HONG KONG RAINFALL AND LANDSLIDES IN 1996

GEO REPORT No. 70

C.K.L. Wong

GEOTECHNICAL ENGINEERING OFFICE
CIVIL ENGINEERING DEPARTMENT
THE GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION

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This report was originally produced in October 1997 as GEO Special Project Report No. SPR 7/97

First published, September 1998

Prepared by:

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This publication is available from:

Government Publications Centre,
Ground Floor, Low Block,
Queensway Government Offices,
66 Queensway,
Hong Kong.

Overseas orders should be placed with:

Publications Sales Office,
Information Services Department,
28th Floor, Siu On Centre,
188 Lockhart Road, Wan Chai,
Hong Kong.

Price in Hong Kong: HK$112
Price overseas: US$20 (including surface postage)

An additional bank charge of **HK$50** or **US$6.50** is required per cheque made in currencies other than Hong Kong dollars.

Cheques, bank drafts or money orders must be made payable to
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PREFACE

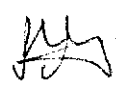
In keeping with our policy of releasing information which may be of general interest to the geotechnical profession and the public, we make available selected internal reports in a series of publications termed the GEO Report series. A charge is made to cover the cost of printing.

The Geotechnical Engineering Office also publishes guidance documents as GEO Publications. These publications and the GEO Reports may be obtained from the Government's Information Services Department. Information on how to purchase these documents is given on the last page of this report.

R.K.S. Chan
Principal Government Geotechnical Engineer
September 1998

FOREWORD

This Report presents a review of the rainfall and landslides in Hong Kong throughout 1996. Geotechnical engineers of the District Divisions of the Geotechnical Engineering Office provided details of the notable landslides. Supplementary landslide data were provided by the Agriculture and Fisheries Department, Architectural Services Department, Drainage Services Department, Fire Services Department, Highways Department, Housing Department and Water Supplies Department. The Hong Kong Observatory provided rainfall information. All contributions are gratefully acknowledged.



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ABSTRACT

This Report reviews the rainfall and landslides in Hong Kong throughout 1996. Rainfall information has been obtained from the Geotechnical Engineering Office (GEO) automatic raingauge system and from the Hong Kong Observatory (HKO). Most of the landslide data have been taken from the records of incidents reported to the GEO during the year. Supplementary data have been obtained from other Government departments.

The rainfall at HKO in 1996 was only 2% above the Hong Kong annual mean. A total of 163 incidents was reported to the GEO. Of these, 153 were classified as genuine landslides.

CONTENTS

1. INTRODUCTION

This Report reviews and provides factual data on rainfall and landslide occurrences in Hong Kong throughout 1996. Rainfall information has been obtained from the Geotechnical Engineering Office (GEO) and the Hong Kong Observatory (HKO)(formerly known as the Royal Observatory (RO) up to 30 June 1997). Most of the landslide data have been taken from the records of incidents reported to the GEO during the year. Supplementary data have been obtained from other Government departments. Only landslides reported to the GEO are analyzed and described in detail in this report, since they were inspected by the geotechnical engineers of the GEO and detailed information is available.

In this Report, a landslide is defined as the collapse of a soil or rock mass, and includes the failure of fill slopes, cut slopes, natural slopes, retaining walls, and rock or boulder falls. A 'major' landslide is defined as a failure in which the volume of the collapsed mass is 50 m^3 or above, or where a fatality has occurred.

A total of 163 incidents was reported to the GEO in 1996. Of these, 153 were genuine landslides, and four of them were major.

The arrangement of this Report is similar to the previous annual rainfall and landslides reports (Premchitt, 1991a-1991e; Siu, 1991; Tang, 1992; Evans, 1992; Chen, 1993; Chan, 1994 & 1995; Wong, 1996). This Report reviews rainfall and landslides throughout the whole year rather than emphasising any one specific rainstorm.

2. RAINFALL

2.1 The Raingauge System

In the rugged terrain of Hong Kong, the distribution and intensity of rainfall during a storm can vary dramatically with respect to both geography and time. In order to provide sufficient coverage for a meaningful analysis of rainfall distribution, the HKO has installed a network of raingauges which, in 1996, comprised 21 automatic and 104 manual raingauges at 82 locations. A 'principal' raingauge is located at the HKO's headquarters in Tsim Sha Tsui, and a continuous rainfall record has been kept at this location since 1884.

Since 1978, the GEO, in cooperation with the HKO, has established an automatic raingauge system (comprising 48 GEO and 22 HKO automatic raingauges in 1996) which transmits real-time rainfall data via telephone lines to the GEO and to the HKO at five-minute intervals. The locations of the GEO automatic raingauges (Figure 1) were selected to supplement the network of other types of raingauges and to provide specific information in areas of particular geotechnical interest.

In this Report, where a comparison is being made for 'daily' rainfalls, the 24-hour rolling maximum rainfall will be used instead of daily rainfall, since the latter is based on an arbitrary fixed period of midnight to midnight, which does not necessarily represent the maximum rainfall over a 24-hour period. In addition, when rainfall is quoted without reference to the location of measurement, this refers to that recorded at the HKO headquarters in Tsim Sha Tsui.

2.2 Hong Kong Observatory Records

The year's weather for 1996 was described in RO (1996). The comments on rainfall given in the RO Weather Summary are as follows :

> "The year's total rainfall was near normal and amounted to 2 249.1 millimetres, only two per cent above the normal of 2 214.3 millimetres".
>
> "April ... Three episodes of heavy rain contributed to most of the month's rainfall of 228.7 millimetres which was 67.2 millimetres above normal".
>
> "June ... Both the monthly total rainfall and the accumulated rainfall for the year were seven per cent above normal for the same periods".
>
> "July ... Occasional showers and thunderstorms affected the territory but the monthly rainfall of 230.3 millimetres was still 29 per cent below normal".
>
> "The weather was unstable from 14 to 18 August with rainfall amounting to 206.1 millimetres. Torrential rain on 15 August caused flooding in many places".
>
> "The total rainfall of 604.0 millimetres recorded in September 1996 was the sixth highest for the month and was more than twice the normal figure of 299.7 millimetres".

A summary of heavy rainstorms in 1996 and the landslides reported to have occurred in the rainstorms is given in Table 1. This Table shows all periods in which the 24-hour rainfall at the HKO exceeded 50 mm. The four-day and fifteen-day antecedent rainfalls which occurred prior to these 24-hour periods are also shown in this Table. The four heaviest 24-hour rainfalls in 1996 are 13 to 14 September (238.9 mm), 22 to 23 June (120.3 mm), 30 April to 1 May (98.0 mm) and 21 to 22 June (95.0 mm).

The rainfall data recorded at the HKO for 1996 are presented in Figures 2 to 5. Cumulative rainfall since 1 January is shown in Figure 2. Daily and monthly rainfalls are shown in Figures 3 and 4 respectively. Figure 5 shows the hourly rainfalls for the four heavy 24-hour rainfalls in 1996.

2.3 Geotechnical Engineering Office Records

Rainfall data from the 48 GEO automatic raingauges are kept in the Civil Engineering Library on the First Lower Ground Floor of the Civil Engineering Building.

The 24-hour, five-hour and one-hour maximum rainfalls (rolling rainfall amounts using one clock hour rainfall as the basic unit) recorded by the GEO raingauges during heavy

rainstorms in 1996 are given in Table 1.

Appendix A contains hourly rainfall data recorded by the GEO raingauges for the two heavy 24-hour rainstorms.

2.4 Rainfall Distribution

Rainfall distribution with time and location can be assessed by referring to detailed GEO and HKO records.

The isohyets of 24-hour rainfalls for the three heavy rainstorms in 1996 are shown in Figures 6 and 7.

2.5 Warnings Issued by the Hong Kong Observatory

Relevant warnings issued by the HKO and Landslip Warnings jointly issued by the GEO and the HKO are summarised in Table 2. A total of two Landslip Warnings was issued in 1996 on the basis of predetermined rainfall criteria, after consultation between the GEO and the HKO.

2.6 Comparison with Past Rainstorms

The return periods of the heavy rainstorms in 1996 were estimated for rainfall durations of one hour to fifteen days based on the rainfall recorded at the HKO (Table 3). The estimated return periods range from less than two years to four years. It is noted that the maximum rainfalls for most durations were recorded in the rainstorm in mid-September 1996.

In Figure 2, the cumulative rainfall for 1996 is shown in comparison with the wettest year (1982), the driest year (1963) since records began in 1884 and the mean value from 1961 to 1990. The monthly rainfall in September was more than double its corresponding mean value. The 1996 annual rainfall was 2 249.1 mm, which is only 2% higher than the mean value of 2214.3 mm. Figure 4 shows monthly rainfalls in 1996 in comparison with the recorded maximum (since 1884) and mean (1961-1990) monthly rainfalls.

3. LANDSLIDES

3.1 Landslide Occurrence in 1996

The numbers of incidents reported to various Government departments in 1996 are shown in Table 4.

Details of all 163 incidents reported to the GEO are summarized in Appendix B. In total, 153 incidents were classified as genuine landslides. The rest of them were either not landslides or incidents which were of no geotechnical concern, such as fallen trees. They

were therefore not considered in the statistical analysis described below. The locations of all the reported incidents are shown in Drawing No. GCSP 8/17, which is attached to this report. Selected incidents are illustrated in Plates 1 to 7. Further details of these incidents can be found in the incident files of the District Divisions of the GEO.

A summary of the four major landslides is given in Table 5.

Wherever possible, the dates and times of the landslides were assessed by the geotechnical engineers during site inspections. Some cases were not reported to the GEO until several days or weeks after the incidents. For these, it was difficult to determine the exact time of occurrence. Out of the 153 reported landslides, the date of failure was recorded for 101 landslides. The daily numbers of these landslides are plotted in Figure 3. Of these 101 landslides, the time of landslide was given to within one hour for 43 incidents.

The numbers of reported landslides which occurred during periods of heavy rain are shown in Table 1, where the numbers of incidents reported by the Fire Services Department are also shown for comparison. For the events not shown in Table 1, five landslides occurred in a single day on 25 June and 15 September, and there were smaller number of landslides on all other days.

The numbers of landslide incidents occurred during the Landslip Warning periods are shown in Table 6.

Based on GEO's landslide inspection reports, 61 landslides in 1996 were considered by the inspecting geotechnical engineer to be associated with poor maintenance. This amounted to about 40% of all the reported landslides in 1996.

It is possible that there were other landslides which were not reported to the GEO. These are likely to be landslides which involved less significant consequence, such as failures affecting remote areas and open spaces.

3.2 Facilities Affected by Landslides

3.2.1 General

The numbers of landslides affecting various types of facility (building lot, road, etc.) in Hong Kong, Kowloon and the New Territories are shown in Table 7. The numbers of major failures affecting different types of facility are also given in Table 7. It should be noted that a failure may affect more than one type of facility. Landslide consequences, classified according to failure type, are shown in Table 8.

3.2.2 Squatter Areas

A total of 12 landslides affected squatter areas and none was major (Table 7). These landslides led to the permanent evacuation of four squatter huts and temporary evacuation of seven huts (Table 8).

3.2.3 Building Lots

There were 23 landslides affecting building lots and private properties, none was major (Table 7). These landslides resulted in the temporary evacuation of seven houses and 47 flats in part or in total (Table 8). An example of this category is HK 9/4, which is described in Section 4.8.

3.2.4 Roads and Access

A total of 87 sections of roads, access, footpaths and pedestrian pavements were affected by landslides. Two of these were major incidents (Table 7). Four selected examples, viz. MW 5/3, ME 4/3, HK 7/4 and HK 9/4, are described in Sections 4.2, 4.4, 4.7 and 4.8 respectively.

3.2.5 Construction Sites

Nine landslides affected construction sites, of which one was a major incident (Table 7). Three of them, viz. MW 3/3, K 6/1 and HK 7/4, are described in Sections 4.3, 4.5 and 4.7.

3.2.6 Carparks, Playgrounds, Gardens and Yards

Ten landslides affected carparks, playgrounds, gardens and yards, of which one was a major incident. One selected sample, viz. HK 9/5, is described in Section 4.9.

3.2.7 Catchwaters and Reservoirs

Landslides affecting catchwaters and reservoirs were usually dealt with separately by the Water Supplies Department and not reported to the GEO. In 1996, only three minor landslides of this category were reported to the GEO.

3.2.8 Other Areas

Other areas affected by landslides include country and urban parks, open areas and hillside, cemetery and urns. A total of two areas within the country and urban parks was reported to have been affected by landslides. Fifteen landslides affected open areas and hillside and one of them was a major incident. There was one major landslide which affected a cemetery. This landslide, viz. MW 6/5, is described in more detail in Section 4.6.

3.3 Types of Landslides

3.3.1 General

Landslides reported to the GEO have been classified into six types of failure, i.e. fill slopes, cut slopes, natural slopes, retaining walls, rock/boulder falls and others. The numbers of different types of landslide are shown in Table 9.

3.3.2 Fill Slopes

There were 14 fill slope failures, forming 9.2% of all landslides reported. None of these was major incident. Incident ME 4/3 is discussed in Section 4.4.

3.3.3 Cut Slopes

There were 95 cut slope failures, forming 62.1% of all landslides reported. There were classified further according to types of material involved, i.e. soil, soil/rock and rock.

There were 75 reported incidents for soil cut slopes, four of which were major incidents. There were 20 soil/rock cut slope failures, none of which was major. No rock slope failure was reported.

Landslides in soil cut slopes discussed in detail in Section 4 include incidents MW 5/3 (Plate 1), MW 3/3 (Plate 2), K 6/1, MW 6/5 (Plate 4), HK 7/4 (Plate 5), HK 9/4 (Plate 6) and HK 9/5 (Plate 7).

3.3.4 Retaining Walls

There were 10 reported failures of retaining walls, forming 6.5% of all landslides reported. None of them was major.

3.3.5 Natural Slopes

There were nine natural slope failures reported, forming 5.9% of all landslides. None of them was major.

3.3.6 Rock and Boulder Falls

There were 25 cases of rock and boulder falls, forming 16.3% of all landslides. None of them was major.

3.4 Landslide Volume Distribution

Tables 10 and 11 show the distribution of landslide volume for all landslide incidents which were reported to the GEO. The approximate volume of failure was recorded for 140 out of the total of 153 reported landslides. Of the landslides for which the volume was recorded, 87 landslides (about 57%) involved less than 5 m^3 of material. Four of the reported landslides (about 3%) involved a failure volume of 50 m^3 or above.

3.5 Rainfall-Landslide Relationships

The relationship between rainfall and landslides in 1996 can be seen from the plot of daily rainfall and daily number of landslides in Figure 3. The majority of the recorded landslides occurred at times of heavy rainfall. The geographical distribution of rainfall had a considerable influence on the occurrence of landslide. Figures 6 and 7 show the locations of landslides for which the dates of occurrence are known (see Section 3.1), and the 24-hour rainfall isohyets for the corresponding rainstorms in 1996.

4. NOTABLE LANDSLIDES

4.1 General

Out of the 153 landslides reported to the GEO, eight are described in more detail in the following Sections in chronological order. These landslides have been selected mainly on the basis of their failure volume, consequence and technical interest. Three of these, viz. MW 96/3/3, K96/6/1 and HK 96/7/4, are possibly construction related incidents.

4.2 Incident MW 96/5/3 : Above Golf Driving Range, Area 19, Tuen Mun

(Date : January 1996. Major failure of a soil cut slope affecting a track, Plate 1)

A major failure of a soil cut slope above a golf driving range Area 19, Tuen Mun was identified by the GEO in May 1996. According to a villager, the slope had probably failed in January. The failure involved the upper part of a 45 m high cut slope with an average slope angle of 30°. The failed portion was 6 m high and 115 m in breath, resulting in a failure volume of about 750 m^3 of decomposed volcanics and colluvium. An old failure scar was noted below the failed portion. There was a track above the slope and part of it fell away with the landslide. This failure was possibly associated with run off from uphill blocked channels.

4.3 Incident MW 96/3/3 : Pik Tin Street, Shatin

(Date : March 1996, Major signs of distress of a soil cut slope resulting in a construction site being affected, Plate 2)

An incident involving major signs of distress in the form of tension cracks on a soil

cut slope above a construction site at Pik Tin Street, Shatin was reported to the GEO on 11 March 1996. Exact date of occurrence is not known.

The slope was about 23 m high with an average slope angle of 40° with berms at every 8 m. There was a natural hillside above the cut slope. It had a vegetation cover (trees and bushes). Tension cracks were found above the first and second berms. The drains were found to be blocked or broken. This incident was probably associated with insufficient maintenance.

4.4 Incident ME 96/4/3 : Tai Po Road, Tai Po Kau

(Date : 23 April 1996. Fill slope failure resulting in closure of a road, Plate 3)

On 23 April, a landslide took place at the fill slope on the downhill side of Tai Po Road, Tai Po Kau. The fill slope was about 20 m high with a slope angle of about 30°. It was covered with grass before failure. At the time of landslide, trench excavation was being carried out across the road on the uphill side. The failure was probably caused by rupture of a watermain in the trench during excavation, which could have led to considerable subsurface seepage to the downhill side of the road. Subsidence of part of the road surface and washing out of the fill slope occurred as a result. Tai Po Road was closed due to this failure.

4.5 Incident K 96/6/1 : Fung Tak Road, Wong Tai Sin

(Date : 10 June 1996. Trench collapse resulting in the injury of one construction worker.)

At about 16:10 on 10 June, the side of a 3 m deep and 2 m wide trench which was excavated into highly and completely decomposed granite collapsed. The trench was located at a pedestrian pavement of Fung Tak Road, Wong Tai Sin.

This incident involved a 2 m^3 failure volume and resulted in injury of a construction worker. The failure was probably caused by lack of trench support during construction.

4.6 Incident MW 96/6/5 : Wo Hop Shek Cemetery, Fanling

(Date : 25 June 1996. Major failure of a soil cut slope affecting a cemetery, Plate 4)

On 25 June, about 80 m^3 of weathered rock fell from a grassed soil cut slope at Wo Hop Shek Cemetery, Fanling, causing damage to a large number of buried urns on the slope. The cut slope was about 18 m high with an average slope angle of 45°. The failure involved the full height of the slope and was about 20 m wide. It affected the cemetery and was probably caused by surface water infiltration into the slope after heavy rainfall.

4.7 Incident HK 96/7/4 : Near 212 Victoria Road, Pok Fu Lam

(Date : 25 July 1996. Major failure of a temporary cut slope affecting a construction site and resulting in closure of a road, Plate 5)

At about 8:00 a.m. on 25 July 1996, a sub-vertical temporary cut for the construction of a retaining wall on the downhill side of Victoria Road (part of the Highways Department Victoria Road Improvement Project), failed and resulted in a failure volume of 75 m^3. The temporary cutting was about 10 m in height with an average angle of 80°. The failure debris, estimated to be about 10.5 m in breadth, 4 m in length with a maximum depth of 1.8 m, was trapped behind the partially completed retaining wall.

Based on site inspection on 25 July 1996, the failure was probably caused by the lack of temporary support to the sub-vertical cut.

4.8 Incident HK 96/9/4 : Below No. 1 Wang Fung Terrace, Tai Hang

(Date : 14 September 1996. Failure of a soil cut slope resulting in the temporary evacuation of 45 flats, blockage of a road and closure of a carpark, Plate 6)

At about 5:00 p.m. on 14 September, about 30 m^3 of weathered rock and a tree slipped from a soil cut slope below No. 1 Wang Fung Terrace. The slope was about 15 m high with an inclination of 70-75°. It was covered by broken chunam before the landslide. This failure resulted in temporary evacuation of 45 flats and a carpark above the slope, and closure of two lanes of Tai Hang Road below the slope.

According to the field observation on the following day, the channel at the slope crest was blocked with debris. A downpipe was discharging water onto this channel. Deep gullies were found at the slip scar immediately below the discharge point of the broken channel. Lack of maintenance and tree root action were considered to be the major factors contributing to the failure.

4.9 Incident HK 96/9/5 : Junction of Ap Lei Chau Bridge and Lee Nam Road, Ap Lei Chau

(Date : 14 September 1996. Major failure of a soil cut slope resulting in a sports playground being affected, Plate 7)

At about 7:30 p.m. on 14 September, about 50 m^3 of decomposed volcanic rock and colluvium slipped from a soil cut slope (No. 15NW-A/C1) near the Junction of Ap Lei Chau Bridge Road and Lee Nam Road, Ap Lei Chau.

The slope was about 30 m high, with an average inclination of 45°. The natural terrain above it was sloping at 35° and was covered with shrubs and grass. Before the failure the slope was covered by shotcrete. The portion of the slope that failed was about 12 m high and 9 m wide, with a maximum depth of failure of about 3 m. The debris was found to be soft and wet with a debris length of 14 m, affecting the open space and sports playground below.

The failure was probably caused by infiltration from the intense rainfall into the natural hillside above.

5. CONCLUSIONS

Rainfall at the HKO in 1996 was 2% higher than the Hong Kong annual average.

Two Landslip Warnings were issued in 1996. There were 153 landslides reported to the GEO. The landslides resulted in one injury. According to the data given in GEO's landslide inspection reports and supplementary information provided by GEO's District Divisions, the consequence resulting from the landslides included temporary evacuation of seven squatter huts, seven houses and 47 flats, permanent evacuation of four squatter huts, and blockage of 87 sections of road, pedestrian pavement and access.

About 40 % of the landslides were judged to be related to poor slope maintenance.

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LIST OF TABLES

Table 1 - Rainfall-Landslide Events in 1996 with 24-hour Rainfall Greater than 50 mm

Date[1] of Event	Maximum Rainfall								Landslide Consequences			
	Hong Kong Observatory					GEO Raingauges[2]			Number of Landslides		Persons Killed (Injured)	Number of Huts Evacuated Permanently
	24-hr	5-hr	1-hr	Antecedent		24-hours	5-hours	1-hour	GEO[3]	FSD		
				4 days	15 days							
13-14 Sep 96 [4]	238.9	109.5	47.2	56.6	184.6	286.0 (H06)	128.0 (N13)	73.0 (N13)	16	2	-	-
22-23 Jun 96 [4]	120.3	45.4	16.5	106.3	203.8	265.5 (H05)	140.5 (H05)	67.0 (H22)	7	-	-	-
30 Apr-1May 96	98.0	55.9	33.4	21.8	86.9	120.5 (K04)	87.0 (H10)	54.0 (N17)	1	-	-	-
21-22 Jun 96	95.0	39.8	19.5	13.8	108.8	249.0 (H20)	140.0 (N13)	62.0 (H20)	2	-	-	-
4-5 May 96	94.1	71.0	29.5	63.2	126.1	173.5 (N17)	166.0 (N17)	93.0 (N17)	5	-	-	-
15-16 Aug 96	80.1	55.4	33.4	61.2	107.4	140.0 (H15)	97.5 (H15)	75.0 (H07)	1	-	-	-
15-16 Jun 96	72.4	34.5	14.7	5.3	18.9	107.0 (K07)	60.5 (K07)	33.5 (N10)	-	-	-	-
29-30 May 96	70.7	43.5	25.5	49.4	49.4	123.5 (H21)	79.0 (N13)	35.5 (N13)	-	-	-	-
19-20 Apr 96	64.8	47.6	17.6	0.0	12.5	94.5 (N17)	67.5 (N17)	36.5 (N17)	1	-	-	-
23-24 Jun 96	64.0	56.6	48.2	222.9	324.1	348.0 (N05)	140.5 (N05)	67.0 (H22)	12	-	-	-
21-22 Jul 96	62.3	22.2	15.7	49.5	71.8	131.0 (N17)	51.0 (N17)	38.5 (N17)	-	-	-	-
21-22 Sep 96	61.8	40.4	25.5	71.2	466.1	114.0 (K07)	61.0 (N06)	35.5 (H17)	6	-	-	1
17-18 Aug 96	57.5	39.7	31.9	145.1	191.3	110.0 (H08)	65.0 (H08)	44.0 (H08)	3	1	-	-
28-29 Mar 96	56.3	55.7	37.8	10.5	17.4	74.0 (N17)	74.0 (N17)	48.0 (H13)	1	-	-	-
2-3 Sep 96	54.9	40.1	30.4	30.4	56.8	77.0 (N09)	72.5 (N09)	41.5 (N17)	-	-	-	-
19-20 Sep 96	54.5	31.6	21.7	9.6	404.7	161.5 (N09)	74.0 (N09)	52.0 (N09)	1	-	-	-
3-4 Apr 96	50.5	34.8	11.8	14.6	85.4	71.5 (H10)	45.5 (H10)	23.0 (H01)	3	-	-	-
Selected Previous Major Rainstorms (for comparison only)												
29 May 82	394	153	44	1	11	430	237	111	551	15	22(26)	1153
20-21 May 89	388	149	37	28	42	566	224	51	340	3	2(3)	199
8 May 92	324	196	110	65	71	385	244	110	350	9	3(5)	92

Notes:
(1) The events are arranged in order of the intensity of 24-hour rolling maximum rainfall recorded at the Hong Kong Observatory, Tsim Sha Tsui.
(2) The maxima for the rainstorms are selected from the 48 GEO Raingauges. The GEO Raingauge reference number is shown in brackets.
(3) Reported totals are for genuine reported landslides known to have occurred on specific dates.
(4) Landslip warnings were issued for these events.
(5) GEO = number of landslides reported to Geotechnical Engineering Office; FSD = number of landslides reported to Fire Services Department.

Table 2 - Warnings Issued by the Hong Kong Observatory in 1996

Month	Monthly Rainfall (mm)	Dates on Which Warnings Were in Effect				
		Thunderstorm	Flood	Landslip	Tropical Storm	Rainstorm
January	1.3	-	-	-	-	-
February	27.2	-	-	-	-	-
March	83.1	29	29	-	-	-
April	228.7	1, 19, 30	19, 30	-	-	30 (Red)
May	313.9	1, 4, 5, 6, 7, 25-26, 27, 28, 28-29, 29, 29-30	1, 4, 5, 25, 29, 29-30	-	-	5 (Red)
June	404.0	9, 14, 14-15, 15-16, 21-22, 22-23, 24, 24-25, 27-28, 29	15-16, 21-22, 22, 22-23, 24, 25	22(23:15)-23(12:15)	-	-
July	230.3	3, 11, 11-12, 19, 21, 21-22, 22, 23, 26, 27-28, 28-29, 30	12, 19	-	21-22 (Signal 1, Frankie) 26-27 (Signal 1, Gloria)	-
August	308.3	1-2, 2, 4, 10, 11, 14, 15, 16, 16-17, 18, 20, 21, 25, 31	14, 15	-	6 (Signals 1, Lisa) 20-21 (Signal 1, Niki)	-
September	604.0	2, 3, 4, 5, 7, 13, 13-14, 14, 19, 20, 21, 22	9, 14-15, 21, 22	14(17:00)-15(17:25)	8-9 (Signals 1-8, Sally) 18-20 (Signal 1, Willie)	-
October	44.8	-	-	-	19-20 (Signal 1, Beth)	-
November	3.5	-	-	-	-	-
December	0	-	-	-	-	-
Total	2249.1	64 days	25 days	2 Warnings	7 Warnings	2 days

Notes: (1) Landslip Warnings were issued after consultation between GEO and HKO.

(2) Information in this Table is based on RO (1996).

Table 3 - Maximum Rainfalls Recorded at the Hong Kong Observatory in 1996 and Their Estimated Return Periods

Duration	Rainfall[2] (mm)	Ending Time		Estimated Return Period (Years)[1]
		Date	Time	
1 hour	48.2	Jun 24, 1996	05:00	<2
2 hours	64.3	Sep 14, 1996	18:00	<2
5 hours	109.5	Sep 14, 1996	18:00	<2
12 hours	164.3	Sep 14, 1996	21:00	<2
24 hours	238.9	Sep 14, 1996	24:00	3
2 days	318.2	Sep 15, 1996	14:00	4
4 days	350.0	Sep 15, 1996	14:00	3
7 days	394.9	Sep 15, 1996	14:00	3
15 days	528.9	Sep 22, 1996	08:00	3

Notes : (1) Return periods were assessed from the Gumbel equation, after Lam & Leung (1994), to the nearest year.

(2) Rainfall maxima as recorded at the Hong Kong Observatory, Tsim Sha Tsui (rolling rainfall amounts using one clock hour as the basic unit, the 1 hour maximum is clock hour).

Table 4 - Number of Incidents Reported to Various Departments in 1996

Department	Total Number	Type of Incident		
		Landslide	Flooding	Others
Agriculture & Fisheries Department	4	4	0	0
Architectural Services Department	10	6	4	0
Drainage Services Department	194	0	194	0
Fire Services Department	15	4	11	0
Geotechnical Engineering Office, Civil Engineering Department	163	153	0	10
Highways Department	330	46	32	252
Housing Department	2	2	0	0
Water Supplies Department	19	16	0	3

Note : "Others" includes minor signs of distress and incidents of no geotechnical concerns such as fallen trees.

Table 5 - List of Major Landslides Reported to GEO in 1996

Incident No.	Location (Slope No.)	Failure			Facility Affected	Consequence	Plate No.
		Date (Time)	Type	Scale (m^3)			
HK 7/4	Near 212 Victoria Road, Pok Fu Lam.	25/7 (8:00)	Soil cut slope	Major (75)	Road Construction site	2 lanes of road closed	5
HK 9/5	Junction of Ap Lei Chau Bridge Road and Lee Nam Road, Ap Lei Chau. (15NW-A/C1)	14/9 (19:30)	Soil cut slope	Major (50)	Playground Open space	Playground closed	7
MW 5/3	Above Golf Driving Range, Area 19, Tuen Mun.	January	Soil cut slope	Major (750)	Track		1
MW 6/5	Wo Hop Shek Cemetery, Fanling.	25/6	Soil cut slope	Major (80)	Cemetery		4

Table 6 - Number of Landslides Occurred during Landslip Warning Periods in 1996

Landslip Warning Period	No. of Landslides with Dates of Occurrence Known	No. of Landslides Known to Have Occurred in the Given Duration		
	Occurred on the Days of Warning	Occurred within 24 hours before Warning Issued	Occurred when Warning Was in Force	Occurred within 24 hours after Warning Cancelled
22/6(23:15)-23/6(12:15)	7	2	3	5
14/9(17:00)-15/9(17:25)	21	7	7	1

Notes : (1) Total number of landslides reported to the GEO in 1996 was 153.
(2) 101 landslides were recorded with known dates of occurrence.
(3) 43 landslides were recorded with the time of occurrence given to within one hour.
(4) The above was based on the time and date given in GEO's Incident Reports.

Table 7 - Number of Landslides Reported to GEO Affecting Different Facilities in 1996

Affected Facility	Districts[4]				All
	Hong Kong	Kowloon	New Territories		
			Mainland East	Mainland West	
Squatters	3(0)	0(0)	6(0)	3(0)	12(0)
Building Lots/Properties	5(0)	0(0)	13(0)	5(0)	23(0)
Roads	15(1)	4(0)	18(0)	6(0)	43(1)
Pedestrian Pavements	10(0)	4(0)	7(0)	6(0)	27(0)
Footpaths/Lanes/ Private Access/ Footbridges	9(0)	1(0)	5(0)	2(1)	17(1)
Construction Sites	6(1)	2(0)	1(0)	0(0)	9(1)
Country/Urban Parks	1(0)	0(0)	0(0)	1(0)	2(0)
Open Areas/Hillside	6(1)	0(0)	4(0)	5(0)	15(1)
Catchwaters/Conduits/ Culvert	2(0)	0(0)	1(0)	0(0)	3(0)
Carpark/Playground Garden/Yard	5(1)	1(0)	2(0)	2(0)	10(1)
Cemetery/Urns	0(0)	0(0)	0(0)	1(1)	1(1)
Unclassified	0(0)	0(0)	6(0)	1(0)	7(0)

Legend:
15(1) Fifteen landslides of which one was major failure

Notes :
(1) Incidents which were not genuine landslides have been excluded.
(2) The numbers of landslides affecting different types of facility are based on Sections 11 and 12 of GEO's Incident Reports.
(3) One landslide may affect more than one type of facility.
(4) Based on GEO's district boundaries, which are shown in Drawing No. GCSP 8/17.

Table 8 - Consequence Related to Type of Failure in 1996

Type of Failure		No. of Squatter Huts Evacuated[2]		No. of Blocks, Houses or Flats Evacuated or Partially Closed[2]	No. of Landslides Involving Blockage or Closure[2]			Deaths (Injuries)
		Permanent	Temporary		Roads	Pedestrian Pavements	Footpaths, Back Lanes, Private Access	
Fill Slope		-	-	1 flat	6	1	-	-
Cut Slope	Soil	2	4	6 houses 45 flats	11	5	-	0(1[4])
	Soil/Rock	-	-	-	6	5	-	-
	Rock	-	-	-	-	-	-	-
Natural Slope		-	-	-	-	-	-	-
Retaining Wall		2	3	-	-	3	2	-
Rock/Boulder Fall		-	-	1 house 1 flat	10	4	2	-
Others (e.g. subsidence)		-	-	-	-	-	-	-

Notes :
(1) Incidents which were not genuine landslides have been excluded.
(2) Based on Sections 11 and 12 of GEO's Incident Reports.
(3) A failure may give rise to more than one type of consequence.
(4) Possibly associated with construction activity.

Table 9 - Number of Landslides Reported to GEO in 1996 Classified by Type of Failure

Type of Failure [1]		Number	Percentage (%)
Fill Slope		14(0)	9.2
Cut Slope	Soil	75(4)	49.0
	Soil/Rock	20(0)	13.1
	Rock	0(0)	0.0
Retaining Wall		10(0)	6.5
Natural Slope		9(0)	5.9
Rock/Boulder Fall		25(0)	16.3
Others (e.g. subsidence)		0(0)	0.0
Total		153(4)	100.0

Legend:

75(4) Seventy-five Landslides of which four were major failures

Notes :
(1) Incidents which were not genuine landslides have been excluded.
(2) Data shown in this Table are based on Sections 5 and 6 of GEO's Incident Reports. Where a landslide involved more than one type of failure, the predominant type has been adopted.

Table 10 - Landslide Volume Distribution with Respect to District

Volume of Failure (m^3)	Districts[2]				
	Hong Kong	Kowloon	New Territories		All
			Mainland East	Mainland West	
<5	34	7	28	18	87(57%)
≥5 to <10	3	1	10	2	16(10%)
≥10 to <20	1	-	7	2	10(7%)
≥20 to <50	10	1	9	3	23(15%)
≥50 to <500	2	-	-	1	3(2%)
≥500 to <1000	-	-	-	1	1(1%)
≥1000	-	-	-	-	0(0%)
Not Recorded	2	1	9	1	13(8%)
Total	52(34%)	10(7%)	63(41%)	28(18%)	153(100%)

Legend :

87(57%) 87 landslides, which amount to 57% of the 153 landslides reported to the GEO.

Notes : (1) Incidents which were not genuine landslides have been excluded.
(2) Based on GEO's district boundaries, which are shown in Drawing No. GCSP 8/17.

Table 11 - Landslide Volume Distribution with Respect to Type of Failure

Volume of Failure (m^3)	Fill Slope	Cut Slope			Retaining Wall	Natural Slope	Rock/Boulder Fall	Others (e.g. subsidence)	Total
		Soil	Soil/Rock	Rock					
<5	4	44	12	-	4	1	22	-	87(57%)
≥5 to <10	4	6	3	-	1	2	-	-	16(10%)
≥10 to <20	3	2	1	-	2	1	1	-	10(7%)
≥20 to <50	3	11	2	-	1	5	1	-	23(15%)
≥50 to <500	-	3	-	-	-	-	-	-	3(2%)
≥500 to <1000	-	1	-	-	-	-	-	-	1(1%)
≥1000	-	-	-	-	-	-	-	-	0(0%)
Not Recorded	-	8	2	-	2	-	1	-	13(8%)
Total	14(9%)	75(49%)	20(13%)	0(0%)	10(7%)	9(6%)	25(16%)	0(0%)	153(100%)
Notes : (1) Incidents which were not genuine landslides have been excluded.									

LIST OF FIGURES

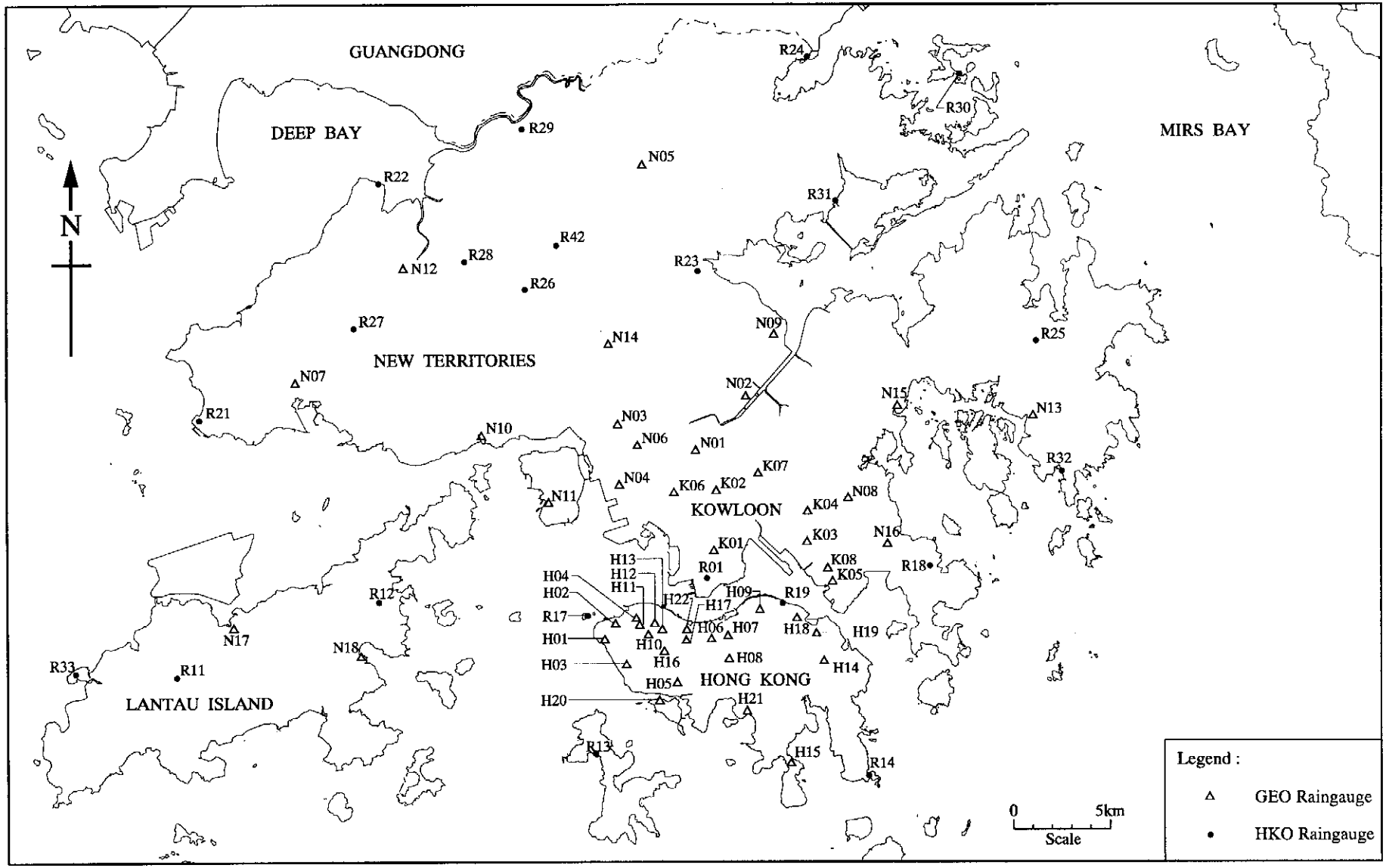
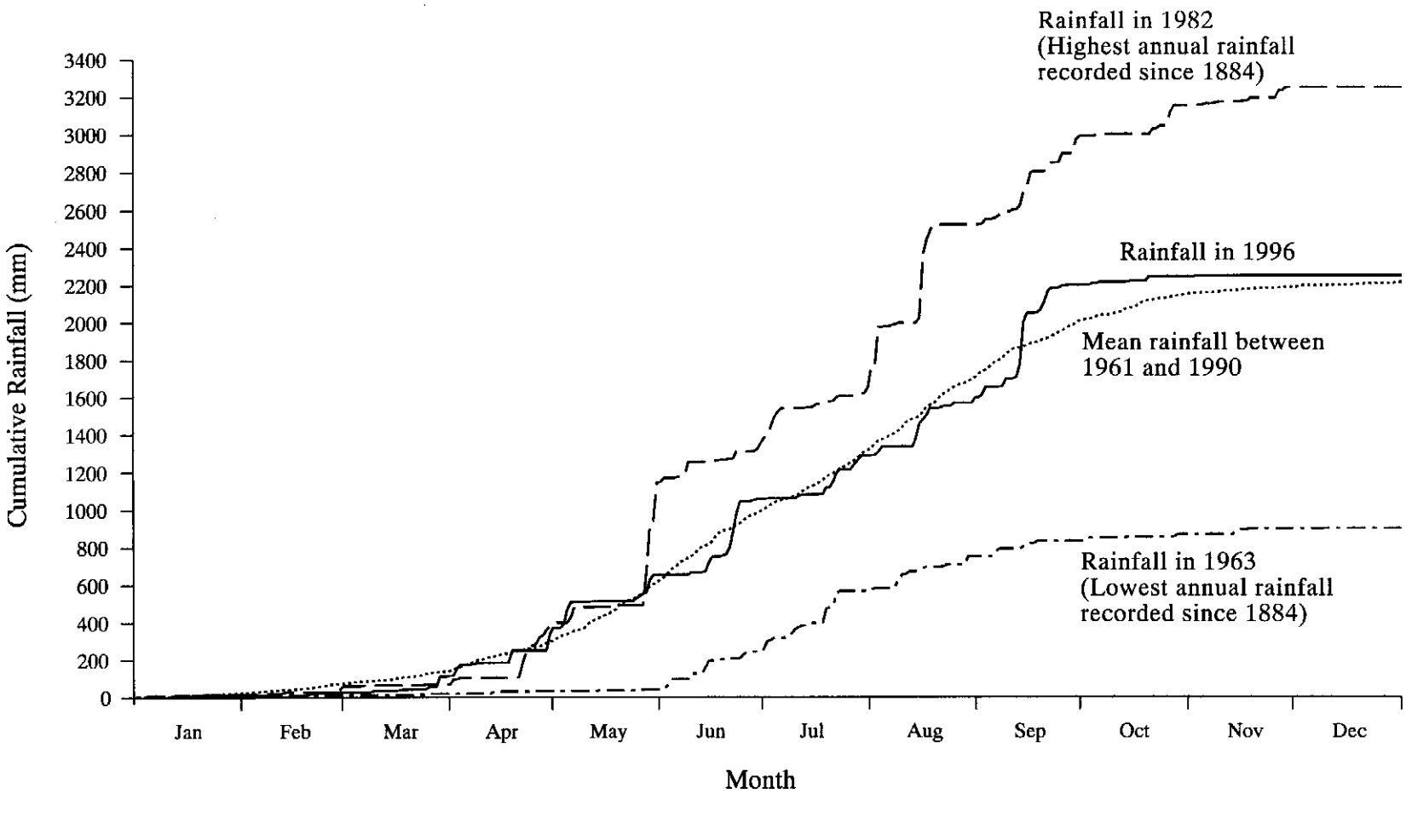
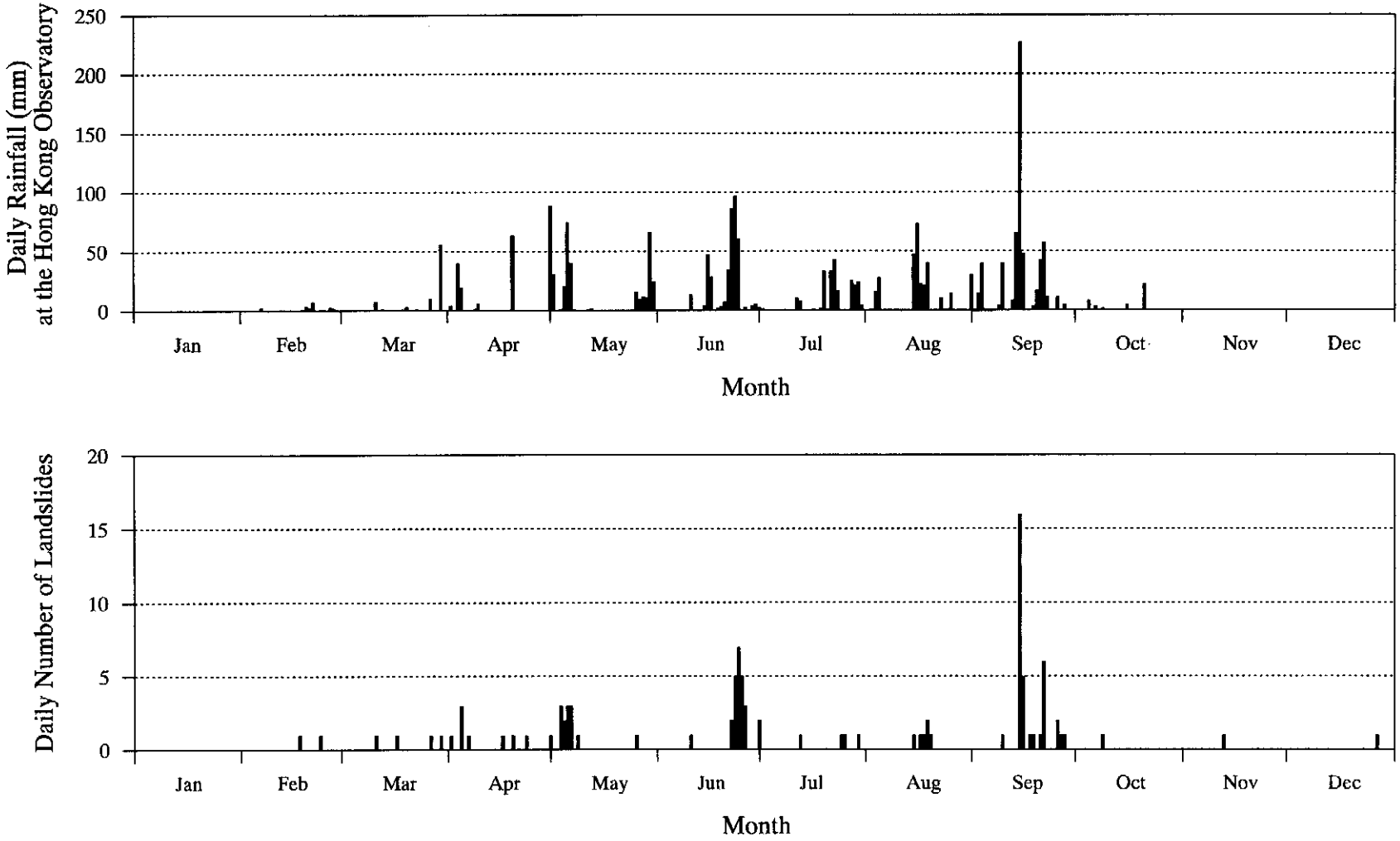


Figure 1 - Locations of GEO and HKO Automatic Raingauges



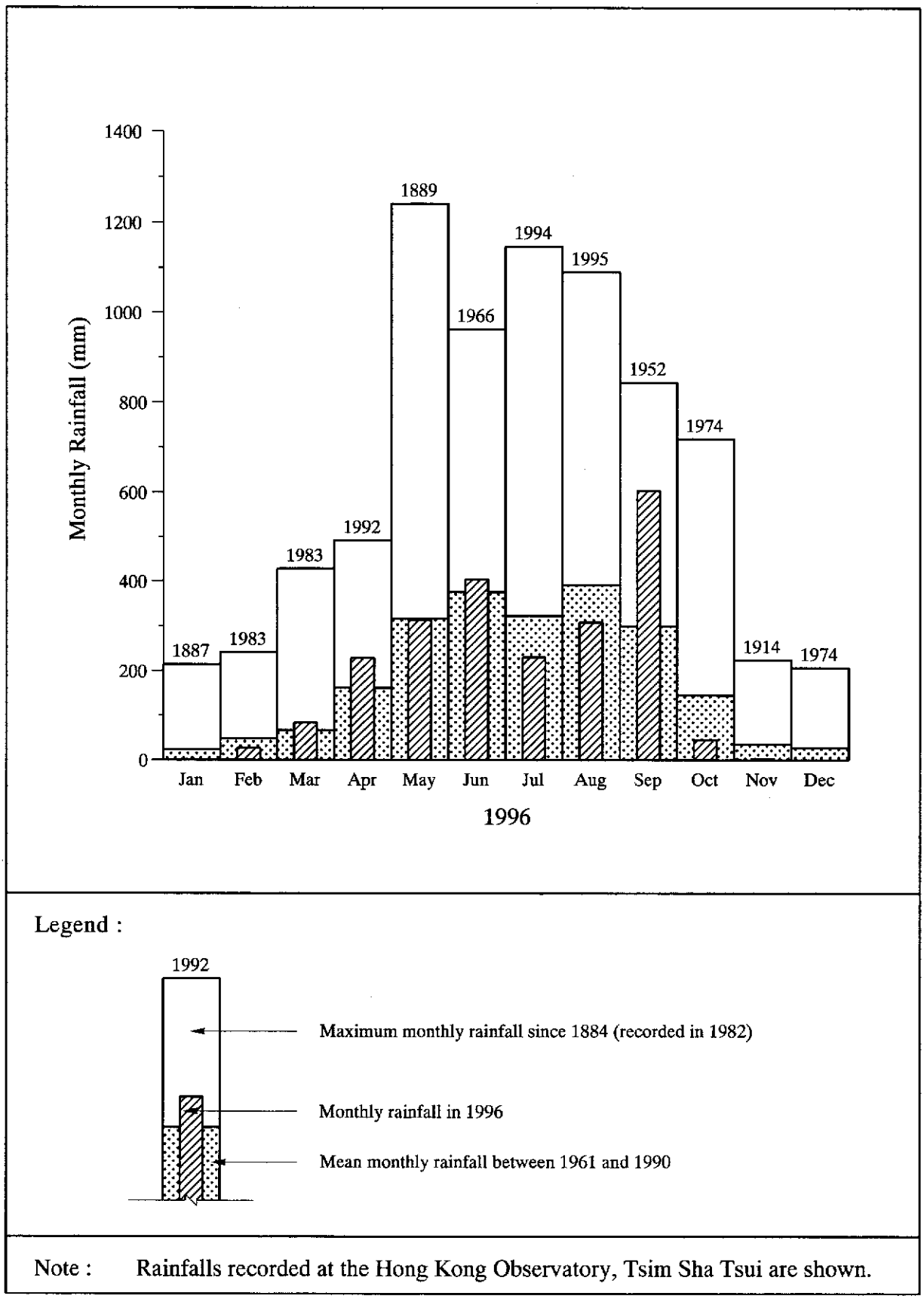
Note : Rainfalls recorded at the Hong Kong Observatory, Tsim Sha Tsui are shown.

Figure 2 - Cumulative Rainfall for 1996 and Recorded Highest, Mean and Lowest Cumulative Rainfalls



Note : Number of landslides known to have occurred on specific dates is shown.

Figure 3 - Daily Rainfall and Distribution of Number of Landslides in 1996



Note : Rainfalls recorded at the Hong Kong Observatory, Tsim Sha Tsui are shown.

Figure 4 - Monthly Rainfalls in 1996 in Comparison with Recorded Maximum and Mean Monthly Rainfalls

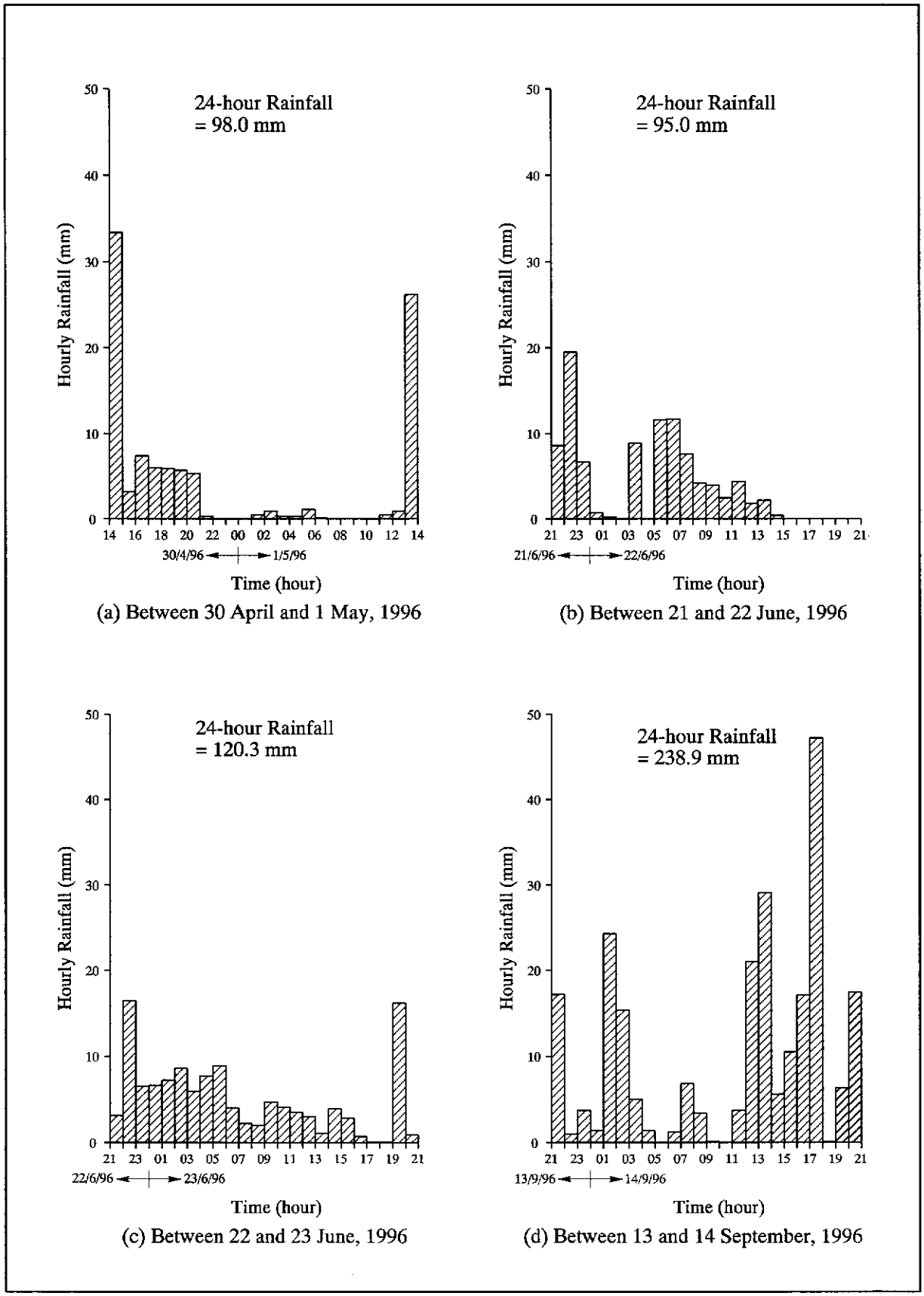
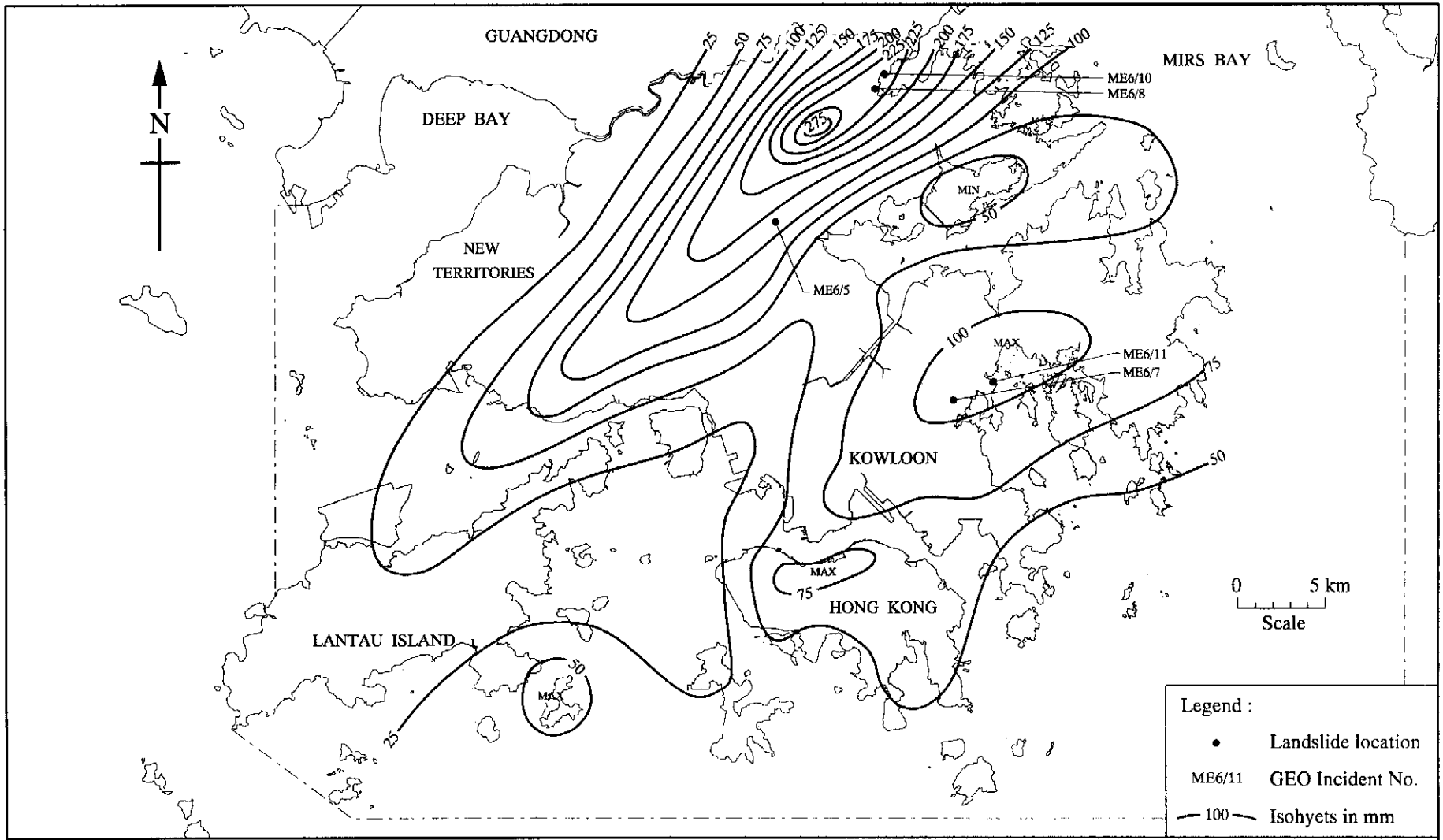
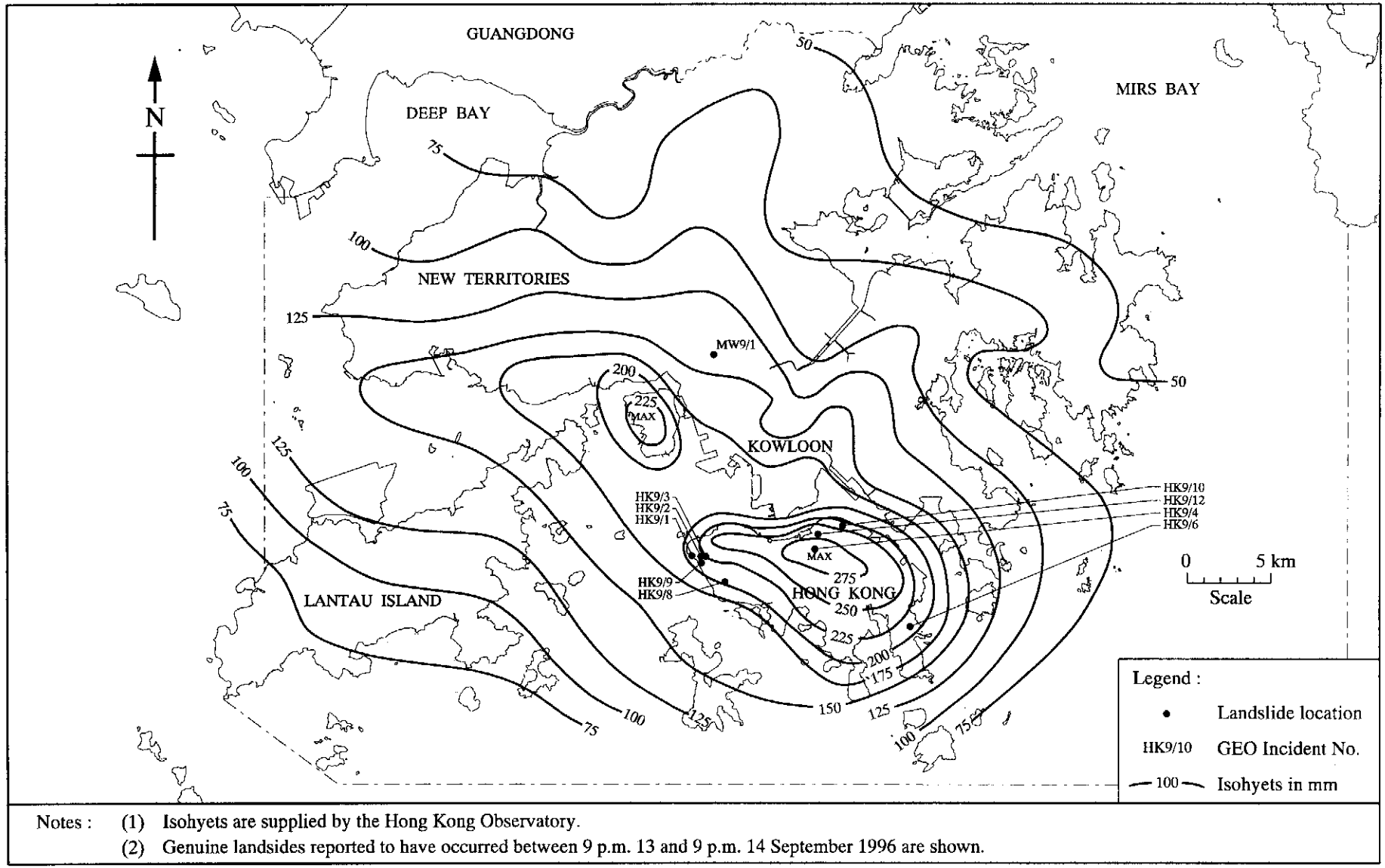


Figure 5 - Hourly Rainfall Intensities at the Hong Kong Observatory for the Four Heavy 24-hour Rainstorms in 1996



Notes : (1) Isohyets are supplied by the Hong Kong Observatory.
(2) Genuine landsides reported to have occurred between 9 p.m. 23 and 9 p.m. 24 June 1996 are shown.

Figure 6 - 24-hour Rainfall Distribution Ending at 9 p.m. on 24 June 1996 and Locations of Landslides



Notes : (1) Isohyets are supplied by the Hong Kong Observatory.
(2) Genuine landsides reported to have occurred between 9 p.m. 13 and 9 p.m. 14 September 1996 are shown.

Figure 7 - 24-hour Rainfall Distribution Ending at 9 p.m. on 14 September 1996 and Locations of Landslides

LIST OF PLATES

Plate 1 : Negative No. MW9608502 Taken on : 3-5-96

Description : Major failure of a soil cut slope affecting a track.

Plate 1 - Above Golf Driving Range, Area 19, Tuen Mun (Incident MW 96/5/3)

Plate 2 : Negative No. MW9604610 Taken on : 14-3-96

Description : Major signs of distress of a soil cut slope resulting in a construction site being affected.

Plate 2 - STTL 410, Pik Tin Street, Shatin (Incident MW 96/3/3)

Plate 3 : Negative No. ME9609704 Taken on : 23-4-96

Description : Fill slope failure resulting in closure of a road.

Plate 3 - Near Savanna Garden, Tai Po Road, Tai Po Kau (Incident ME 96/4/3)

Plate 4 : Negative No. MW9601417 Taken on : 27-6-96

Description : Major failure of a soil cut slope affecting a cemetery.

Plate 4 - Wo Hop Shek Cemetery, Fanling (Incident MW 96/6/5)

Plate 5 : Negative No. I9635703 Taken on : 25-7-96

Description : Major failure of a temporary cut slope affecting a construction site and resulting in closure of a road.

Plate 5 - Near 212 Victoria Road, Pok Fu Lam (Incident HK 96/7/4)

Plate 6 : Negative No. I9647025 Taken on : 15-9-96

Description : Failure of a soil cut slope resulting in the temporary evacuation of 45 flats, blockage of a road and closure of a carpark.

Plate 6 - Below 1 Wang Fung Terrace, Tai Hang (Incident HK 96/9/4)

Plate 7 : Negative No. I9648218 Taken on : 16-9-96

Description : Major failure of a soil cut slope resulting in a sports playground being affected.

Plate 7 - Junction of Ap Lei Chau Bridge Road and Lee Nam Road, Ap Lei Chau (Incident HK 96/9/5)

APPENDIX A

RECORDS FROM GEO RAINGAUGES DURING THE TWO HEAVY 24-HOUR RAINSTORMS OF 1996

LIST OF FIGURES

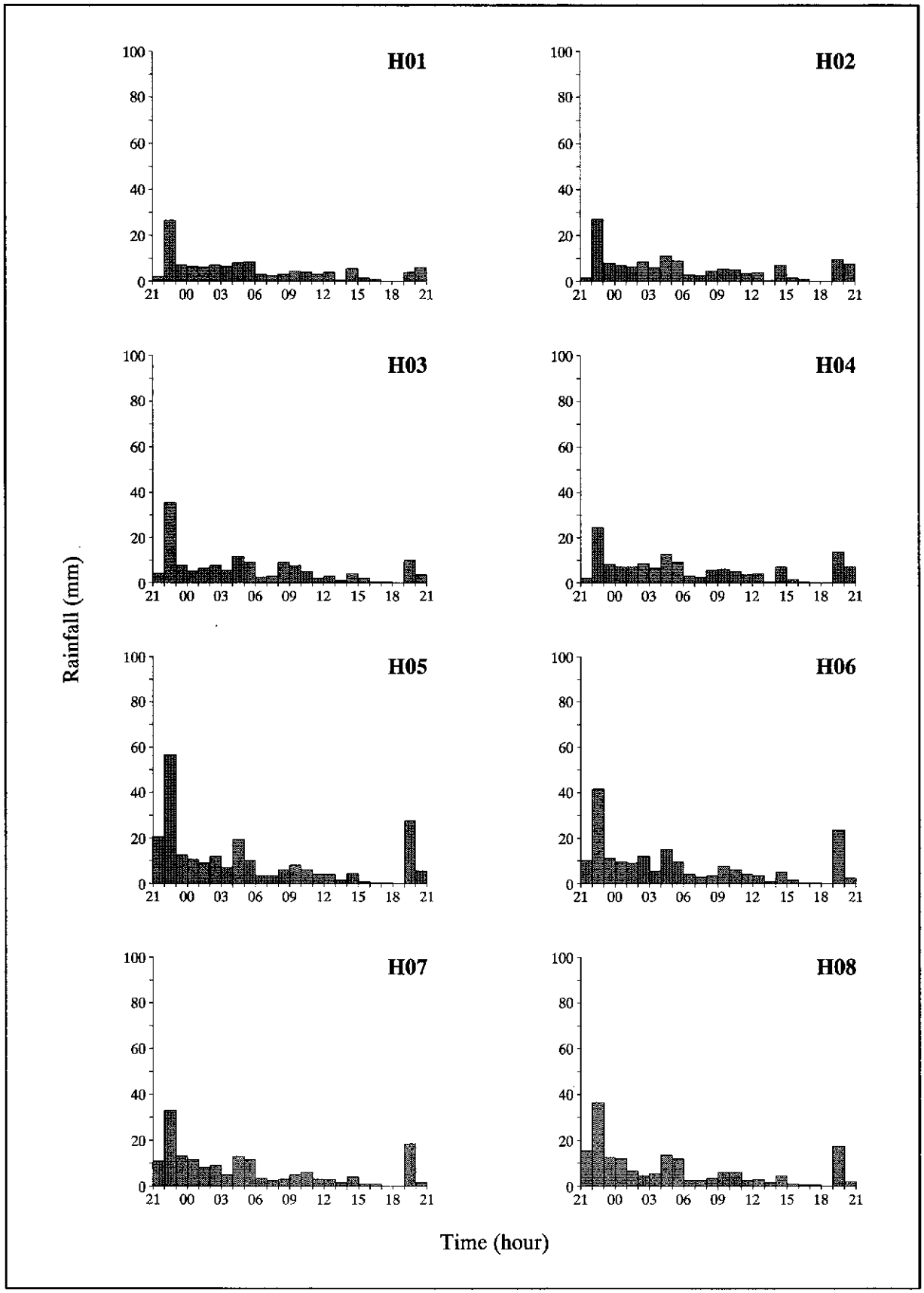


Figure A1 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 22 to 23 June, 1996 (Sheet 1 of 6)

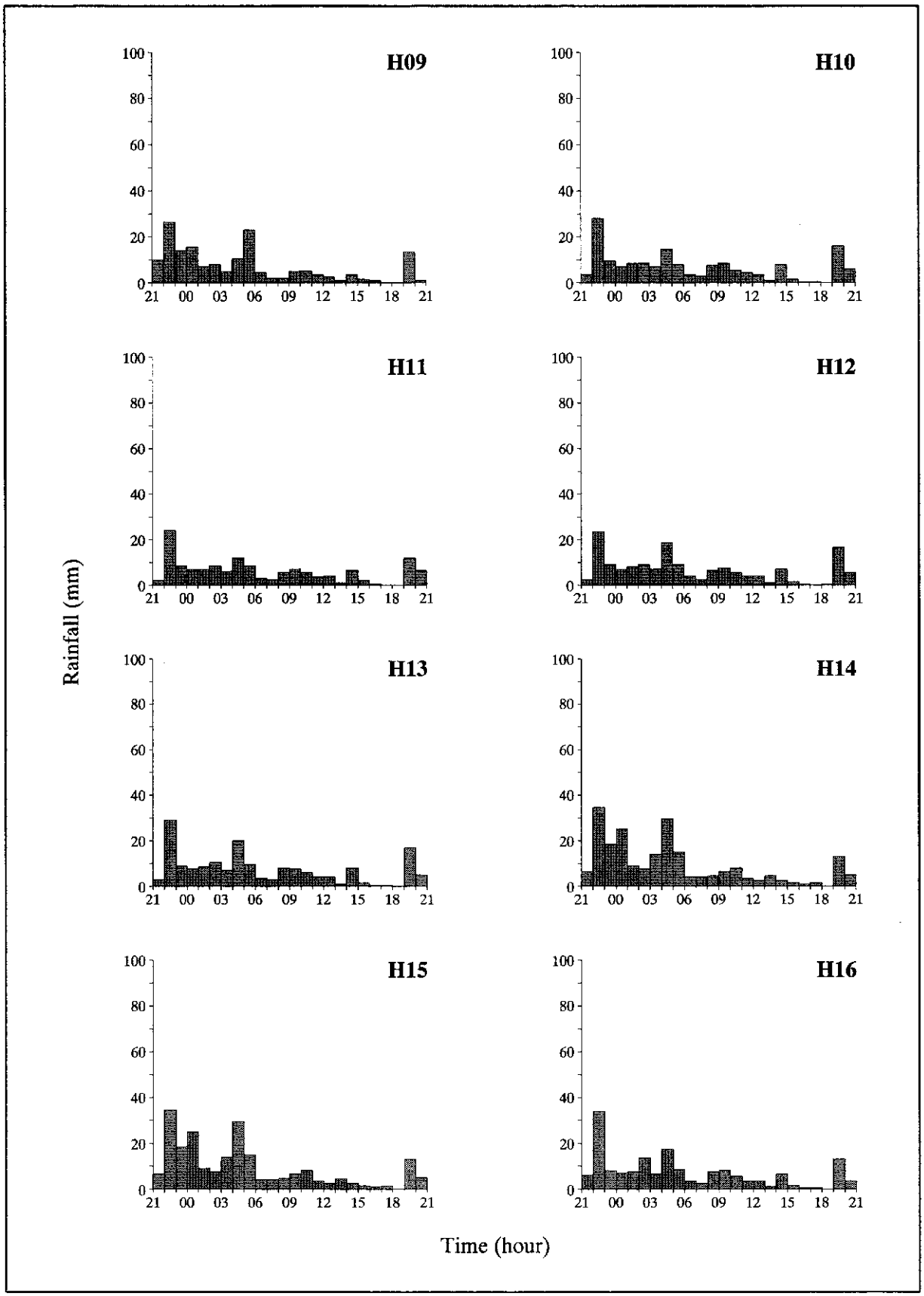


Figure A1 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 22 to 23 June, 1996 (Sheet 2 of 6)

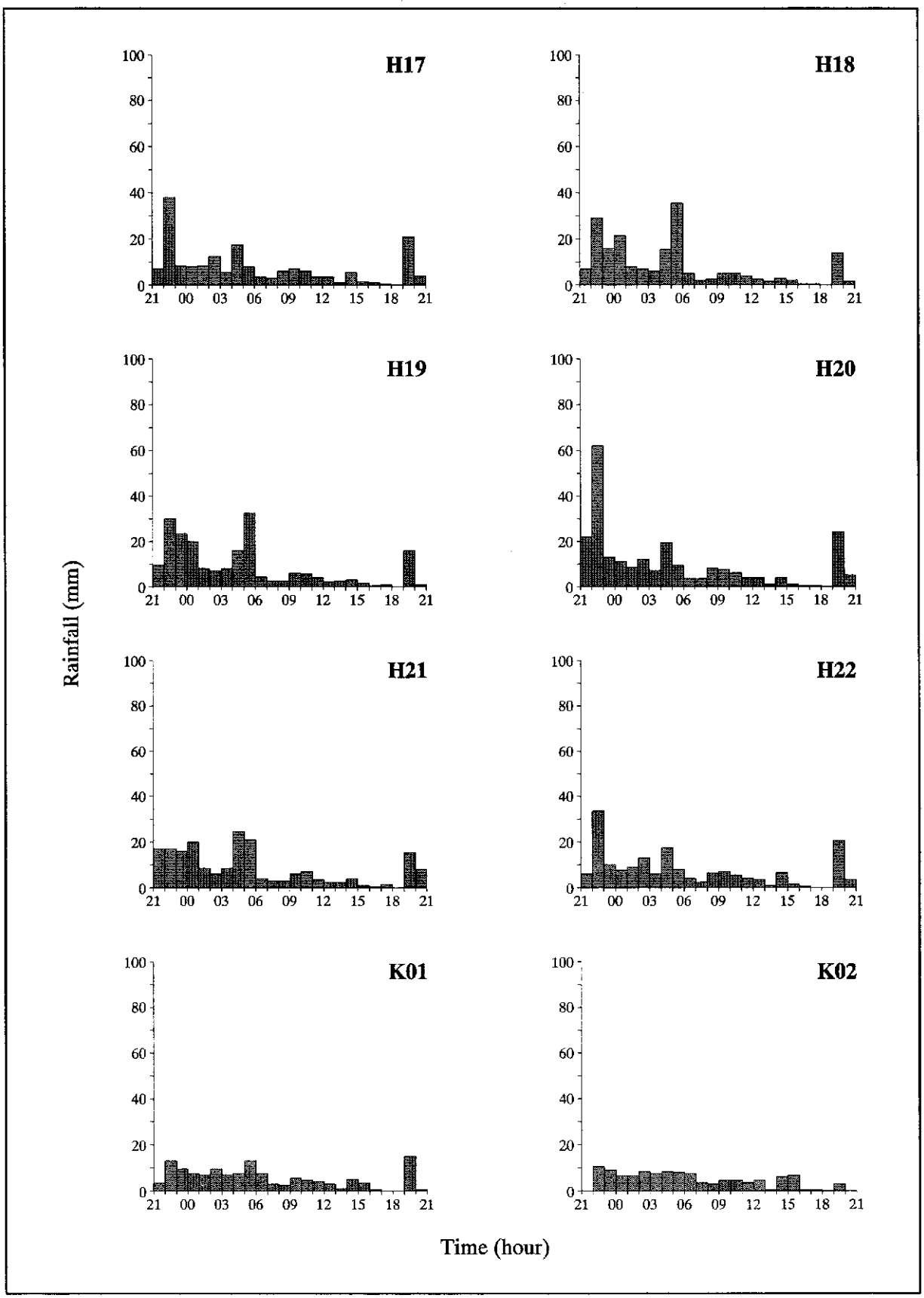


Figure A1 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 22 to 23 June, 1996 (Sheet 3 of 6)

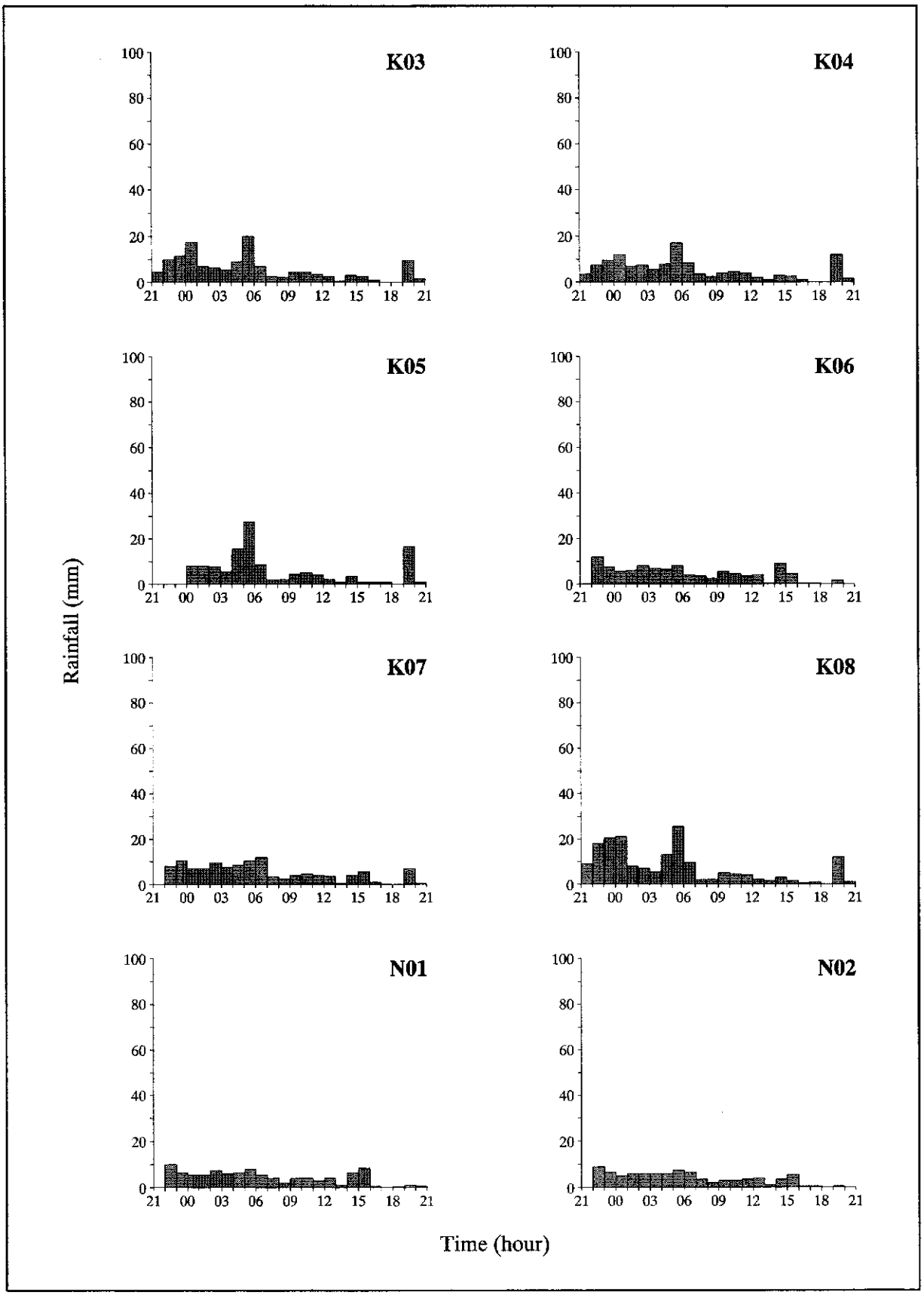


Figure A1 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 22 to 23 June, 1996 (Sheet 4 of 6)

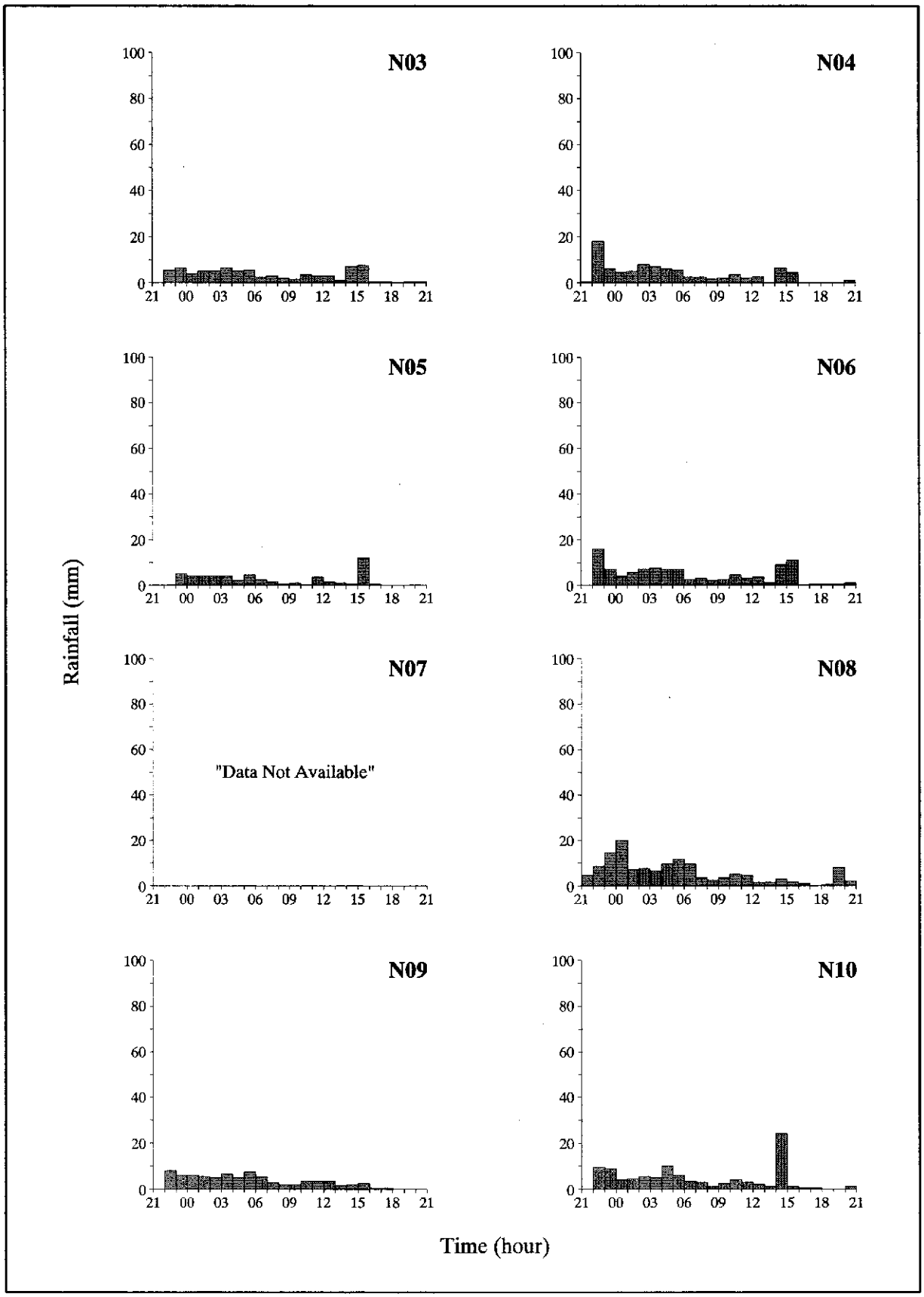


Figure A1 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 22 to 23 June, 1996 (Sheet 5 of 6)

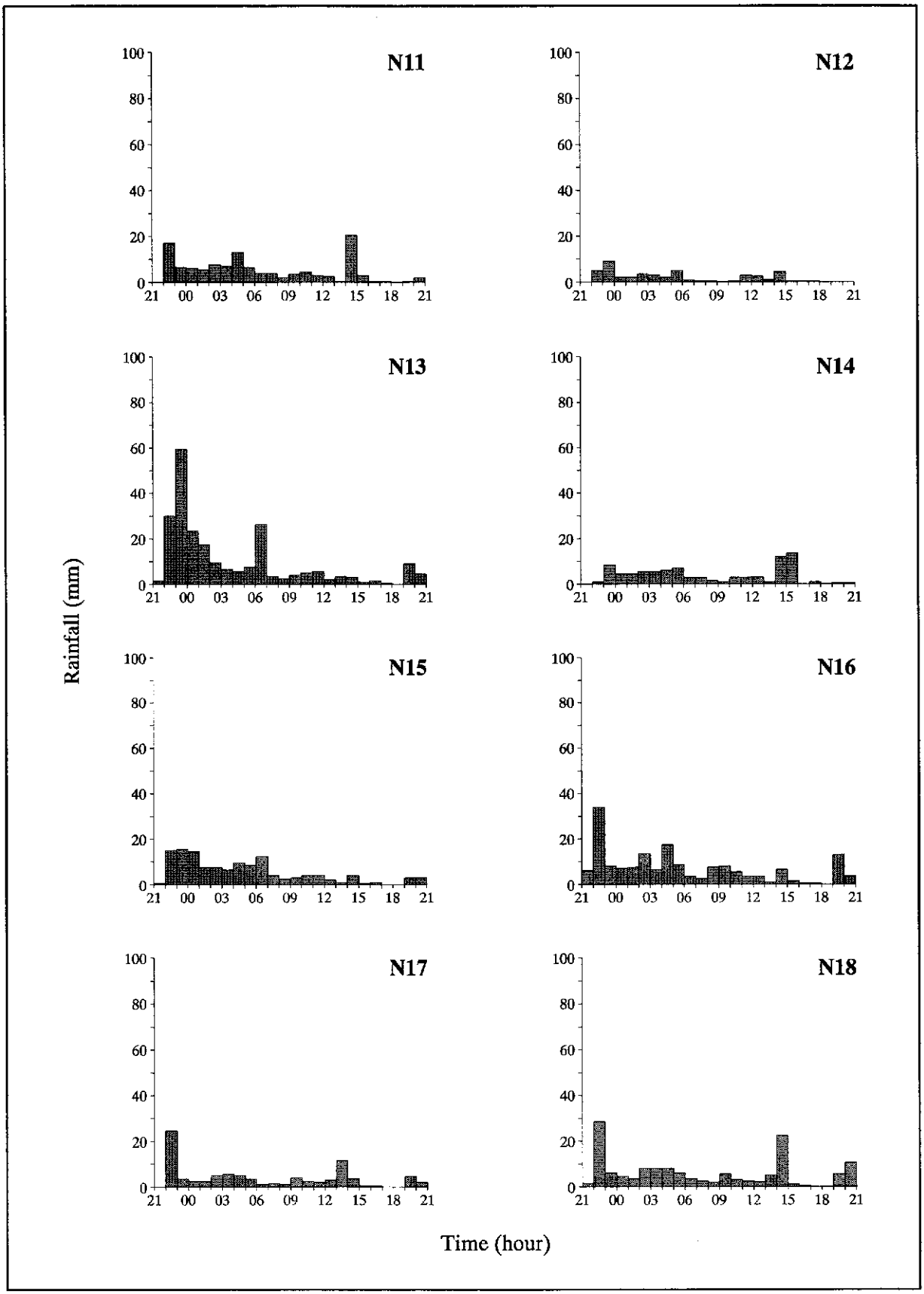


Figure A1 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 22 to 23 June, 1996 (Sheet 6 of 6)

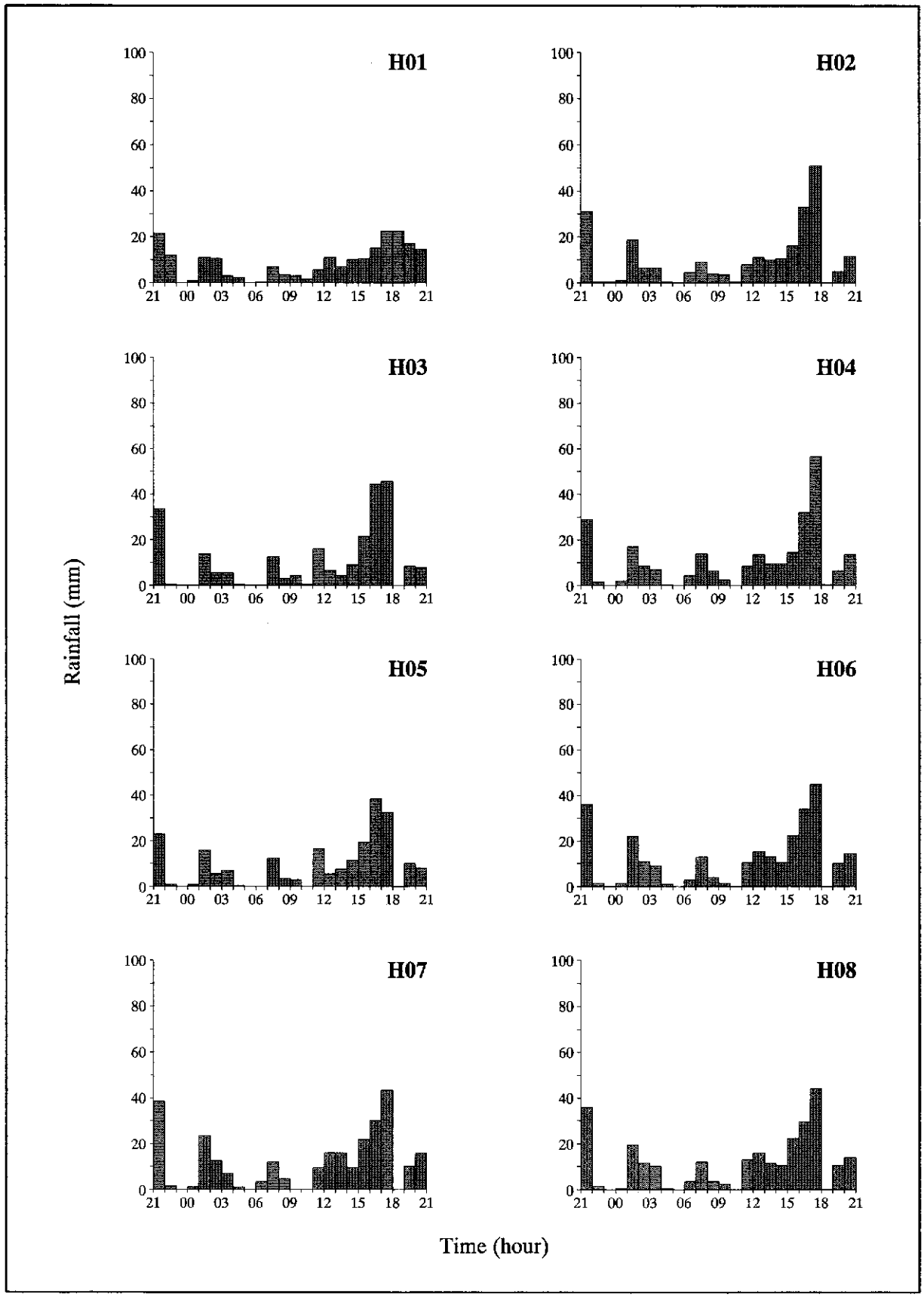


Figure A2 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 13 to 14 September, 1996 (Sheet 1 of 6)

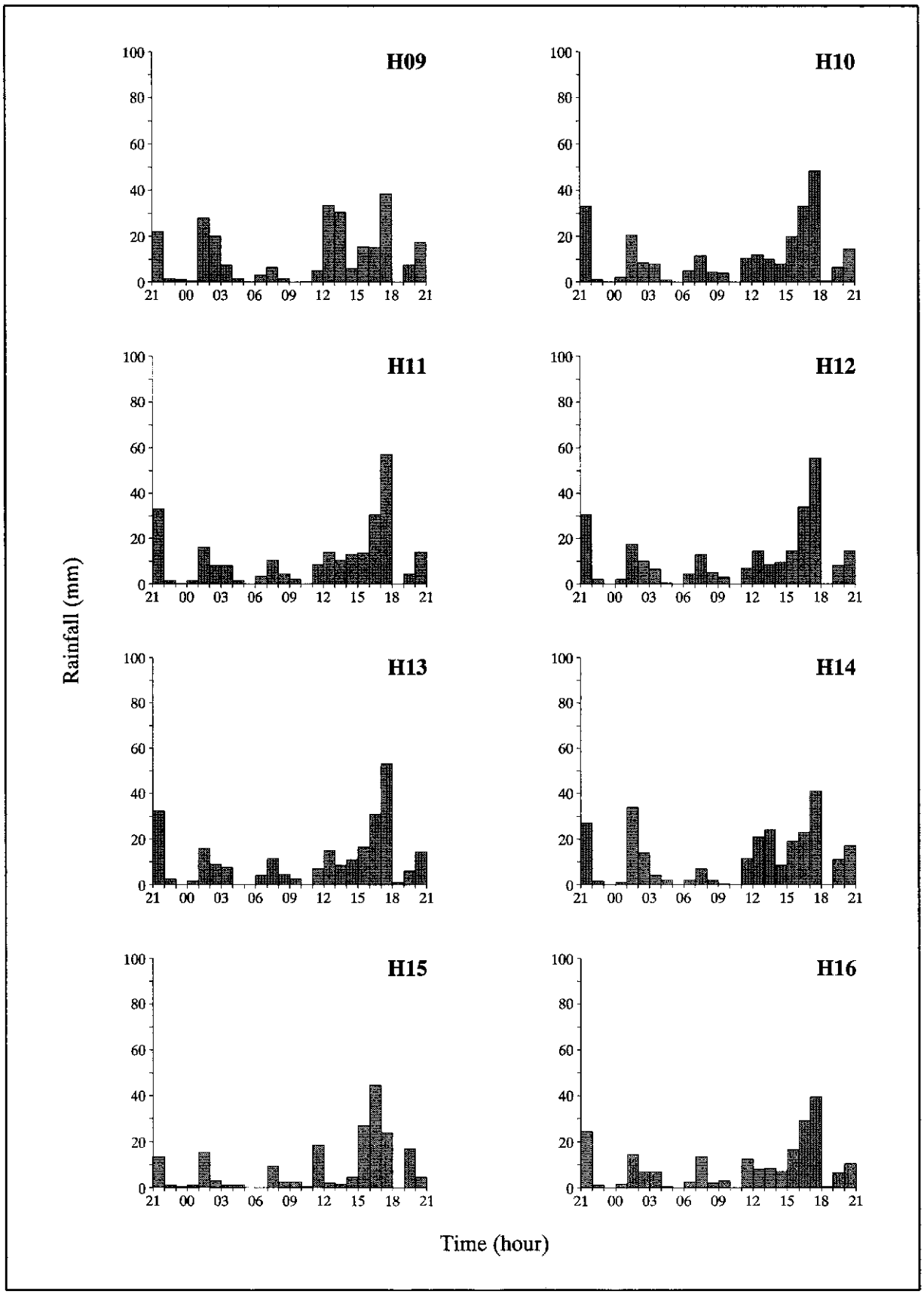


Figure A2 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 13 to 14 September, 1996 (Sheet 2 of 6)

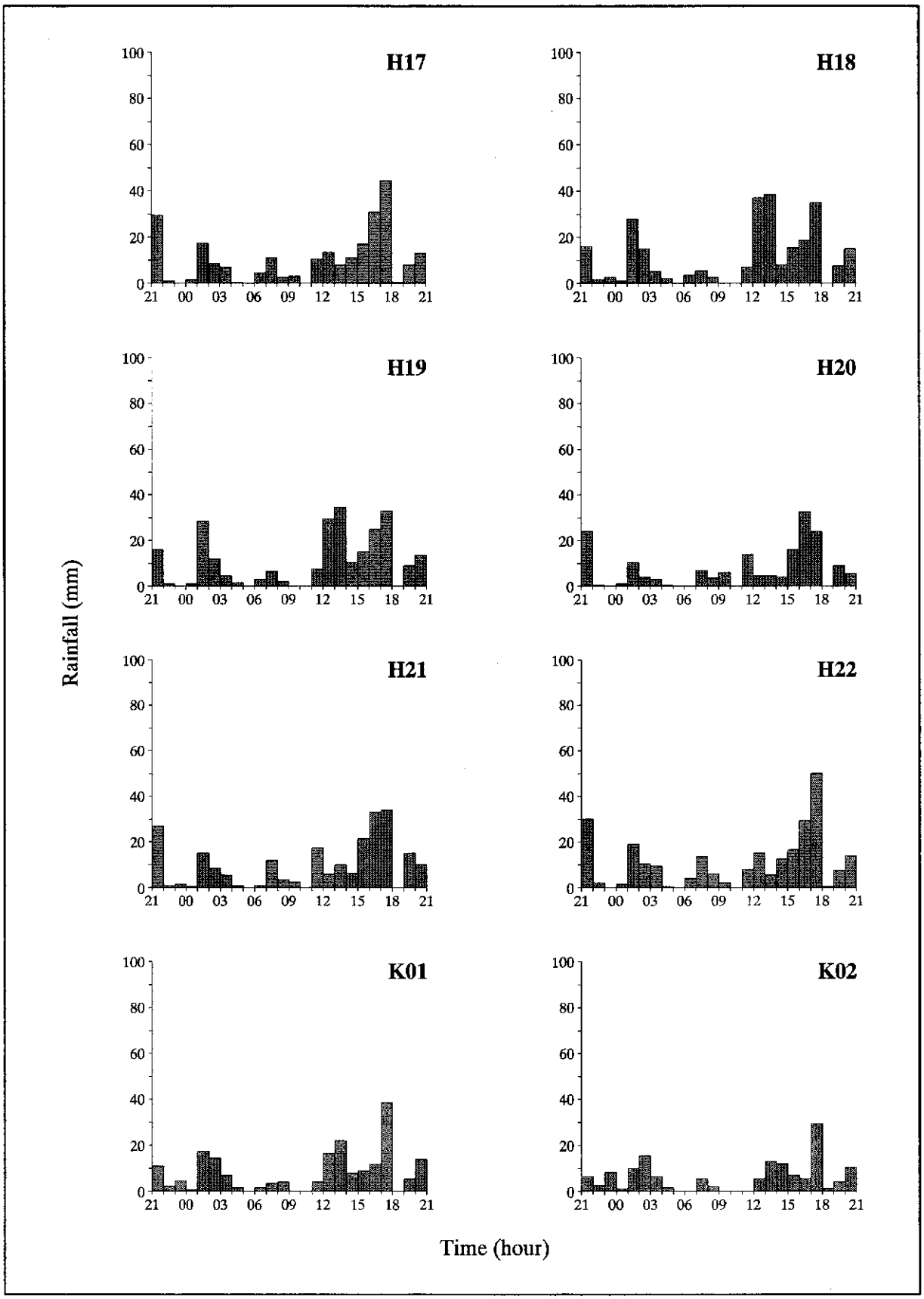


Figure A2 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 13 to 14 September, 1996 (Sheet 3 of 6)

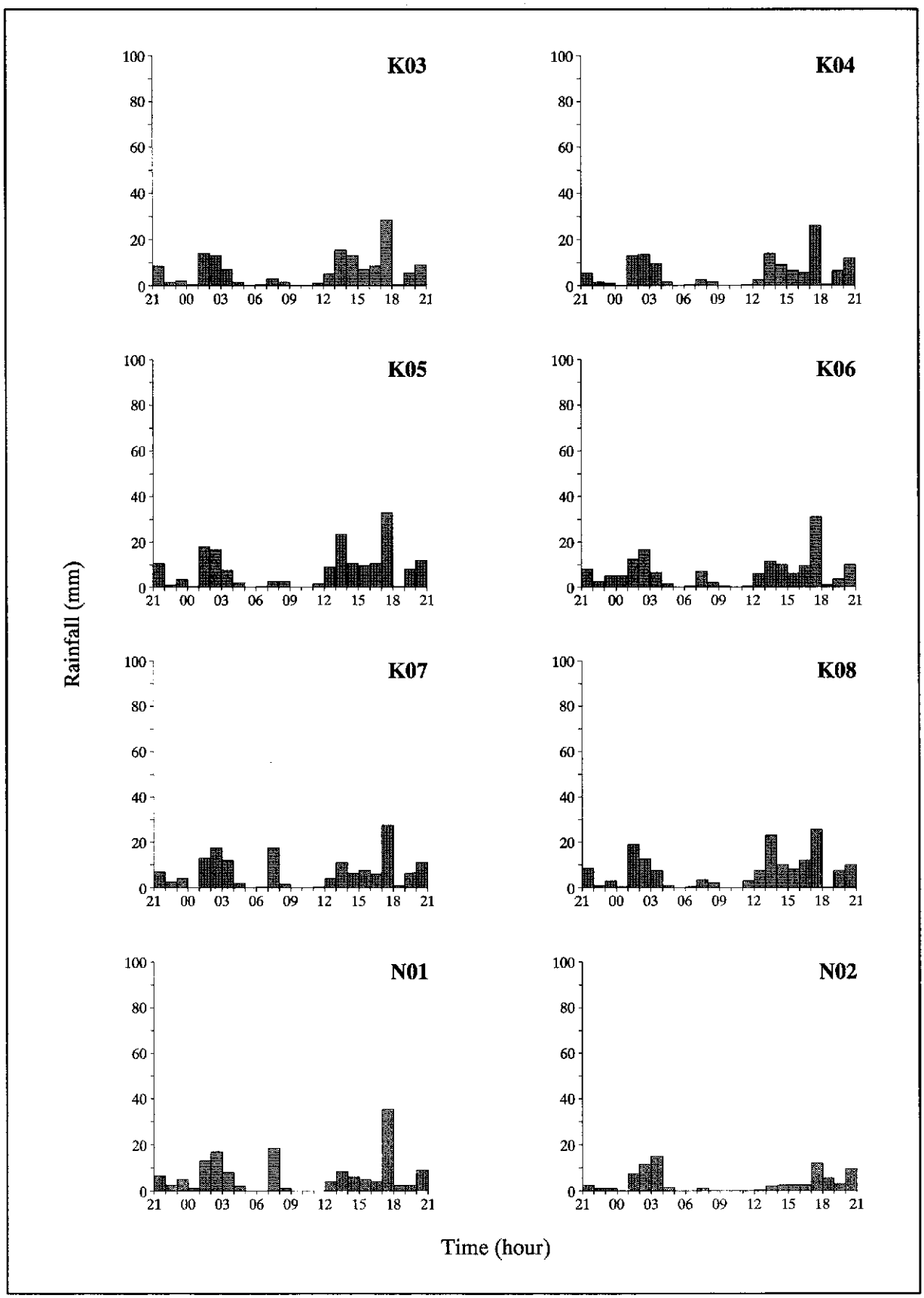


Figure A2 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 13 to 14 September, 1996 (Sheet 4 of 6)

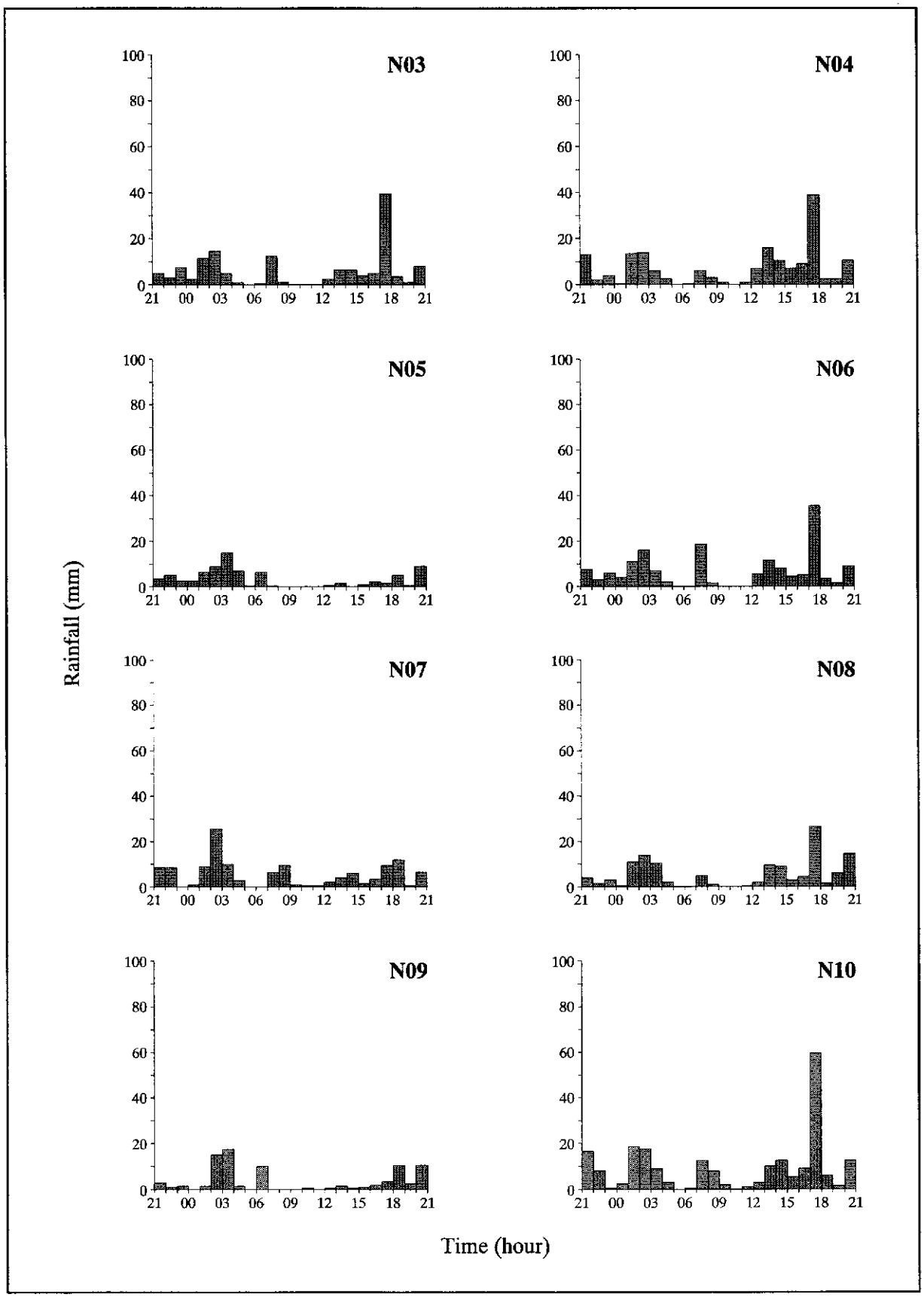


Figure A2 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 13 to 14 September, 1996 (Sheet 5 of 6)

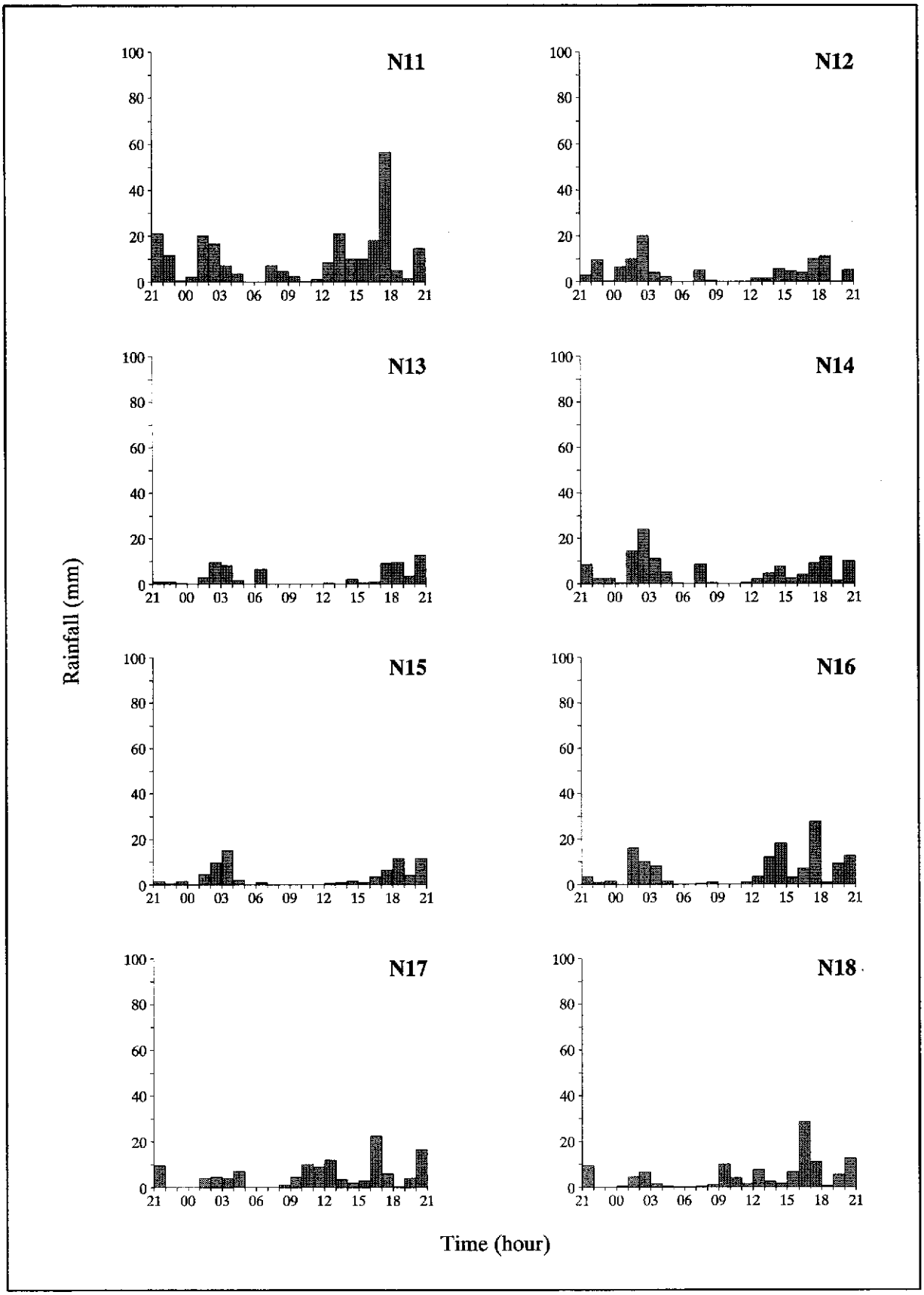


Figure A2 - Histograms of Hourly Rainfall Recorded by GEO Raingauges during 13 to 14 September, 1996 (Sheet 6 of 6)

APPENDIX B

LIST OF INCIDENTS REPORTED TO GEO

LIST OF TABLES

Table B1 - List of Incidents on Hong Kong Island Reported to GEO in 1996 (Sheet 1 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
HK 1/1	55 South Bay Road, Repulse Bay.	3/10/95	Public	23/8/1995	Natural slope	Minor (20)	Building lot		
HK 2/1	2-2A Mount Davis Road, Pok Fu Lam.	25/1	Public	Wet Season 1995	Natural slope	Minor (3)			
HK 3/1	Dynasty Court, Old Peak Road, Mid-Levels. (11SW-B/C82)	11/3	HyD/HK	Unknown	Soil cut slope	Minor (0.5-1)	Building lot		
HK 3/2	Dynasty Court, Old Peak Road, Mid-Levels. (11SW-A/CR209)	13/3	HyD/HK	Unknown	Soil/rock cut slope	Minor (0.5-1)	Open space		
HK 3/3	1 Peak Road, Wan Chai Gap. (11SW-D/C599)	26/3	Police	26/3 (pm)	Boulder fall	Minor (<1)	Road	1 lane of road closed	
HK 3/4	40 Island Road, Repulse Bay. (15NW-B/C56)	13/3	Public	13/8/1995	Soil/rock cut slope	Minor (<40)	Building access		
HK 3/5	Maryknoll Sister's School, Tai Hang Road, Jardine's Lookout. (11SE-C/CR43)	29/3	Police	29/3 (10:45)					No geotechnical concern, only tree fallen
HK 3/6	A Kung Ngam Village Road, Shau Kei Wan. (11SE-B/C93)	11/3	UC	Before 19/3	Soil/rock cut slope	Minor (0.1)			
HK 4/1	Near Lamp Post 32667, Tai Tam Road, Stanley. (15NE-A/C193)	4/4	HyD/HK	4/4 (2:00)	Rock fall	Minor (1)	Road	1 lane of road closed	
HK 4/2	Access path between Kwun Lung Lau and Sai Wan Estate, Kennedy Town. (11SW-A/CR8)	4/4	Police	4/4 (morning)	Soil cut slope	Minor (2)			

Table B1 - List of Incidents on Hong Kong Island Reported to GEO in 1996 (Sheet 2 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
HK 4/3	Opposite 25 Kennedy Road, Wan Chai. (11SW-D/C668)	1/4	HyD/HK	1/4 (10:00)	Rock fall	Minor (0.03)	Pedestrain pavement		
HK 4/4	8 South Bay Road, Repulse Bay. (15NE-A/C88)	19/4	Police	19/4 (14:50)	Rock fall	Minor (0.5)	Road	1 lane of road closed	
HK 4/5	St. John's College, University of Hong Kong, 82 Pokfulam Road, Pok Fu Lam. (11SW-A/C140)	30/4	WSD	28-29/4	Soil/rock cut slope	Minor (1-3)	Open space		
HK 5/1	Canadian International School, Nam Long Shan Road, Wong Chuk Hang.	5/5	HyD/HK	5/5 (morning)	Soil cut slope	Minor (40)	Road	2 lanes of road blocked	
HK 5/2	41 Mount Kellett Road, The Peak. (11SW-C/C255)	6/5	Public	4-5/5	Soil/rock cut slope	Minor (5-10)	Construction site		
HK 5/3	Holy Cross Church, Holy Cross Path, Sai Wan Ho.	6/5	HD	6/5 (2:00)	Retaining wall	Minor (4)	Pedestrain pavement Open space	Pedestrian pavement closed	
HK 5/4	Lung Fu Pavilion, Lung Fu Shan, Pok Fu Lam.	4/1	HyD/HK	September, 1995	Soil cut slope	Minor (1)	Road		
HK 5/5	Aberdeen Reservoir Road, Aberdeen.	9/5	AFD	3/5	Soil cut slope	Minor (1-2)			
HK 5/6	Aberdeen Reservoir Road, Aberdeen.	9/5	AFD	3/5	Soil cut slope	Minor (0.5)			
HK 5/7	Opposite 52 Chung Hom Kok Road, Chung Hom Kok. (15NE-C/C87)	10/5	Public	Unknown					No failure, only dislodgement of slope surface protection
HK 6/1	Stubbs Road, Happy Valley. (11SW-D/C383)	22/6	Police	22/6 (8:35)	Soil cut slope	Minor (2)	Road	1 lane of road closed	

Table B1 - List of Incidents on Hong Kong Island Reported to GEO in 1996 (Sheet 3 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
HK 6/2	Near Entrance of Matilda Hospital, Mount Kellet Road, The Peak. (11SW-C/C253)	23/6	HyD/HK	23/6 (9:45)	Rock fall	Minor (0.5)	Road	1 lane of road closed	
HK 6/3	Footpath between Blocks 16-18 and Blocks 45-48, Baguio Villa, Pok Fu Lam. (11SW-C/F77)	23/6	Police	23/6 (7:00)	Fill slope	Minor (3)	Road Footpath	1 lane of road closed	
HK 6/4	Hut No. 35C Pokfulam Village, Pok Fu Lam.	23/6	Police	Unknown	Retaining wall	Minor	Squatter Pedestrain pavement	2 huts temporarily evacuated Pedestrian pavement closed	
HK 6/5	Monmouth Path, Wanchai. (11SW-B/R591)	23/6	Police	Unknown	Retaining wall	Minor (2)	Pedestrain pavement	Pedestrian pavement closed	
HK 6/6	24 Mount Cameron Road, Wan Chai Gap.	17/5	HyD/HK	8/5	Natural slope	Minor (5)	Stream		
HK 6/7	Junction of Ap Lei Chau Bridge Road and Lee Nam Road, Ap Lei Chau. (15NW-A/C1)	22/6	FSD	22/6					No failure, only dislodgement of slope surface protection
HK 6/8	Middle Island, Repulse Bay.	24/6	BD	23/6	Soil cut slope	Minor (2)	Open space		
HK 6/9	Mount Davis Path, Pok Fu Lam.	24/6	TDD	Unknown	Soil/rock cut slope	Minor (0.5)	Footpath		
HK 6/10	Tong Bin Lane, Wong Chuk Hang. (11SW-D/C91)	26/6	TDD	26/6	Soil cut slope	Minor (3)	Pedestrain pavement	Pedestrian pavement closed	
HK 7/1	St. Stephen's Beach, Stanley.	4/7	Arch SD	30/6	Rock fall	Minor (0.1)	Footpath	Pedestrian pavement Footpath closed	
HK 7/2	Hairpin Beach, Stanley. (15NE-A/C243)	4/7	Arch SD	30/6	Rock fall	Minor (0.2)	Playground		

Table B1 - List of Incidents on Hong Kong Island Reported to GEO in 1996 (Sheet 4 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
HK 7/3	Below Belilios Public School, King's Road, North Point. (11SE-A/CR11)	12/7	Police	12/7 (9:08)	Rock fall	Minor (0.02)	Pedestrain pavement	Pedestrian pavement closed	
HK 7/4	Near 212 Victoria Road, Pok Fu Lam.	25/7	HyD/HK	25/7 (8:00)	Soil cut slope	Major (75)	Road Construction site	2 lanes of road closed	Plate 5
HK 7/5	8 Tai Tam Road, Stanley.	29/7	BD	29/7 (13:30)	Rock fall	Minor (0.8)	Open space		
HK 8/1	Tai Tam Reservoir Road, Tai Tam Tuk Reservoir. (15NE-A/C208)	18/8	FSD	18/8 (9:00)	Soil cut slope	Minor (25)	Road Country park	1/2 lane of road blocked	
HK 8/2	7B Bowen Road, Central. (11SW-B/C180)	18/8	Police	18/8 (morning)	Soil/rock cut slope	Minor (45)	Construction site		
HK 9/1	Felix Villas, 61 Mount Davis Road, Pok Fu Lam. (11SW-C/R50)	14/9	Police	14/9 (16:00)	Rock fall Soil/rock cut slope	Minor (24)	Building lot Building access Construction site	1 flat evacuated Building access closed	
HK 9/2	West Island School, 250 Victoria Road, Pok Fu Lam.	14/9	FSD	14/9 (16:00)	Fill slope Natural slope	Minor (30)	Building lot Road Pedestrain pavement Construction site Carpark	1 flat evacuated 1 lane of road closed	
HK 9/3	Chinese Christian Cemetery, Victoria Road, Pok Fu Lam. (11SW-C/C186)	14/9	Police	14/9 (16:00)	Soil cut slope	Minor (45)	Squatter Construction site	1 hut temporarily evacuated	
HK 9/4	Below 1 Wang Fung Terrace, Tai Hang. (11SE-A/C124)	14/9	FSD	14/9 (17:00)	Soil cut slope	Minor (30)	Building lot Road Carpark	45 flats evacuated 2 lanes of road closed Carpark closed.	Plate 6
HK 9/5	Junction of Ap Lei Chau Bridge Road and Lee Nam Road, Ap Lei Chau. (15NW-A/C1)	14/9	FSD	14/9 (19:30)	Soil cut slope	Major (50)	Open space Playground	Playround closed	Plate 7

Table B1 - List of Incidents on Hong Kong Island Reported to GEO in 1996 (Sheet 5 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
HK 9/6	Junction of Big Wave Bay Road and Shek O Road. (15NE-B/C18)	14/9	GEO	14/9 (15:30 -16:00)	Soil/rock cut slope Rock fall	Minor (<5)	Road	1 lane of road closed	
HK 9/7	Near 9 Big Wave Bay Road, Shek O. (15NE-B/C72)	16/9	HyD/HK	Unknown	Soil cut slope	Minor (0.2)	Road	1 lane of road closed	
HK 9/8	Hut No. 100H Pokfulam Village, Pokfulam.	14/9	Police, HyD/HK	14/9 (9:30)	Retaining wall Fill slope	Minor (14.7)	Squatter		
HK 9/9	Scenic Villa, 2-28 Victoria Road, Pok Fu Lam. (11SW-C/C179)	14/9	Public	14/9 (17:00)	Soil cut slope	Minor (20)	Pedestrain pavement	Pedestrian pavement closed	
HK 9/10	Opposite Braemar Terrace, Pak Fuk Road, North Point. (11SE-A/C87)	14/9	Police	14/9 (14:00)	Soil/rock cut slope	Minor (2)	Pedestrain pavement	Pedestrian pavement closed	
HK 9/11	Below 25 Tai Hang Drive, Tai Hang.	16/9	Police	14/9	Retaining wall	Minor (20)	Stream		
HK 9/12	Building Contractor's Association School, 62 Tin Hau Temple Road, North Point. (11SE-A/CR101)	16/9	Police	14/9 (18:00)	Rock fall	Minor (0.3)	Building access		
HK 9/13	At Rear of Latrine of Victoria Peak Garden Carpark, 40 Mount Austin Road, The Peak. (11SW-A/C341)	17/9	Police	9/9	Soil/rock cut slope	Minor (5-6)	Footpath		
HK 9/14	Near Catchpit BL71, Black's Link, Wong Nai Chung Gap.	17/9	Police	17/9 (morning)	Boulder fall	Minor (0.67)	Road	1/3 lane of road blocked	
HK 9/15	404 Victoria Road, Pok Fu Lam. (11SW-A/C290)	18/9	HyD/HK	18/9 (morning)	Soil cut slope	Minor (1)	Building access		

Table B1 - List of Incidents on Hong Kong Island Reported to GEO in 1996 (Sheet 6 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
HK 9/16	13-15 Tai Hang Road, Tai Hang. (11SE-A/C130)	25/9	BD	14/9	Soil/rock cut slope	Minor (1.05)	Building access		
HK 9/17	Chi Fu Fa Yuen Morning Trail, Pok Fu Lam.	1/10	DO/S	27/9	Soil cut slope	Minor (3)	Pedestrain pavement		
HK 12/1	13-15 Tai Hang Road, Tai Hang. (11SE-A/C130)	27/12	BD	26/12 (15:40)	Boulder fall	Minor (0.1)	Carpark		

Table B2 - List of Incidents in Kowloon Reported to GEO in 1996

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
K 2/1	Behind Block 1, Hung Hom Estate, Hung Hom. (11NE-C/C114)	19/10/95	HD	Unknown	Rock fall	Minor	Building access		
K 4/1	Opposite 67 Sheung Shing Street, Homantin. (11NW-D/C55)	4/4	Police	4/4 (am)	Rock fall	Minor (<0.1)	Pedestrain pavement	Pedestrian pavement closed	
K 4/2	Shatin Pass Road, Tse Wan Shan.	6/4	HyD/K	6/4 (13:00)	Rock fall	Minor (4.5)	Road	Road blocked	
K 5/1	Shatin Pass Road, Tse Wan Shan.	6/5	Police	6/5 (8:00)	Boulder fall	Minor (0.045)	Road	1/2 lane of road blocked	
K 5/2	Below Hui Kwong Street Bus Terminus/Park, Sau Mau Ping. (11NE-D/N4)	7/12/95	GEO	Unknown	Natural slope	Minor (5)			
K 6/1	Fung Tak Road, Wong Tai Sin.	10/6	FSD	10/6 (16:40)	Soil cut slope	Minor (2)	Pedestrain pavement Construction site	1 person injured Pedestrian pavement closed	
K 6/2	34B Braga Circuit, Mong Kok.	16/6	BD	15-16/6	Soil cut slope	Minor (2)	Construction site Carpark		
K 9/1	Opposite Block 6 Valley Road Estate, Fat Kwong Street, Homantin. (11NW-D/C77)	15/9	HyD/K	15/9 (7:00-8:00)	Soil cut slope	Minor (20)	Road Pedestrain pavement	2 lanes of road closed Pedestrian pavement closed	
K 9/2	Opposite Lok Nga Court, Chun Wah Road, Jordan Valley.	15/9	HyD/K	15/9 (16:00)	Soil/rock cut slope	Minor (4)	Road Pedestrain pavement	Road closed Pedestrian pavement closed	
K 9/3	Chun Wah Road, Ngau Tau Kok.	24/9	HyD/K	21/9	Soil cut slope	Minor (3)			

Table B3 - List of Incidents in Eastern New Territories Reported to GEO in 1996 (Sheet 1 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
ME 1/1	Tai Po Kau Village Office, Tai Po Kau.	10/1	DO/TP	January, 1996	Soil cut slope	Minor (1)	Building lot		
ME 2/1	Lot 787 in DD215, Hiram's Highway, Sai Kung. (8SW-C/CR5)	17/2	BD	17/2 (18:00)	Soil cut slope	Minor (2)	Building lot	4 houses evacuated	
ME 2/2	House No.17 Lung A Pai, Lam Tsuen, Tai Po.	1/12/95	HAD/CER PIS	July - August, 1995	Retaining wall Natural slope	Minor	Squatter	1 hut permanently evacuated	
ME 3/1	Near Wong Chuk Wan, Sai Sha Road, Sai Kung. (8SW-A/C3)	13/3	HyD/NT	Unknown	Soil cut slope	Minor (<10)			
ME 3/2	26 Po Tung Road, Sai Kung.	29/3	Police	29/3 (9:30)	Soil cut slope	Minor (15)	Storage hut	Storage hut dis-used	
ME 4/1	Access Road to Sha Lan Villas and Shuen Wan School, Tai Po.	17/4	Public	16/4 (13:00)	Rock fall	Minor (0.2)	Road	1 lane of road blocked	
ME 4/2	Near Lamp Post V78489, Wong Chuk Wan, Sai Kung.	18/4	HyD/NT	Unknown	Soil cut slope	Minor (<10)	Access road		
ME 4/3	Near Savanna Garden, Tai Po Road, Tai Po Kau.	23/4	HyD/NT	23/4	Fill slope	Minor (25)	Road	1 lane of road closed	Plate 3 probably involving rupture of water main
ME 4/4	Access Road to Ha Hang Village, Tai Po.	22/4	DO/TP	Unknown	Natural slope	Minor (20)	Access road		
ME 5/1	Near Lamp Post EB0912G, Bride's Pool Road, Chung Mei, Tai Po.	4/5	HyD/NT	4/5	Soil/rock cut slope	Minor (20)	Road Pedestrain pavement	1 lane of road closed Pedestrian pavement closed	
ME 5/2	No.1118 in DD217, Tai Chung Hau, Sai Kung.	6/5	Police	3/5	Fill slope	Minor (3)	Open space		
ME 5/3	Access Road to Baptist Church, Po Lo Che Road, Sai Kung.	6/5	Police	6/5 (11:00)	Soil cut slope	Minor (3)	Building access		

Table B3 - List of Incidents in Eastern New Territories Reported to GEO in 1996 (Sheet 2 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
ME 5/4	House No. 10 Shek Kwu Lung, Shatin.	7/5	DO/ST	4/5	Boulder fall	Minor (1)	Building lot	1 house evacuated	
ME 5/5	House No. 73 Sha Tin Wai, Shatin.	2/5	Public	Unknown	Soil cut slope	Minor (<0.1)	Building lot		
ME 5/6	Access Road to 41-44 Wo Liu Hang, Shatin. (7SE-A/C88)	15/5	GEO	Unknown	Soil cut slope	Minor (1)	Open space		
ME 5/7	Near Tso Wo Hang Car Park, Tai Mong Tsai Road, Sai Kung. (8SW-A/C11)	24/5	HyD/NT	Unknown	Soil/rock cut slope	Minor (15)	Pedestrain pavement	Pedestrian pavement closed	
ME 5/8	House Nos. 8-9 Siu Hang Hau Tsuen, Sheung Sze Wan Road, Sai Kung.	26/5	Police	Mid-March , 1996	Soil cut slope Retaining wall	Minor (3)	Building lot Construction site	1 occupant temporarily evacuated	
ME 6/1	Zone 247, Lin Ma Hang Road, Sha Tau Kok.	4/6	HyD/NT	Unknown	Soil/rock cut slope	Minor (<1)	Border fence		
ME 6/2	House No. 26, Pak Sha Wan, Sai Kung.	10/6	Public	3-8/6	Rock fall	Minor (0.016)	Pedestrain pavement	Pedestrian pavement closed	
ME 6/3	House No. 5-6 Welldo Villa, Wong Chuk Wan, Sai Kung.	10/1	Public	Summer, 1995	Soil cut slope	Minor (<10)	Building lot		
ME 6/4	Opposite Lamp Post EA77328 Near To Yuen Tung, Tai Po.	8/6	DO/TP	Early June, 1996	Retaining wall	Minor (1.5)	Footpath	Footpath closed	
ME 6/5	Opposite Lamp Post N37828, Tai Po Road, Tai Wo. (7NW-A/T121)	24/6	HyD/NT	24/6 (8:20)	Soil/rock cut slope	Minor (2)	Road	1 lane of road closed	
ME 6/6	Leung Man Road, Ma On Shan. (7NE-D/C1)	23/6	Police	23/6	Rock fall Soil/rock cut slope	Minor (10)	Road	1 lane of road closed	
ME 6/7	House No. 9 Hing Keng Shek, Sai Kung.	24/6	Police	24/6 (am)	Soil cut slope	Minor (0.4)	Road	1/4 lane of road blocked	

Table B3 - List of Incidents in Eastern New Territories Reported to GEO in 1996 (Sheet 3 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
ME 6/8	House No. 8 Hoi Pui Leng, Luk Keng.	24/6	Police	24/6 (9:00)	Soil cut slope	Minor (45)	Squatter Building lot	1 hut temporarily evacuated 1 house evacuated	
ME 6/9	Lin Ma Hang Road, Sha Tau Kok.	25/6	HyD/NT	24/6	Fill slope	Minor (48)	Road	1 lane of road closed	
ME 6/10	Sha Tau Kok Government Secondary School, 60 Sha Tau Kok Road, Sha Tau Kok.	24/6	ED	24/6 (9:00)	Natural slope	Minor (10)	Building lot		
ME 6/11	House No. 19 St. Peter's Village, Tui Min Hoi, Sai Kung.	24/6	DO/SK	24/6 (5:00)	Soil cut slope	Minor (<10)	Building lot		
ME 6/12	Po Lo Che Road, Sai Kung.	24/6	HyD/NT	Unknown	Soil cut slope	Minor (<10)	Pedestrain pavement	Pedestrian pavement closed	
ME 6/13	House No. 29 Yue Kok, Tai Po.	24/6	Public	Unknown	Soil cut slope	Minor (2)	Squatter		
ME 6/14	Opposite Lamp Post 09244, Bride's Pool Road, Tai Po. (3SE-B/C2)	26/6	HyD/NT	26/6 (14:45)	Soil cut slope	Minor (9)			
ME 6/15	House No. 11 Sam Long Village, Tseng Lan Shue, Sai Kung.	25/6	DO/SK	Unknown	Soil cut slope	Minor (1)	Footpath		
ME 6/16	Shung Him Tong, Fanling.	26/6	DO/N	25/6	Soil cut slope	Minor (3)	Footpath		
ME 6/17	Near Lamp Post 350, Zone 150, Border Road, Sha Tau Kok.	4/7	HyD/NT	After 25/6	Fill slope	Minor (5)	Road		
ME 6/18	Near Lamp Post 81, Zone 251, Lin Ma Hang Road, Sha Tau Kok.	4/7	HyD/NT	25/6	Natural slope	Minor (20)	Border fence		

Table B3 - List of Incidents in Eastern New Territories Reported to GEO in 1996 (Sheet 4 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
ME 6/19	Near Lamp Post 51, Zone 258, Lin Ma Hang Road, Sha Tau Kok.	4/7	HyD/NT	25/6	Soil cut slope	Minor (6)	Border fence		
ME 6/20	Near Lamp Post 125, Zone 239, Lin Ma Hang Road, Sha Tau Kok.	4/7	HyD/NT	After 25/6	Fill slope	Minor (5)	Road		
ME 6/21	Near Lamp Post 19, Zone 266, Lin Ma Hang Road, Sha Tau Kok.	4/7	HyD/NT	25/6	Soil cut slope	Minor (10)	Border fence		
ME 6/22	DD27, 189 Sam Mun Tsai Village, Tai Po.	27/6	DLO/TP	After 25/6	Soil cut slope	Minor (1)			
ME 7/1	26 Po Tung Road, Sai Kung	28/6	DO/SK	26/6 (16:00)	Soil cut slope Boulder fall	Minor (<5)	Building lot		
ME 7/2	Opposite Lamp Post V81365, Access Road to Mau Tso Ngam, Shatin.	5/7	DO/ST	Late June, 1996	Soil cut slope	Minor (2)	Access road		
ME 7/3	Tap Mun, Sai Kung.	1/12/95	HAD/RPIS	Summer, 1995	Soil cut slope	Minor (<5)	Squatter		
ME 7/4	Near Tai Wan, Sai Kung.	22/7	HyD/NT	Unknown	Soil cut slope	Minor (<10)	Pedestrain pavement		
ME 7/5	House No. 89A Fung Yuen, Tai Po.	25/7	DO/NT	24/7	Soil cut slope	Minor (3)	Squatter	1 hut permanently evacuated	
ME 8/1	Near Uk Tau, Pak Tam Road, Sai Kung.	9/8	HyD/NT	Summer, 1995	Soil cut slope	Minor (<10)	Road		
ME 8/2	Near Junction of Hoi Ha Road and Pak Tam Road, Sai Kung.	19/8	Public	19/8	Soil cut slope	Minor (5)	Road		
ME 9/1	House No. 40B Chi Fai Path, Tai Mong Tsai, Sai Kung.	15/9	DO/SK	15/9	Retaining wall	Minor (10)	Carpark		

Table B3 - List of Incidents in Eastern New Territories Reported to GEO in 1996 (Sheet 5 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
ME 9/2	Clearwater Bay Golf & Country Club, Po Toi O, Sai Kung.	17/9	BD	Unknown	Natural slope	Minor (45)	Open space		
ME 9/3	House No. 29 Tai Lam Liu, Shatin. (7SE-A/C65)	20/9	Public	20/9 (am)	Soil cut slope	Minor (0.5)			
ME 9/4	House No. 267 Pai Tau, Shatin.	21/9	DO/ST	21/9	Retaining wall	Minor (5)	Squatter Footpath	1 hut permanently and 1 hut temporarily evacuated Footpath closed	
ME 9/5	Hut No. 13 Hang Mei Deng Village, Mang Kung Uk, Clear Water Bay Road, Sai Kung.	22/9	FSD	21-22/9 (midnight)	Soil cut slope	Minor (0.5)	Building lot		
ME 9/6	Opposite Lamp Post N2384-4 Near Shen Yeung Village, Clear Water Bay Road, Sai Kung.	22/9	HyD	21-22/9 (midnight)	Soil/rock cut slope Boulder fall	Minor (8)	Road	1 lane of road blocked	
ME 9/7	Zone 267, Lin Ma Hang Road, Sha Tau Kok.	21/9	Police	21/9	Soil cut slope	Minor (40)	Border fence		
ME 9/8	Near lamp post 39, Zone 260, Lin Ma Hang Road, Sha Tau Kok.	21/9	Police	21/9	Soil cut slope	Minor (8)	Border fence		
ME 9/9	House No.74-78 Nam Hang, Tai Po.	23/9	DO/TP	21/9	Retaining wall	Minor	Playground		
ME 9/10	Near Lamp Post 156, Zone 231, Lin Ma Hang Road, Sha Tau Kok.	25/9	HyD/NT	25/9 (9:00)	Fill slope	Minor (10)	Road River bank	1/2 lane of road closed River bank eroded	
ME 9/11	Near Lamp Post 116, Zone 242, Lin Ma Hang Road, Sha Tau Kok.	25/9	HyD/NT	25/9 (9:00)	Fill slope	Minor (5)	Road	1/2 lane of road closed Road undermined	

Table B3 - List of Incidents in Eastern New Territories Reported to GEO in 1996 (Sheet 6 of 6)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
ME 10/1	House No. 214 Pau Chung, Tai Po.	30/9	BD	1996	Boulder fall Soil cut slope	Minor (2)	Building lot		
ME 10/2	Opposite Tai Mei Tuk Pumping Station, Bride's Pool Road, Tai Po. (3SE-D/C6)	27/9	HyD/NT	26/9	Soil/rock cut slope	Minor (<3)	Pedestrain pavement		
ME 10/3	Near the pier, Kuk Po, Sha Tau Kok.	26/9	Public	21/9	Natural slope	Minor (30)	Storage shed	Storage shed removed	
ME 10/4	Bride's Pool Road, Chung Pui, Tai Po. (3SE-D/F6)	9/10	HyD/NT	8/10	Fill slope	Minor (5)	Pedestrain pavement	Pedestrian pavement closed	
ME 10/5	Near Lamp Post V81409, Mau Tso Ngam, Shatin.	8/10	DO/ST	Unknown	Fill slope	Minor (3)	Road		
ME 11/1	Tan Ka Wan, Sai Kung.	15/10	DO/TP	Summer, 1996	Soil cut slope Retaining wall	Minor (<10)	Building lot Open space		

Table B4 - List of Incidents in Western New Territories Reported to GEO in 1996 (Sheet 1 of 4)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
MW 2/1	Stonecutters Island, Lai Chi Kok.	26/2	Arch SD	23/2	Soil cut slope Natural slope	Minor (40)	Open space		
MW 3/1	Near Bungalows No. 1-3 Siu Lam Psychiatric Centre, Siu Lam.	28/2	Arch SD	Unknown	Fill slope	Minor (10)	Open space		
MW 3/2	Wing Cho Street, Cho Yiu Estate, Kwai Chung. (11NW-A/C137)	10/3	FSD	10/3 (21:20)	Rock fall	Minor (1)	Road Pedestrain pavement Carpark	2 lanes of road closed Pedestrian pavement closed Carpark closed	
MW 3/3	STTL 410, Pik Tin Street, Shatin.	11/3	Public	Before 8/3					No failure. However major signs of distress were observed. Plate 2
MW 3/4	Block 13, Pak Tin Estate, Shek Kip Mei. (11NW-B/FR1)	16/3	HyD	16/3 (13:40)	Soil/rock cut slope	Minor	Building lot Road Pedestrain pavement	1 lane of road closed Pedestrian pavement closed	
MW 4/1	Hut No. 26 2nd Street, Heung Fan Liu, Shatin.	1/4	FSD	1/4 (morning)					No failure, only dislodgement of slope surface protection
MW 4/2	Ha Kwai Chung Village, Kwai Chung. (7SW-C/C393)	29/3	DLO/KT	Unknown					No failure, However major signs of distress were observed.
MW 4/3	M.S.2.5, Tung Chung Road, Lantau. (9SE-D/C2)	12/4	HyD	Unknown	Soil cut slope	Minor (20)			
MW 4/4	Tsing Yi Road near Tsing Nam Street, Tsing Yi. (10NE-B/C52)	20/4	HyD/NT	Unknown	Soil cut slope	Minor (30)	Open space		
MW 4/5	House No. 556, Area No. 5, Pak Tin Village, Shatin.	30/4	Police	30/4 (18:30)	Soil cut slope	Minor (2)	Building lot	1 house evacuated	

Table B4 - List of Incidents in Western New Territories Reported to GEO in 1996 (Sheet 2 of 4)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
MW 4/6	Tso Kung Tam Outdoor Recreation Centre, Tsuen Wan.	18/4	Arch SD	Unknown	Soil cut slope	Minor (<1)	Pedestrain pavement		
MW 5/1	M.S.11.25, Keung Shan Road, Lantau.	7/5	HyD/NT	5/5 (11:00)	Soil cut slope	Minor (8)	Road	½ lane of road blocked	
MW 5/2	House No. 52, Lot 605 in DD3, Luk Tei Tong, Lantau.	16/5	DLO/IS	5/5 (4:00-5:00)	Soil cut slope	Minor (2)	Building lot		
MW 5/3	Above Golf Driving Range, Area 19, Tuen Mun.	2/5	GEO	January, 1996	Soil cut slope	Major (750)	Track		Plate 1
MW 6/1	Shing Mun Road, Tsuen Wan.	18/6	HyD/NT	17/6 (10:00)					No failure, only dislodgement of slope surface protection
MW 6/2	DD181 CL Licence 717793, Heung Fan Liu, Shatin.	23/6	GEO	23/6 (9:00)	Soil cut slope	Minor (0.3)	Squatter	2 huts temporarily evacuated	
MW 6/3	Tai Wo Tsuen, Fu Yung Shan, Tsuen Wan.	24/6	Police	24/6					No geotechnical concern, only tree fallen
MW 6/4	Near Sun Tin Wai Estate, Lion Rock Tunnel Road, Shatin. (7SW-D/C1)	24/6	Public	24/6	Soil cut slope	Minor (2)	Pedestrain pavement		
MW 6/5	Wo Hop Shek Cemetery, Fanling.	25/6	Arch SD	25/6	Soil cut slope	Major (80)	Cemetery		Plate 4
MW 6/6	Opposite Lamp Post FA0740-2, Ma Po Ping Road, Lantau.	27/6	HyD/NT	22/6 (am)	Soil cut slope	Minor (5)	Road	1 lane of road closed	
MW 6/7	Access footpath to Royal Navy Watch Station, Tai O.	26/6	GPA	25/5 (morning)	Soil cut slope	Minor (<1)	Pedestrain pavement		
MW 6/8	Lutheran Village, Tsing Yi.	2/7	HyD/NT	Unknown	Soil cut slope	Minor (<0.5)	Squatter Lavatory	1 hut permanently evacuated	

Table B4 - List of Incidents in Western New Territories Reported to GEO in 1996 (Sheet 3 of 4)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
MW 8/1	Hut No. 556, Area 5, Pak Tin Village, Shatin.	6/8	HD	4/8 (pm)					No failure, only dislodgement of slope surface protection
MW 8/2	House No. 6 Wai Tsai Second Street, Peng Chau.	12/8	HyD/NT	10/8 (afternoon)					No failure, only dislodgement of slope surface protection
MW 8/3	Above Lai Chi Kok Cottage Area, Lai Chi Kok. (11NW-A/N3)	15/8	HD	14/8 (am)	Rock fall	Minor (<0.02)	Building lot		
MW 8/4	Near Mini Bus Terminus, Shing Mun Road, Tsuen Wan.	17/8	FSD	17/8 (19:30)	Soil cut slope	Minor (1)	Road Country park	1 lane of road closed	
MW 8/5	Near Oi Fei Camp, Ming Fai Road, Cheung Chau.	16/8	HyD	16/8 (am)	Soil cut slope	Minor (1)	Pedestrain pavement		
MW 9/1	Footpath to Wo Yip Hop Squatter Village, Kwai Chung.	14/9	DO/TW	14/9 (am)	Rock fall	Minor (0.01)	Open space		
MW 9/2	Hut No. 33B, 4th street, Heung Fan Liu, Tin Sum, Shatin.	16/9	Police	14/9 (pm)	Fill slope	Minor (<1)	Squatter		
MW 9/3	Siu Lam Tsuen, Siu Lam, Tuen Mun.	16/9	DO/TM	14/9	Soil/rock cut slope	Minor (<1)	Footpath		
MW 9/4	House No. 23 Tsing Lung Tau Village, Tsuen Wan.	16/9	Public	15/9 (night)	Soil cut slope	Minor (4.5)	Road		
MW 9/5	Behind Hanley Villa, Yau Kom Tau, Tsuen Wan.	16/9	BD	14/9	Soil cut slope	Minor (4.5)	Carpark		
MW 9/6	Castle Peak Road, Ting Kau.	17/9	HyD	Unknown	Soil cut slope	Minor (1)	Open space		
MW 10/1	Chau Tau Tsuen, San Tin, Yuen Long.	10/10	DO/YL	15/9 (early morning)	Fill slope Retaining wall	Minor (15)	Fire hose	Fire hose damaged	

Table B4 - List of Incidents in Western New Territories Reported to GEO in 1996 (Sheet 4 of 4)

Incident No.	Location (Slope No.)	Call		Failure			Facility Affected	Consequence	Remarks
		Date	From	Date (Time)	Type	Scale (m^3)			
MW 11/1	House No. 27, Yung Shue Long New Village, Lamma Island.	15/11	DLO/IS	12/11	Soil cut slope	Minor (4)	Building lot		

APPENDIX C

DAILY RAINFALL AT THE HONG KONG OBSERVATORY IN 1996

LIST OF TABLES

Table C1 - Summary of Daily Rainfall at the Hong Kong Observatory in 1996

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	4.5	31.0	Trace	1.8	0.0	0.0	Trace	0.0	0.0
2	0.0	0.0	0.0	Trace	Trace	0.0	0.0	1.6	14.8	1.2	0.2	Trace
3	0.0	0.0	0.0	40.5	1.4	Trace	0.5	16.2	40.1	0.0	0.7	0.0
4	0.0	0.0	0.0	20.0	20.8	0.0	Trace	28.0	1.6	8.6	0.0	0.0
5	0.0	Trace	0.0	Trace	75.1	0.0	0.0	0.4	0.2	0.0	0.0	0.0
6	0.4	2.7	0.0	Trace	40.4	0.0	0.0	0.0	0.0	4.1	0.0	0.0
7	0.0	0.0	0.0	0.0	1.3	0.0	Trace	Trace	Trace	Trace	0.0	0.0
8	0.0	0.0	0.0	1.8	Trace	0.0	0.0	Trace	4.6	1.9	0.0	0.0
9	0.0	Trace	Trace	5.9	Trace	Trace	0.0	Trace	40.3	0.0	0.0	0.0
10	0.0	0.0	7.5	1.0	Trace	13.6	0.8	Trace	0.0	Trace	0.0	0.0
11	Trace	0.0	Trace	Trace	1.2	0.0	10.4	Trace	Trace	Trace	0.0	0.0
12	0.1	0.0	1.7	0.9	1.9	0.0	8.6	0.0	8.8	0.0	1.2	0.0
13	Trace	0.0	Trace	Trace	0.0	0.0	Trace	0.0	65.7	0.0	0.2	0.0
14	0.0	0.0	0.1	Trace	0.0	4.6	0.8	47.8	227.0	0.6	Trace	0.0
15	Trace	0.0	Trace	Trace	0.0	47.7	Trace	73.7	48.5	5.0	Trace	0.0
16	Trace	0.5	Trace	Trace	0.0	29.1	1.7	23.0	Trace	Trace	1.2	0.0
17	0.6	0.1	Trace	Trace	0.0	Trace	Trace	21.0	Trace	0.0	0.0	0.0
18	Trace	1.6	1.6	0.0	0.0	2.5	2.1	40.6	4.1	0.0	Trace	0.0
19	Trace	4.1	3.2	63.9	0.0	3.7	33.4	0.0	17.0	Trace	0.0	0.0
20	Trace	3.0	Trace	1.2	0.0	7.6	1.2	0.0	43.1	22.2	0.0	0.0
21	Trace	7.4	0.2	Trace	Trace	34.8	33.6	0.4	57.8	1.2	0.0	0.0
22	Trace	0.2	1.5	Trace	Trace	86.3	43.3	10.5	12.0	0.0	0.0	0.0
23	Trace	0.4	0.3	0.0	0.0	97.2	16.7	Trace	Trace	Trace	0.0	0.0
24	0.2	1.4	Trace	0.0	0.0	61.0	Trace	Trace	1.6	0.0	Trace	0.0
25	0.0	0.4	Trace	0.0	15.7	0.1	0.0	14.7	11.5	0.0	0.0	0.0
26	0.0	3.0	10.0	0.0	9.4	2.7	Trace	Trace	0.0	Trace	0.0	Trace
27	0.0	2.3	0.5	Trace	12.0	0.2	25.1	0.0	5.2	0.0	0.0	0.0
28	0.0	0.1	0.4	Trace	11.4	4.5	21.7	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	55.9	Trace	66.6	5.5	24.0	0.0	0.0	0.0	0.0	0.0
30	0.0		Trace	89.0	24.4	2.9	4.6	0.1	0.1	0.0	0.0	0.0
31	0.0		0.2		1.3		0.0	30.3		0.0		0.0
TOTAL	1.3	27.2	83.1	228.7	313.9	404.0	230.3	308.3	604.0	44.8	3.5	Trace

Note : Annual Rainfall of 1996 is 2249.1 mm.

LIST OF DRAWINGS

Drawing No.	
GCSP 8/17	Location Map of Reported Incidents in 1996