaths	Injuries reported to GEO
		Permanent	Temporary		Roads	Pedestrian Pavements	Footpaths, Alleyways or Private Access Paths		
Fill Slopes		0	0	0	0	1	0	0	0
Cut Slopes	Soil	0	0	0	1	1	1	0	0
	Soil/Rock	0	0	0	1	0	1	0	0
	Rock	0	0	0	2	1	0	0	0
Retaining Walls		0	0	0	0	0	0	0	0
Natural Hillside		0	0	0	3	0	2	0	0
Total		0	0	0	7	3	4	0	0

Notes: (1) A squatter dwelling is defined as a place of residence that contains one or more tolerated squatter structures, i.e. all structures registered in 1982 Housing Department's Squatter Structure Survey (GEO, 2018).
(2) A failure may give rise to more than one type of consequence.

Table 3.4 Breakdown of Facility Groups Affected by Major Landslides

Types of Major Landslides	Facility Group Affected by Major Landslides (Group No.)						
	1a	1b	2a	2b	3	4	5
All Major Landslides	0	0	0	0	0	0	2
Major Landslides on Man-made Slopes	0	0	0	0	0	0	0
Major Landslides on Natural Hillside	0	0	0	0	0	0	2

Notes: (1) Facility groups are classified in accordance with the GEO Technical Guidance Note No. 15 (GEO, 2007).

(2) A given landslide may affect more than one type of facility.

Table 3.5 Breakdown of Landslides by Types of Slope Failures

Types of Slope Failures		Number	Percentage (%)
Fill Slopes		9 (0)	6.9
Cut Slopes	Soil	61 (0)	46.5
	Soil/Rock	16 (0)	12.2
	Rock	14 (0)	10.7
Retaining Walls		15 (0)	11.5
Natural Hillside		16 (1)	12.2
Total		131 (1)	100

Legend:

16 (1) Sixteen landslides, one of which was a major failure

Note: Where a landslide involved more than one type of failure, the predominant type of failure has been considered in the above classification.

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 89 landslides (67.9%) involved less than 5 m³ of material. There was one major landslide (with a failure volume of 50 m³ or more), which occurred on the natural hillside below the access road to No. 7 Peel Rise with a failure volume of about 283 m³ in association with the bursting of a watermain.

Table 3.6 Landslide Volume Distribution with Respect to Geographical Locations

Volume of Failure (m ³)	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
< 5	25	6	58	89 (67.9%)
≥ 5 to < 10	0	2	17	19 (14.5%)
≥ 10 to < 20	5	0	8	13 (9.9%)
≥ 20 to < 50	3	0	6	9 (6.9%)
≥ 50 to < 200	0	0	0	0 (0%)
≥ 200 to < 500	1	0	0	1 (0.8%)
≥ 500 to < 1000	0	0	0	0 (0%)
≥ 1000	0	0	0	0 (0%)
Total	34	8	89	131 (100%)

Legend:

89 (67.9%) Eighty-nine landslides, which amount to 67.9% of the total 131 genuine landslides reported to the Government

Table 3.7 Landslide Volume Distribution with Respect to Types of Slope Failures

Volume of Failure (m ³)	Fill Slopes	Cut Slopes			Retaining Walls	Natural Hillside	Total
		Soil	Soil/Rock	Rock			
< 5	3	39	12	13	13	9	89 (67.9%)
≥ 5 to < 10	5	11	0	1	0	2	19 (14.5%)
≥ 10 to < 20	0	8	4	0	1	0	13 (9.9%)
≥ 20 to < 50	1	3	0	0	1	4	9 (6.9%)
≥ 50 to < 200	0	0	0	0	0	0	0 (0%)
≥ 200 to < 500	0	0	0	0	0	1	1 (0.8%)
≥ 500 to < 1000	0	0	0	0	0	0	0 (0%)
≥ 1000	0	0	0	0	0	0	0 (0%)
Total	9	61	16	14	15	16	131 (100%)

Note: Where a landslide involved more than one type of failure, the predominant type of failure has been considered in the above classification.

4 Notable Landslides

4.1 General

Of the 131 genuine landslides reported to the Government that occurred in 2019, four incidents are described in more detail below. These four incidents have been selected on the basis of their consequences and scales.

4.2 The 2 August 2019 Landslide on a Retaining Wall at Tai Tong Shan Road, Yuen Long (Incident No. 2019/08/2481)

On 2 August 2019, an incident involving a concrete block retaining wall was reported to have occurred at Tai Tong Shan Road, Yuen Long (Figure 4.1). The time of the incident was not known while there had been intense rainfall in precedent of the reporting time. Associated with Amber and Red Rainstorm Warnings, Landslip Warning was in effect between the night time of 31 July and the morning of 2 August 2019. The incident involved an overturning failure of concrete block wall with a failure volume of about 25 m³. The wall, of about 700 mm thick, was recently formed to retain a fill platform with a retaining height of about 2.5 m. The fallen concrete blocks damaged the steel cladding wall and supporting frame of a flimsy storage structure at the wall toe. No casualty was reported.

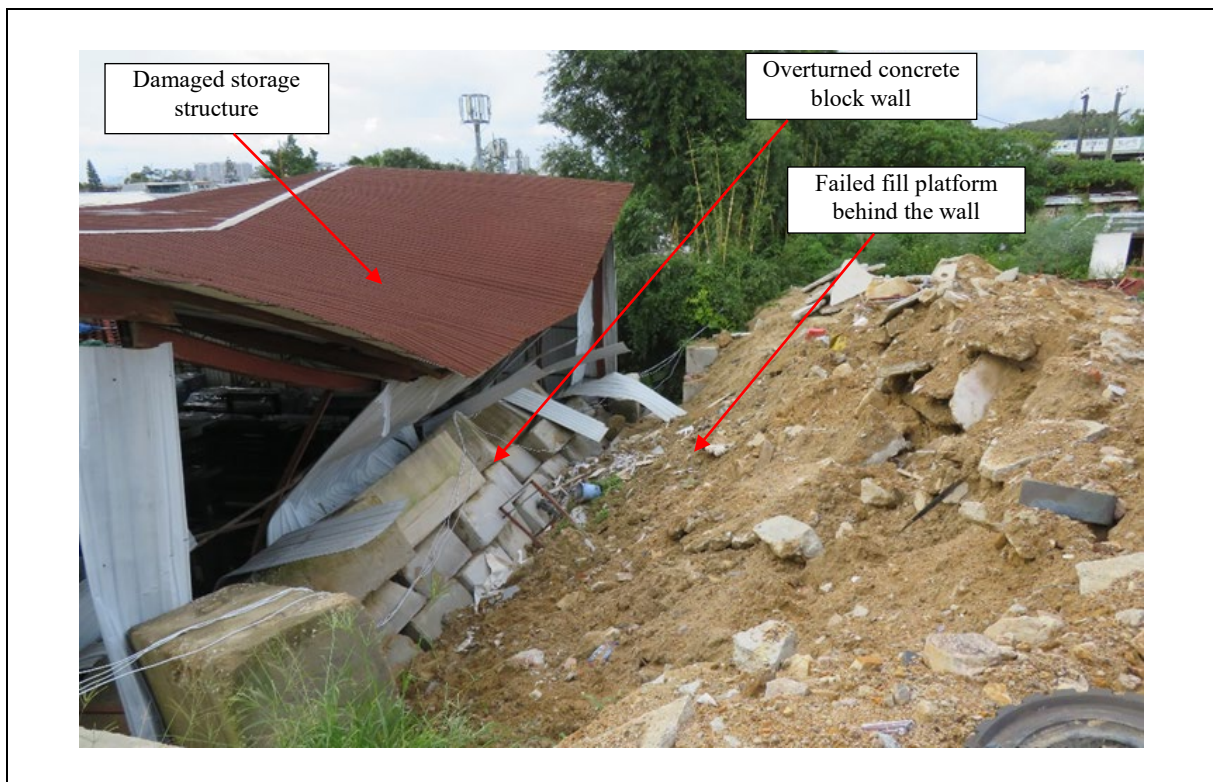


Figure 4.1 View of the 2 August 2019 Landslide on a Retaining Wall at Tai Tong Shan Road, Yuen Long (Incident No. 2019/08/2481)

4.3 The 26 August 2019 Landslide on a Cut Slope at No. 88A Pok Fu Lam Road, Hong Kong Island (Incident No. 2019/08/2488)

At about 6:45 a.m. on 26 August 2019 when Landslip Warning was in effect, a landslide occurred on a soil cut slope originally shielded behind the brick wall of a residential building at No. 88A Pok Fu Lam Road (Figure 4.2). The landslide, involving an estimated failure volume of about 10 m³, resulted in the collapse of a portion of the brick wall with the debris deposited and partially blocked the access road adjacent to the building. No casualty was involved and the incident was reported by several media sources.



Figure 4.2 Views of the 26 August 2019 Landslide on a Cut Slope at No. 88A Pok Fu Lam Road, Hong Kong Island (Incident No. 2019/08/2488)

4.4 The 19 April 2019 Landslide on a Retaining Wall behind Nos. 24 and 25 O Long Village, Sai Kung (Incident No. 2019/04/2427)

At about 6:00 p.m. on 19 April 2019 when Amber Rainstorm Warning was in effect, a landslide occurred on a rubble retaining wall behind two squatter dwellings of Nos. 24 and 25 O Long Village, Sai Kung (Figure 4.3). The subject retaining wall was about 1.7 m in height at the failure location. The landslide involved a failure volume of approximately 2 m³. The landslide debris was deposited on the alleyway behind the two squatter dwellings and piled up against the external wall of the structures. The landslide resulted in damage of the windows of one of the two squatter dwellings. No casualty was reported.



Figure 4.3 View of the 19 April 2019 Landslide on a Retaining Wall behind Nos. 24 and 25 O Long Village, Sai Kung (Incident No. 2019/04/2427)

4.5 The 26 June 2019 Rockslide on Slope No. 11NW-D/C16 at Argyle Street, Mong Kok (Incident No. 2019/06/2456)

At about 6:30 p.m. on 26 June 2019, a rockslide occurred on the lower batter of slope No. 11NW-D/C16 at Argyle Street, Mong Kok (Figure 4.4). Little rain was recorded preceding the incident on that day. A rockslide with a failure volume of approximately 4 m³ originated from the bare rock cut face of the slope. The debris, comprising rock fragments and some vegetation, was largely deposited on the pedestrian pavement and some of it was found on a road lane. As a result, two road lanes, the pedestrian pavement and the bus stops at slope toe were temporarily closed. No casualty was involved. The incident was reported in the media.

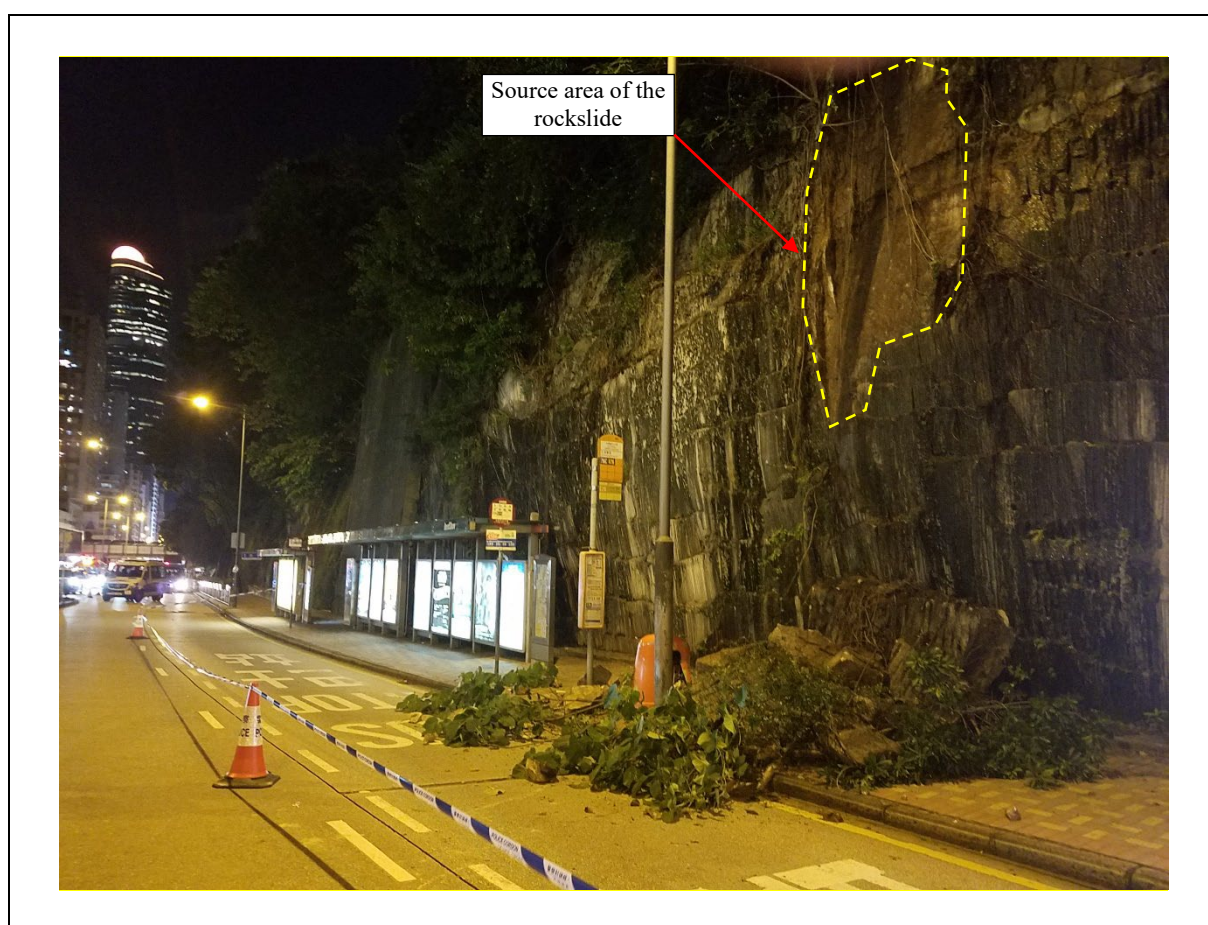


Figure 4.4 View of the 26 June 2019 Rockslide on Slope No. 11NW-D/C16 at Argyle Street, Mong Kok (Incident No. 2019/06/2456)

5 Conclusion

Rainfall recorded at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 2396.2 mm in 2019, near the mean annual rainfall of 2398.5 mm between 1981 and 2010. In 2019, two Landslip Warnings were issued between 31 July and 2 August and on 26 August 2019. Of the 131 genuine landslides, one was a major failure, 90 were minor failures and 40 were very minor failures with negligible consequences.

There were ten landslides in 2019 with notable consequences. Of these landslides, one led to damage of windows of a squatter dwelling, one resulted in damage of a storage structure and one resulted in partial collapse of a brick wall of a residential building. The remaining seven landslides resulted in temporary closure of roads. Other landslides in 2019 primarily affected footpaths or minor access roads, catchwaters, open areas and a construction site without any significant direct or indirect consequence. No fatality was reported as a result of the landslides.

6 References

- GEO (2007). *Guidelines for Classification of Consequence-to-Life Category for Slope Features (GEO Technical Guidance Note No. 15)*. Geotechnical Engineering Office, Civil Engineering and Development Department, Hong Kong, 14 p.
- GEO (2018). *Non Development Clearance (Slope Safety) of Squatters (GEO Circular No. 3)*. Geotechnical Engineering Office, Civil Engineering and Development Department, Hong Kong, 19 p.
- HKO (2020). *The Year's Weather - 2019*. Hong Kong Observatory, Hong Kong, 8 p.

Appendix A

Some Selected Rainfall Parameters for the Two Rainstorms
with Landslip Warnings issued in 2019

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Table A1 Some Selected Rainfall Parameters for the Two Rainstorms with Landslip Warnings Issued in 2019

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	31 July - 2 August 2019	18	N16	29	N16	37.5	N16	59	N16
2	25-27 August 2019	13	H29	22	N54	32	N54	47.5	H12, H16

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	31 July - 2 August 2019	81.5	N16	91	N16	143.5	K07	150	K07	152	N37
2	25-27 August 2019	80	H05	125.5	H16	156	H16	164.5	N06	168.5	N06

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	31 July - 2 August 2019	194.5	K07	234.5	K07	252.5	K07	279	N37	359	N53
2	25-27 August 2019	172	N06	186	H16	249.5	H04	266	H16	333.5	H04

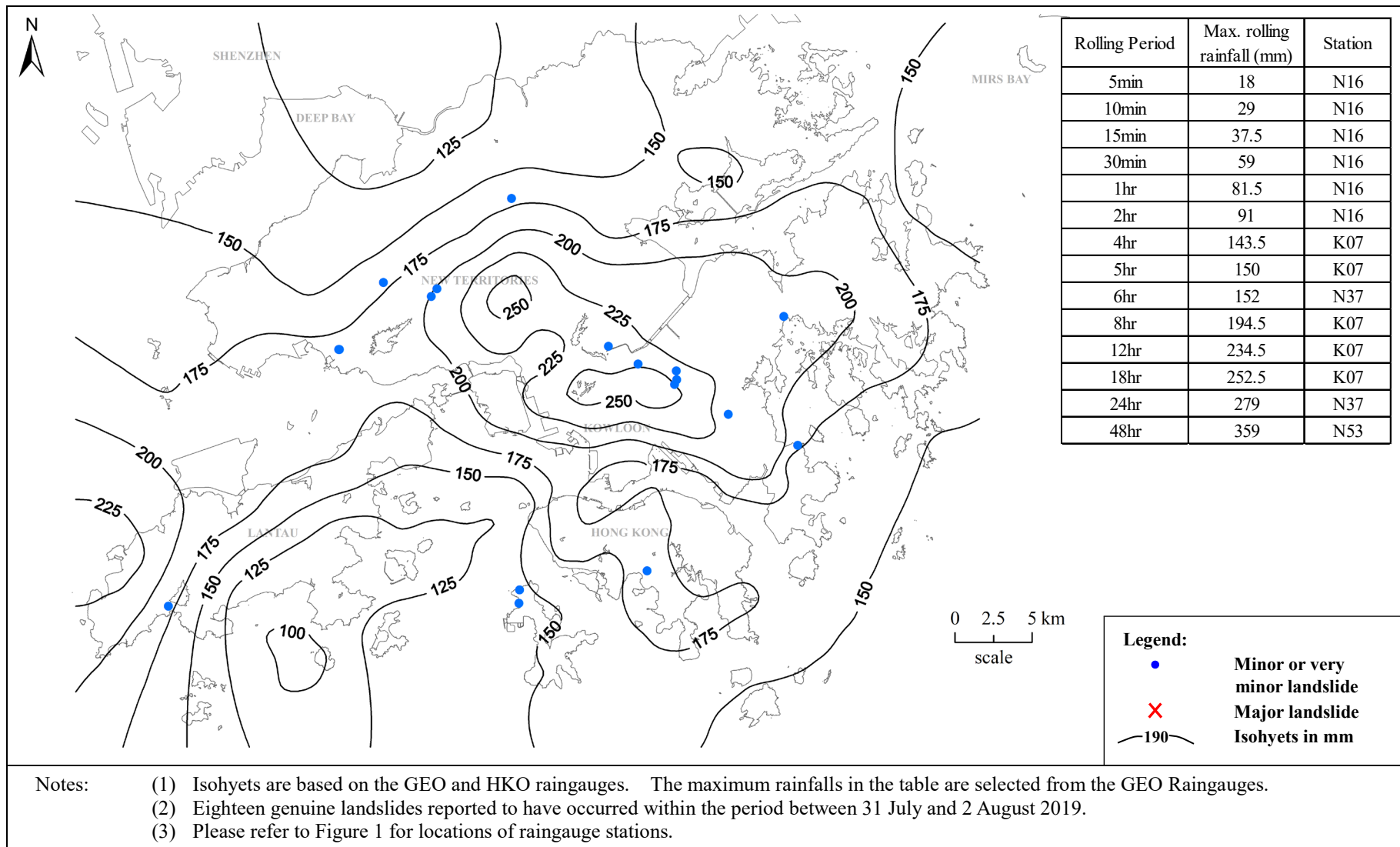


Figure A1 Maximum Rolling 24-hour Rainfall Distribution for the Period between 31 July (00:00) and 2 August 2019 (24:00) and Locations of Landslides

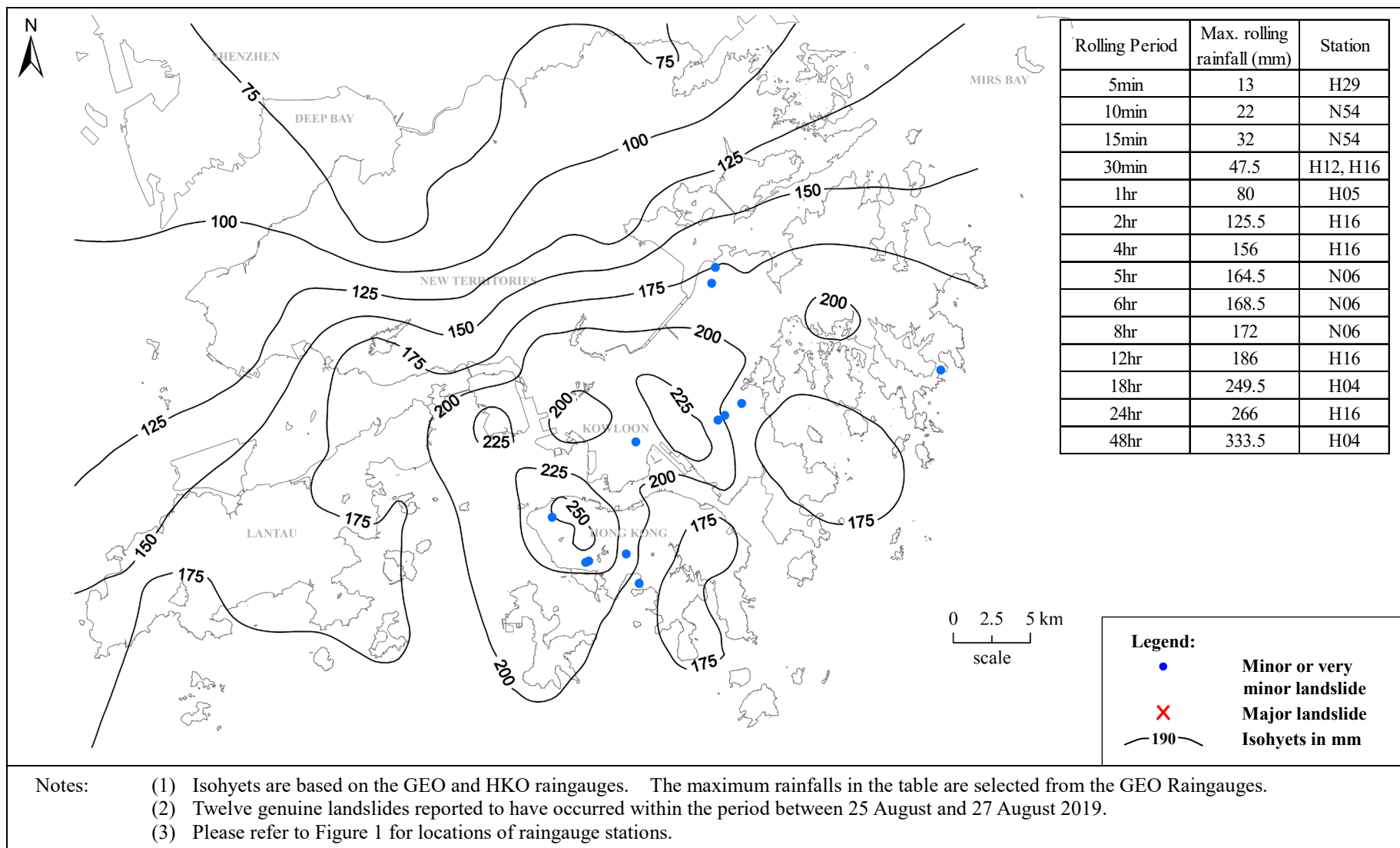


Figure A2 Maximum Rolling 24-hour Rainfall Distribution for the Period between 25 August (00:00) and 27 August 2019 (24:00) and Locations of Landslides

Appendix B

List of Landslide Incidents Reported to the Government

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Table B1 List of Major Landslide Incidents

Incident No.	Location	Feature Registration No. (if any)	Failure			Facility Affected	Consequence
			Date (Time)	Feature Type	Scale (m ³)		
2019/05/2434	Below the access road to No. 7 Peel Rise, the Peak	Natural hillside	6/5 (12:38)	Natural hillside	283	Road; access road	Peel Rise (one lane road) temporarily closed; access road pavement partially undermined

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 1 of 4)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/03/2423	Opposite to Lamp Post No. 35908, Repulse Bay Road	< 3 m high cut slope	6/3	Public	Unknown	Rock cut	0.02 (Rockfall)	Road	-
2019/04/2424	No. 1 Tai Shek Street, Sai Wan Ho	≥ 3 m high cut slope	1/4	BD	Unknown	Rock cut	0.2 (Rockfall)	Minor footpath	-
2019/04/2426	Peak Road	11SW-D/C589	12/4	HyD	12/4 (11:30)	Soil/rock cut	18	Road	All two lanes of Peak Road temporarily closed
2019/04/2428	Adjoining Feature No. 11SE-C/C146, Tai Tam Road	< 3 m high cut slope	20/4	HyD	20/4 (11:25)	Soil cut	0.1	Road	-
2019/04/2430	Within tenancy agreement no. HX558, Tai Tam Village, Stanley	2 m high retaining wall	23/4	BD	Unknown	Masonry wall	0.7	Pedestrian pavement; open area	-
2019/04/2431	Access road to No. 28 Lugard Road, the Peak	11SW-A/CR226	25/4	HyD	Unknown	Soil/rock cut	1.466	Access road; construction site	-
2019/05/2433	Near No. 20 Repulse Bay Road	15NE-A/F1	2/5	Public	20/4	Fill	21	Minor footpath; open area	-
2019/05/2434	Below the access road to No. 7 Peel Rise, the Peak	Natural hillside	6/5	Police	6/5 (12:38)	Natural hillside	283	Road; access road	Peel Rise (one lane road) temporarily closed; access road pavement partially undermined
2019/05/2438	Junction between Tai Hang Road and Mount Butler Road	11SE-C/C59	20/5	HyD	Unknown	Rock cut	0.1 (Rockfall)	Road	-
2019/05/2440	Peak Road	11SW-D/CR586	29/5	HyD	Unknown	Soil/rock cut	0.01	Road	-
2019/06/2446	Shek O Road	15NE-B/C34	5/6	HyD	4/6	Rock cut	2	Road	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 2 of 4)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/06/2447	Near Big Wave Bay Road car park overlooking the right of way for RBL290	< 3 m high cut slope	5/6	HyD	4/6	Soil cut	2	Access road	-
2019/06/2454	Big Wave Bay Village, opposite to FEHD's Refuse Collection Point	< 5 m high fill slope	13/6	HAD	24/4	Fill	2	Access road	-
2019/06/2457	Below House No. 359, Big Wave Bay Village, Shek O	≥ 3 m high cut slope	24/6	HAD	4/6	Soil cut	11.8	Minor footpath	-
2019/07/2461	Chung Hom Kok Road, Stanley	15NE-A/C131	4/7	HyD	Unknown	Soil cut	1	Other (gas governor kiosk)	-
2019/08/2476	No. 37 Repulse Bay Road, Repulse Bay	15NE-A/C13	1/8	Police	01/8 (11:45)	Rock cut	0.25 (Rockfall)	Road	One lane of Repulse Bay Road temporarily closed
2019/08/2483	Mount Butler Road, Jardine's Lookout	11SE-C/CR137	8/8	HyD	Unknown	Soil cut	1.4	Road	-
2019/08/2485	Above Feature No. 11SW-D/C336 at Mount Nicholson Road	Natural hillside	18/8	HyD	18/8 (19:07)	Natural hillside	0.12 (Boulder fall)	Pedestrian pavement	-
2019/08/2488	No. 88A Pok Fu Lam Road	7 m high cut slope	26/8	Police	26/8 (06:45)	Soil cut	10	Building; access road	Brick wall of the building partially collapsed
2019/08/2492	Above Peel Rise near Feature Nos. 11SW-D/C1935 and 11SW-D/DT12	Natural Hillside	26/8	Police	26/8 (00:00)	Natural hillside	20	Road	Peel Rise (one lane road) temporarily closed
2019/08/2496	Adjoining Seaview Promenade, below 38 Island Road	Natural Hillside	29/8	Public	27/8 (12:15)	Natural hillside	25	Open area	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 3 of 4)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/09/2499	South of Pumping Station, Sandy Bay Road, Pok Fu Lam	11SW-C/F124	3/9	GEO	Unknown	Fill	4.7	Open area	-
2019/09/2500	Behind Sky Scraper, Tin Hau Temple Road, North Point	11SE-A/CR43	14/9	Police	Unknown	Rock cut	0.16 (Rockfall)	Pedestrian pavement	Footpath temporarily closed
2019/10/2505	Bowen Road	11SW-B/CR211	9/10	HyD	Unknown	Soil cut	0.4	Road	-
2019/10/2509	Wai Tsui Crescent, North Point	11SE-A/C56	19/10	HyD	Unknown	Rock cut	0.12 (Rockfall)	Other (access stairway)	-
2019/05/1008WS (WSD/2019/5/1/HK&I)	Tai Tam Reservoir Road, Tai Tam	4 m high cut slope	6/5	WSD	Unknown	Soil/rock cut	3 (Rockfall)	Minor footpath	-
2019/05/1009WS (WSD/2019/5/2/HK&I)	Tai Tam Reservoir Road, Tai Tam	7 m high cut slope	6/5	WSD	Unknown	Soil/rock cut	4	Access road	-
2019/08/1032WS (WSD/2019/8/6/HK&I)	Aberdeen Valley Scheme, West Catchwater (1st Section), Ch.1310 - Ch. 1450	11SW-D/CR1700	27/8	WSD	Unknown	Soil/rock cut	16	Catchwater	Catchwater blocked
2019/08/1033WS (WSD/2019/8/7/HK&I)	Adjoining Catchwater within Aberdeen Country Park	11SW-D/CR2065	29/8	WSD	Unknown	Soil cut	16	Catchwater	Catchwater blocked
2019/08/1037HY (HyD/HK/2019/08/0027)	Unallocated Government Land adjacent to Feature No.11SW-B/C299, Borrett Road	> 3m high cut slope	9/8	HyD	9/8	Soil cut	0.4	Road	-

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

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/08/1038HY (HyD/HK/ 2019/08/0028)	Borrett Road	11SW-B/C187	9/8	HyD	9/8	Soil cut	0.04	Road	-
2019/11/1047HY (HyD/HK/ 2019/11/0034)	Natural Terrain opposite to Lamp Post No. 16706 on Lugard Road	Natural hillside	4/11	HyD	4/11	Natural hillside	0.3 (Boulder fall)	Minor footpath	-
2019/11/1048WS (WSD/2019/ 11/1/HK&I)	Aberdeen East Catchwater	11SW-D/CR1292	1/11	WSD	Unknown	Soil cut	0.2	Catchwater	-
2019/12/1054WS (WSD/2019/ 12/1/HK&I)	Tai Tam Tuk Reservoir Road	15NE-A/C444	10/12	WSD	Unknown	Soil cut	0.3	Access road	-

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

Table B3 List of Landslide Incidents in Kowloon

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/04/2429	Tai Po Road near Lung Yuet Road	11NW-B/FR15	22/4	HyD	19/4	Fill	6	Pedestrian pavement	-
2019/05/2436	At 20 m Northwest of Fuk Tak Temple	< 3 m high retaining wall	9/5	Others	Unknown	Masonry wall	0.1	Minor footpath	-
2019/06/2443	Tak Bo Garden Block H, 3 Ngau Tau Kok Rd, Jordan Valley	11NE-C/C188	1/6	Police	1/6 (10:30)	Rock cut	2.5	Access road	-
2019/06/2444	Adjacent to Feature No. 11NE-A/C494, Shatin Pass Road, Wong Tai Sin	< 3 m high cut slope	1/6	HyD	Unknown	Rock cut	0.1 (Rockfall)	Road	-
2019/06/2456	Argyle Street, Mong Kok	11NW-D/C16	26/6	Police	26/6 (18:36)	Rock cut	4 (Rockfall)	Road	Two lanes of Argyle Street and bus stops temporarily closed
2019/08/2489	14 Tin Kwong Road, opposite to Man Kwong College (Parking metre no.: 6712B, 6711A)	11NW-D/CR252	26/8	Police	26/8 (08:40)	Soil cut	8	Pedestrian pavement	Pedestrian pavement temporarily closed
2019/12/1049HY (HyD/K/2019/12/0032)	Shatin Pass Road	11NE-A/C916	20/12	HyD	20/1 (11:37)	Soil/rock cut	0.15	Road	-
2019/12/1050HD (Nil No.)	Below Ngau Chi Wan Street, Choi Wan (II) Estate	11NE-A/CR115	9/12	HD	9/12	Fill	0.05	Pedestrian pavement	Pedestrian pavement temporarily closed

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

Table B4 List of Landslide Incidents in the New Territories (Sheet 1 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/03/2421	Heung Fan Liu Street, Sha Tin	7SW-D/C344	5/3	HyD	Unknown	Soil cut	8	Access road	-
2019/03/2422	Tai Mong Tsai Road, Sai Kung	8SW-A/C247	6/3	HyD	6/3	Soil cut	1 (Rockfall)	Pedestrian pavement	-
2019/04/2427	Behind House No. 25 O Long Village, Po Lo Che, Sai Kung	1.7 m high retaining wall	19/4	Police	19/4 (18:00)	Rubble wall	2	Registered squatter dwelling	Damage of windows of a squatter dwelling
2019/05/2435	Lim Cho Street, Kwai Chung	11NW-A/C139	8/5	HyD	8/5	Rock cut	0.05 (Rockfall)	Pedestrian pavement	-
2019/05/2439	Near Lamp Post No. VD2764, access road north of Siu Hang San Village, Fanling	3SW-A/C79	15/5	DO	Unknown	Soil cut	2.5	Access road	-
2019/05/2441	No. 40 Luen On San Tsuen West, Castle Peak Road, Tai Lam, Tuen Mun	< 3 m high cut slope	29/5	Police	29/5 (00:00)	Soil cut	1	Minor footpath	-
2019/06/2445	Clearwater Bay Road at Sheung Yeung, Sai Kung	Natural hillside	4/6	Police	4/6 (08:27)	Natural hillside	1	Road	One lane of Clear Water Bay Road temporarily closed
2019/06/2448	Ma Nam Wat Village	Natural hillside	3/6	Public	29/5	Natural hillside	1.5 (Boulder fall)	Registered squatter dwelling	-
2019/06/2449	Adjacent to Lamp Post No. SSTD0058, near House No. 75B, Sha Tin Tau New Village Area 6	< 3 m high retaining wall	11/6	Public	11/6 (05:00)	Retaining wall	0.26	Access road	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 2 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/06/2450	Behind No. 10 Château de Maison, Ha Wong Yi Au, Tai Po	7NW-B/C586	10/6	Police	31/5 (15:30)	Soil cut	10	Building	-
2019/06/2451	Below Feature No. 12NW-C/FR187	Natural hillside	10/6	Public	8/6 (10:50)	Natural hillside	0.63	Building	-
2019/07/2458	House No. 35B, Tseng Lan Shue Tsuen	< 3 m high retaining wall	3/7	BD	3/7 (18:30)	Retaining wall	4	Village House	-
2019/07/2459	Tsing Chin Street, Tsing Yi	10NE-B/C70	7/7	HyD	5/7 (11:00)	Soil cut	5	Road	-
2019/07/2460	Golden Hill Road, Sha Tin	7SW-C/F246	8/7	HyD	4/7	Fill	9.8	Access road	-
2019/07/2462	Castle Peak Road, Kwai Chung	7SW-C/C282	8/7	HyD	3/7	Soil cut	1.5	Pedestrian pavement	-
2019/07/2463	Southwest of No. 21A, Siu Lam Tsuen, Tuen Mun	< 3 m high retaining wall	8/7	Public	3/7 (12:00)	Masonry wall	3	Registered squatter dwelling	-
2019/07/2464	Near Tai Po Tsai Service Reservoir, Clear Water Bay Road	< 3 m high cut slope	14/6	DLO	14/6	Soil cut	0.42	Nil	-
2019/07/2465	Behind Lot No. 1564 in D.D. 8, Ping Long Village, Tai Po	< 3 m high retaining wall	17/7	DLO	Unknown	Masonry wall	1.5	Minor footpath; other (platform above the retaining wall)	Crest platform locally undermined
2019/07/2466	Adjacent to Celestial Villa, near Ta Ku Ling San Tsuen, Sai Kung	11NE-B/C770	22/7	LandsD	15/7	Soil cut	2	Pedestrian pavement	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 3 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/07/2467	Fan Kam Road, Yuen Long	2SE-D/C377	31/7	Public	31/7 (18:00)	Soil cut	0.001	Nil	-
2019/07/2468	Kak Tin Village, Sha Tin	7SW-D/C655	31/7	DO	31/7	Soil cut	40	Minor footpath	-
2019/08/2471	Behind House 87B, Pak Shek Wo San Tsuen, Pak Shek Wo, North of Clear Water Bay Road	< 3 m high cut slope	1/8	Police	1/8	Soil cut	9.5	Registered squatter dwelling	-
2019/08/2472	Near Coral Villa, road adjoining Wing Lung Road, Tseung Kwan O	< 3 m high cut slope	1/8	Police	1/8	Soil/rock cut	18	Access road	Access road (one lane road) to Coral Villa temporarily closed
2019/08/2473	Near House No.24 of Kwun Yam Shan Tsuen, Kwun Ping Road, Tsz Wan Shan, Sha Tin	7SE-C/C423	1/8	DLO	1/8	Soil cut	0.16	Minor footpath	-
2019/08/2474	Kwun Ping Road, Sha Tin	7SE-C/C349	1/8	DLO	1/8	Soil cut	1	Road	-
2019/08/2477	Shatin Pass Road, Wong Tai Sin	7SE-C/C408	1/8	HyD	1/8	Rock cut	3.14	Road	-
2019/08/2478	Pak Tin Tsuen, at the SE to the Shatin 400kV Substation, Heung Fan Liu, Tai Wai	7SW-D/C1024	1/8	DLO	31/7	Soil cut	2.5	Nil	-
2019/08/2481	Lot No. 1305 in DD117, No. 11 Tai Tong Shan Road, Yuen Long	2.5 m high retaining wall	2/8	FSD	Unknown	Retaining wall	20	Building	Storage structure damaged

Table B4 List of Landslide Incidents in the New Territories (Sheet 4 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/08/2482	Near Rhine Terrace, Castle Peak Road, Sham Tseng	6SE-C/C18	8/8	Public	8/8	Rock cut	1.8 (Rockfall)	Nil	-
2019/08/2484	Yeung Ka Tsuen	< 3 m high retaining wall	15/8	DO	Unknown	Masonry wall	1	Minor footpath	-
2019/08/2486	Near Lamp Post No. EB4387, Fu Ning Garden, Tseung Kwan O	12NW-C/C582	15/8	Public	12/8	Soil cut	8	Pedestrian pavement	-
2019/08/2490	Ma Kam Street, Ma On Shan	7NE-D/C93	26/8	HyD	26/8 (10:00)	Soil cut	20	Road	One lane of Ma Kam Street temporarily closed
2019/08/2491	Above house No.26C, Tseng Lan Shue Tsuen, Sai Kung	11NE-B/C1052	26/8	Police	26/8	Soil cut	6.3	Building	-
2019/08/2495	50 m North of Feature No. 7NE-D/C176, Ma On Shan Tsuen Road	< 3 m high fill slope	26/8	DO	26/8 (10:00)	Fill	5	Road	-
2019/08/2497	Pak Shek Wo San Tsuen, Sai Kung	< 3 m high cut slope	30/8	Police	27/8	Soil cut	2	Registered squatter dwelling	-
2019/09/2498	Masonry wall adjacent to Lamp Post No. SST-D-0027, near House No. 49, Shatin Tau New Village, Sha Tin	2 m high retaining wall	2/9	Public	Unknown	Masonry wall	0.8	Minor footpath	-
2019/09/2501	Ta Ku Ling San Tsuen, Sai Kung	11NE-B/R433	13/9	LandsD	27/8	Masonry wall	3.3	Registered squatter dwelling	-
2019/09/2503	Hiking trail between Sai Kung Man Yee Road and Pak A Village, Sai Kung	< 3 m high cut slope	16/9	DO	Unknown	Soil cut	16	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 5 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/10/2504	Near Feature No. 6NE-C/C6, Shek Tong Tsuen	< 3 m high retaining wall	4/10	LandsD	Unknown	Retaining wall	3.6	Minor footpath	-
2019/10/2506	Above Chuk Yuen North Estate, Wong Tai Sin	Natural hillside	11/10	GEO	11/10 (14:30)	Natural hillside	0.42	Building	-
2019/10/2507	At access road leading to Mau Tat Village	7SE-C/C132	15/10	DO	Unknown	Soil cut	0.3	Access road	-
2019/10/2508	To the west of Lamp Post No. VE3268	Natural hillside	14/10	DLO	2/9	Natural hillside	1.5	Minor footpath	-
2019/10/2510	Entrance of Shui Bin Village, Sai Kung	12NW-C/C217	23/10	DLO	Unknown	Soil cut	0.6	Building	-
2019/01/1001WS (WSD/2019/1/1/NTW)	Near access road to Tai Lam Chung Reservoir	6SW-B/C38	10/1	WSD	Unknown	Soil cut	0.8	Access road	-
2019/02/1003WS (WSD/2019/2/1/NTW)	Tai Lam Chung Catchwater (Section A), Ch. 0075 to Ch. 0190	6SE-A/CR187	25/2	WSD	Unknown	Soil cut	6	Catchwater	-
2019/03/1004WS (WSD/2019/3/1/NTE)	WSD access road to Pumping Station, High Island Reservoir, Sai Kung	8SE-C/C20	11/3	WSD	Unknown	Soil cut	3	Nil	-
2019/04/1005WS (WSD/2019/4/2/NTW)	Adjoining WSD access road leading to Ki Lun Shan Village Supply Tank	Natural hillside	23/4	WSD	Unknown	Natural hillside	36	Access road	-
2019/05/1006AF (AFCD/2019/05/0001)	Tai Lam Forest Track	6SE-A/C262	1/5	AFCD	1/5	Soil cut	5	Access road	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 6 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/05/1007LD (LandsD/2019/06/284)	House No. 23, Fu Tei Sheung Tsuen, Tuen Mun	6SW-A/C179	27/5	LandsD	27/5	Soil cut	3	Registered squatter dwelling	-
2019/06/1010AF (AFCD/2019/06/0001)	Adjacent to Tai Mong Tsai Barbecue Area Site 8	8SW-A/F31	1/6	AFCD	1/6	Fill	5	Open area	-
2019/06/1011WS (WSD/2019/6/1/NTW)	East of Lai Chi Kok, Salt Water Pumping Station, Mei Foo	11NW-A/C480	10/6	WSD	Unknown	Soil cut	0.4	Other (pumping station)	-
2019/06/1012WS (WSD/2019/6/2/NTW)	Near Sham Tseng, Settlement Basin, Sham Tseng	6SE-C/C171	25/6	WSD	Unknown	Soil/rock cut	13	Minor footpath	-
2019/06/1013LD (LandsD/2019/07/0286)	Ma Tso Lung, Sheung Shui	2SE-B/C348	2/6	LandsD	2/6	Soil cut	0.1	Registered squatter dwelling	-
2019/07/1015AF (AFCD/2019/07/0001)	Shing Mun Forest Track - Needle Hill Section	7SW-B/C434	1/7	AFCD	1/7	Soil cut	5	Access road	-
2019/07/1016AF (AFCD/2019/07/0002)	Shing Mun Arboretum, Shing Mun Country Park	7SW-B/C617	17/7	AFCD	17/7	Soil cut	1.5	Nil	-
2019/07/1017LD (LandsD/2019/07/0294)	No. 24 Ma Tso Lung Village, Sheung Shui	2SE-B/C331	16/7	LandsD	16/7	Soil cut	16	Nil	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 7 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/07/1018LD (LandsD/2019/09/0316)	Wilson Trail (between Ma Yau Tong and Lam Tin Park)	11NE-D/C911	10/7	LandsD	10/7	Soil cut	4.4	Minor footpath	-
2019/08/1020AF (AFCD/2019/08/0001)	Shing Mun Forest Track - Reservoir Section, Shing Mun Country Park	7SW-A/C282	15/8	AFCD	Unknown	Soil/rock cut	2.5 (Rockfall)	Nil	-
2019/08/1021AF (AFCD/2019/08/0002)	Shing Mun Forest Track - Reservoir Section, Shing Mun Country Park	7SW-A/C281	15/8	AFCD	Unknown	Soil cut	1.5	Minor footpath	-
2019/08/1022AF (AFCD/2019/08/0003)	Shing Mun Forest Track - Lead Mine Pass Section, Shing Mun Country Park	Natural hillside	15/8	AFCD	Unknown	Natural hillside	2 (Boulder fall)	Minor footpath	-
2019/08/1023LD (LandsD/2019/08/0299)	Behind House No. 14, Tai Wan Village, Sai Kung	8SW-A/CR226	1/8	LandsD	1/8	Retaining wall	0.13	Building	-
2019/08/1024LD (LandsD/2019/08/0304)	Near So Kwun Wat Road, So Kwun Wat, Tuen Mun	6SW-C/C906	1/8	LandsD	1/8	Soil cut	0.4	Open area	-
2019/08/1025LD (LandsD/2019/08/0302)	Near So Kwun Wat Road, So Kwun Wat, Tuen Mun	6SW-C/CR149	1/8	LandsD	1/8	Soil cut	4	Open area	-
2019/08/1026WS (WSD/2019/8/1/NTW)	Tai Lam Chung Catchwater (Section E) Ch. 1270 - Ch. 1305	6NE-C/CR182	2/8	WSD	Unknown	Soil cut	2	Catchwater	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 8 of 9)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/08/1027WS (WSD/2019/8/2/NTW)	Tai Lam Chung Catchwater (Section E) Ch. 185 - 270	6SE-A/CR196	2/8	WSD	Unknown	Soil cut	20	Catchwater	Catchwater partially blocked
2019/08/1029WS (WSD/2019/8/4/NTE)	Access Road to Intake 'MA', Po Lo Che Road, Sai Kung	8SW-A/C175	6/8	WSD	Unknown	Soil/rock cut	3	Access road	-
2019/08/1030WS (WSD/2019/8/5/NTE)	East Dam, High Island Reservoir, Sai Kung	8SE-D/C2	26/8	WSD	Unknown	Rock cut	8 (Rockfall)	Other (drainage line)	-
2019/09/1034HY (HyD/NTE/2019/09/0019)	Tai Po Road - On Unallocated Government Land adjacent to Feature No. 11NW-B/CR333	Natural hillside	2/9	HyD	2/9	Natural hillside	5	Open area	-
2019/09/1035WS (WSD/2019/9/1/NTW)	Tai Lam Chung Catchwater Section M	6SE-D/CR243	6/9	WSD	Unknown	Soil/rock cut	0.3	Catchwater	-
2019/09/1039AF (AFCD/2019/10/0001)	BBQ Area Site No. 4, Shing Mun Country Park	Natural hillside	24/9	AFCD	24/9	Natural hillside	20	Minor footpath	Foothpath at crest temporarily closed
2019/09/1040LD (LandsD/2019/10/0327)	House No. 157, Tomg Hang Tsuen, Fanling	3SW-A/CR248	24/9	LandsD	24/9	Soil/rock cut	1	Registered squatter dwelling	-
2019/10/1041AF (AFCD/2019/10/0002)	Trail Leading to Ng Tung Chai, Tai Mo Shan Country Park	Natural hillside	24/9	AFCD	Unknown	Natural hillside	7	Minor footpath	Trail at crest temporarily closed

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

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/11/1042HY (HyD/NTE/2019/11/0031)	Golden Hill Road, Sha Tin	7SW-C/F360	1/11	HyD	1/11	Fill	5	Access road	-
2019/11/1043WS (WSD/2019/11/2/NTW)	Along Catchwater, NE of Cultivation, North of Tusen Wan	7SW-A/CR137	5/11	WSD	Unknown	Soil cut	0.3	Catchwater	-
2019/11/1044WS (WSD/2019/11/3/NTW)	Tai Lam Chung Catchwater (Section L), Ch.2660 - Ch.2820	6SE-C/CR620	8/11	WSD	Unknown	Soil/rock cut	0.6	Catchwater	-
2019/11/1045WS (WSD/2019/11/4/NTE)	South of Ch.1300, Kowloon Hills Fitness Trial, Lion Rock Country Park	7SW-D/CR508	22/11	WSD	Unknown	Soil cut	1.5	Catchwater	-
2019/11/1046WS (WSD/2019/11/5/NTE)	Beacon Hill Catchwater at Ch.1200	7SW-D/CR514	22/11	WSD	Unknown	Soil cut	0.2	Catchwater	-
2019/12/1051LD (LandsD/2020/01/0337)	Siu Sau, Tuen Mun	6SW-C/C600	9/12	LandsD	9/12	Soil cut	2.6	Registered squatter dwelling	-
2019/12/1052WS (WSD/2019/12/2/NTE)	Golden Hill Catchwater, South Conduit	7SW-C/C1002	23/12	WSD	Unknown	Soil cut	6	Nil	-
2019/12/1053WS (WSD/2019/12/3/NTE)	40 m SE of Tsui Lam Estate, Pik Lam House, Tseung Kwan O	11NE-D/C918	30/12	WSD	Unknown	Soil/rock cut	0.3 (Rockfall)	Nil	-

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

Table B5 List of Landslide Incidents on Outlying Islands

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2019/06/2453	Behind No. 17 Hung Shing Ye, Lamma Island	15NW-A/CR39	12/6	BD	10/6 (19:00)	Soil/rock cut	0.5	Village house	-
2019/08/2479	8 m SW of No. 48 Pak Kok Kau Tsuen, Lamma Island	14NE-B/R122	1/8	Public	1/8 (14:00)	Masonry wall	2	Registered squatter dwelling	-
2019/08/2480	Behind No. 42 Po Wah Yuen, Lamma Island	< 3 m high cut slope	1/8	Public	1/8 (13:00)	Soil cut	1	Village house	-
2019/09/2502	Wang Pui Road, Lantau Island	13NW-B/C20	17/9	HyD	17/9	Soil cut	13	Access road	-
2019/01/1002WS (WSD/2019/1/2/HK&Ic)	380 m North of the Transmission Station, East of Sok Kwu Wan, Lamma Island	15NW-C/R18	31/1	WSD	Unknown	Retaining wall	10	Access road	-
2019/06/1014HY (HyD/NTE/2019/06/0014)	Above Feature No. 14NW-D/C337, Hak Pai Road, Cheung Chau	Natural hillside	14/6	HyD	14/6	Natural hillside	0.1	Nil	-
2019/07/1019WS (WSD/2019/7/1/HK&I)	Shek Pik Catchwater (Section E), Ch. 1531 - Ch. 1666	13NE-A/CR148	3/7	WSD	Unknown	Soil cut	3.7	Catchwater	-
2019/08/1031HY (HyD/NTE/2019/08/0018)	Near Lamp Post No. FA0590, Wang Pui Road (near Shek Pik), Lantau Island	13NW-B/C20	2/8	HyD	2/8	Soil cut	19	Access road	-
2019/09/1036WS (WSD/2019/9/3/HK&I)	Tai Long Wan Catchwater	13NW-D/CR2	19/9	WSD	Unknown	Soil cut	8.8	Catchwater	-

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

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