

GEO Technical Guidance Note No. 5 (TGN 5)
Geoguide 2 - Guide to Site Investigation
Updated Appendix B: Sources of Information

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1. **SCOPE**

1.1 This Technical Guidance Note provides an update on the sources of information for the planning of site investigation in Hong Kong. It supersedes Appendix B: Sources of Information of Geoguide 2 (GCO, 1987).

1.2 Any feedback on the contents of this TGN should be given to Chief Geotechnical Engineer/Geotechnical Projects of the Geotechnical Engineering Office (GEO).

2. **TECHNICAL POLICY**

2.1 As part of its information service, the GEO provides updates on sources of information for the planning of site investigation in Hong Kong from time to time.

3. **RELATED DOCUMENT**

3.1 Geotechnical Control Office (1987). Guide to Site Investigation (Geoguide 2). Geotechnical Control Office, Hong Kong, 365 p.

4. **TECHNICAL RECOMMENDATIONS**

4.1 Since its publication in 1987, Appendix B of Geoguide 2 has summarised important sources of information that are useful for the planning of site investigation in Hong Kong. However, there have been new developments in the Hong Kong Special Administrative Region Government's slope-related information and database systems and in GEO's Aerial Photograph Library. Additional rainfall and landslide study reports, geological maps and memoirs, GEO publications and other useful information have also become available. Annex TGN 5A1 of this TGN is an updated summary of sources of information for planning site investigation in Hong Kong.

4.2 Readers are advised to take note of any warning messages on the data, check with the relevant data owners on the reliability, accuracy and completeness of the data they require where necessary, taking into account the needs of their project. Readers are also invited to provide feedback to the GEO should the need to update this TGN be identified.

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5. **ANNEX**

5.1 TGN 5A1 - Update on Geoguide 2 Appendix B: Sources of Information.

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ANNEX

TGN5 A1 - UPDATE ON GEOGUIDE 2 APPENDIX B: SOURCES OF INFORMATION

1. GENERAL

This document gives important sources of information for the planning of site investigation in Hong Kong, in addition to the publications and guidance documents prepared by the GEO. A complete list of GEO publications and a list of TGNs, which are continually updated, can be found at the website <http://www.cedd.gov.hk> on the Internet. Hard copies of the lists can be obtained by writing to the GEO Standards and Testing Division (see Section 13 for relevant addresses of local organisations and Government Departments). Other information that could be useful for planning, design, construction and maintenance of geotechnical works can be found at the Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>.

2. SLOPE-RELATED INFORMATION SYSTEMS AND DATABASES

2.1 Slope Information System (SIS)

The SIS is a geographical information system developed by the GEO to enable on-line examination and analysis of information on slopes and the surrounding ground (Lam et al, 1998). It contains computerised information including the catalogue of slopes (see Section 2.2 below), slope maps, locations of previous landslide incidents reported to GEO and ground investigation stations, geology, natural terrain landslides and selected geotechnical information for the various districts in Hong Kong. The SIS can be accessed through the SIS terminals in the Civil Engineering and Development Building and also via the Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>. The GEO Slope Safety Division can be contacted for up-to-date information on the development of the SIS.

2.2 Catalogue of Slopes

The Catalogue of Slopes contains information on some 57 000 sizeable man-made slopes in Hong Kong. The Catalogue contains information on physical properties and conditions of each slope (e.g. slope type, slope geometry, type of surface protection, signs of seepage, movements and previous failures), as well as its history (Lam et al, 1998). Information on slopes in the Catalogue can be retrieved from SIS terminals in the Civil Engineering and Development Building, via the Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>, or by application in writing to the GEO Slope Safety Division.

2.3 Slope Maintenance Responsibility Information System (SMRIS) Maintained by the Lands Department

In 1996, the Lands Department commenced a project to systematically identify the maintenance responsibility of all man-made slopes registered in the Catalogue of Slopes. The SMRIS has since been set up and is maintained by the Lands Department. The most up-to-date information of maintenance responsibility can be accessed via the Lands Department or at the Lands

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Department's Website <http://www.landsd.gov.hk>. Where the land status of a slope is not available in SMRIS, the Systematic Identification of Maintenance Responsibility of Slopes (SIMAR) Unit or the respective DLO of Lands Department should be consulted.

2.4 Rainfall Database

The GEO in collaboration with the Hong Kong Observatory (HKO) has established and maintains a network of automatic raingauges throughout Hong Kong. Rainfall data have been recorded at 5-minute intervals at these raingauges since 1984. In 1999, the GEO automatic rainauge system was upgraded and expanded to include 86 GEO raingauges (Pang et al, 2000). Verified rainfall data are available either from the HKO or the GEO Standards and Testing Division.

2.5 Landslide Database

Incident Reports are prepared by GEO staff attending landslide incidents (GEO, 1998). Each Incident Report contains information on the date and time (where known) and location of the incident, the type, size, possible causes contributing to and consequence of the failure, the advice given, evidence of past instabilities, photographs taken of the failure, etc. If the failure mass exceeds 50 m³ or where a fatality is involved, a Landslip Card, which contains more detailed information and is available for inspection in the Public Section of the Civil Engineering Library (CEL) (Section 12.1), is also prepared. In 1997, a computerised landslide database containing data from the Incident Reports and Landslip Cards has been prepared (Chan et al, 1998). The database, which is accessible via the SIS is maintained and updated by the GEO Landslip Preventive Measures Division 1.

2.6 Enhanced Natural Terrain Landslide Inventory (ENTLI)

The ENTLI contains information on about 105,000 landslides occurred on natural terrain. It was compiled from interpretation of aerial photographs taken between 1924 and 2003 and the data were recorded in Geographical Information System (GIS). Comprehensive information is recorded for each landslide record including the dates of the aerial photographs when the landslide was first observed, width and length of the landslide scar, slope gradient, and nature of vegetation cover across the landslide source. The ENTLI is available for inspection as 1:5 000 scale map sheet paper copies in the CEL and the digital copy of the data is held in the GEO Planning Division. The ENTLI replaces the NTLI that has been in use since mid-1990s.

2.7 Boulder Field Inventory

A series of fifteen 1:20 000 scale boulder field inventory maps covering the Hong Kong Special Administrative Region (HKSAR) was completed in 1998. These maps were derived mainly from interpretation of the low altitude aerial photographs taken in 1963. A multiple attribute mapping technique was adopted to present the results. Four attributes were mapped - percentage area covered by boulders, boulder type, boulder size and boulder shape. Areas of land considered to have a relatively uniform pattern of boulder deposits were then delineated within a polygon and drawn onto the 1:20 000 scale topographical maps. The polygons were defined to ensure that the units were essentially homogeneous for the range of attributes described. These

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maps are available in the CEL and a digitised version is available in the SIS. These maps can assist in identification of boulder fall hazards and give information on the number, size, shape and type of boulders present.

2.8 Large Landslide Study

In this study, covering the whole of Hong Kong, a geomorphological interpretation was conducted to identify features thought to be landslides with source areas greater than 20 m wide. The main source of the large landslide data was from the interpretation of the 1963/64 low altitude aerial photographs (Scott Wilson (Hong Kong) Ltd, 1999a, 1999b). The study also examined the large landslides recorded in the NTLI GASP maps and geological maps. The 1:5 000 scaled maps containing the features are available for viewing in the GEO Planning Division.

3. TOPOGRAPHICAL MAPS, PLANS AND AERIAL PHOTOGRAPHS

3.1 Maps and Plans Produced by the Survey & Mapping Office

The Survey & Mapping Office (SMO) of the Lands Department provides maps and plans in various scale and for various purposes in both digital and paper forms. A list of the currently available plans and maps, and their coverage, is given in Table 1.

The Land Information Centre of the SMO operates a Computerised Land Information System (CLIS) and maintains the topographic mapping database covering the whole territory of Hong Kong. These digital maps are being extensively used within Government bureaux and departments as the basic map for various purposes. Many utility companies, engineering consultants, computing system consultants and education institutes have established their own automated mapping, facilities management, customer support and geographic information systems using the digital maps provided by the SMO as their common reference. The digital map data are available in four different formats, namely E00, DGN, DXF and DWG, to suit applications in different platforms.

Services offered by the SMO include the supply of photographic copies of available maps, plans and aerial photographs, as well as producing enlargements and reductions. Other services, such as digital copying and digital image processing are also available. Orders for enlargements and other non-standard items should be placed well in advance, to allow time for production and delivery. These services are available from the Map Publications Centres of the SMO, together with map catalogues, and leaflets on the services offered and on copyright. Updated information on map products and related publications, data map products and map price catalogue, etc., can also be found at the Lands Department Website <http://www.landsd.gov.hk/mapping/en/pro&ser/products.htm>.

3.2 Other Maps

Other map sources include the following:

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- (a) Early maps of Hong Kong are held for reference by the Survey & Mapping Office and the Government Records Service (GRS).
- (b) The Antiquities and Monuments Office (AMO) of Leisure and Cultural Services Department (LCSD) holds research files covering declared monuments, historic buildings, structures and boundaries of archaeological sites. Most of these research materials can be accessed by the public in AMO by appointment. Declared monuments, historic buildings, structures and boundaries of archaeological sites may also be indicated in non-statutory plans which are available for sale in the Map Publications Centres of the Survey & Mapping Office of the Lands Department (Section 3.1).

3.3 **Aerial Photographs**

The availability of vertical aerial photographs is summarised in Tables 2a and 2b. The earliest available aerial photographs covering at least part of the HKSAR were taken in 1924 and 1945 with varying quality. Photographs of improving quality were then taken at various years up to the 1960's. The first HKSAR-wide systematic coverage providing particularly good quality low altitude (less than 10 000 feet) imagery was taken in 1963. Between 1972 and 1985 there was at least partial low altitude photographic coverage of Hong Kong Island and Kowloon each year with sporadic coverage in other areas. Regular low altitude photography has been carried out since 1985 at about 6 monthly intervals with coverage mainly concentrated on Hong Kong Island, Kowloon and the new towns.

High altitude photographic coverage of the HKSAR is more comprehensive since 1972, with only the years 1972, 1977, 1980 and 1984 having very limited coverage. Since 1988, two sets of high altitude photography have been carried out for most years, at 10 000 and 20 000 feet. From 1972 to the mid-1980s, colour photographs were only very occasionally taken with an increase in usage up to 1993. Since 1993, both high- and low-altitude colour aerial photographs have been taken routinely.

In general the aerial photograph scales range from 1:2 500 down to 1:50 000. The low altitude aerial photographs, mainly in the range of 1:6 000 to 1:10 000, are the most useful scale for the majority of aerial photograph interpretation undertaken.

The GEO Aerial Photograph Library contains approximately 159 000 aerial photographs including oblique aerial photographs as of late 2006. A GIS-based computerised aerial photograph retrieval system is now available for users to identify the photograph collection at a workstation in the Library. The Library, which is housed in the GEO Planning Division on the 11th Floor of the Civil Engineering and Development Building, is accessible by staff of the HKSAR Government and also non-Government staff engaged in Government projects.

A similar system for searching aerial photographs is also available in the SIS.

Aerial photographs can be purchased directly from the Map Publications Centres of the Lands Department.

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4. GEOLOGICAL AND RELATED MAPS AND MEMOIRS

4.1 Geological Maps and Memoirs

Geological surveying in Hong Kong is carried out by the Hong Kong Geological Survey of the GEO. A comprehensive geological survey, undertaken at 1:20 000 scale, began in 1982 and was completed in 1996. This produced a series of fifteen maps and six explanatory memoirs, which provides detailed descriptive and geological map coverage of the land and offshore area of the HKSAR. This series of publications supersedes the earlier 1:50 000 scale maps and memoir by Allen & Stephens (1971). In 1988, to cope with the growing demand for detailed geological information, the GEO embarked on a 1:5 000 scale mapping programme of main development areas. This has been supported by a number of specialist projects. Thirty-four maps and six sheet reports have been published to date and the Sheet Reports are available (free of charge) either from the GEO Planning Division or downloaded from the CEDD Website <http://www.cedd.gov.hk>. The coverage of the maps, memoirs and reports is shown in Figure 1. The maps and memoirs (except those which are free of charge) can be obtained from the Map Publications Centres of the Survey and Mapping Office while the memoirs are also available from the online Government Bookstore at <http://www.bookstore.gov.hk>.

4.2 Terrain Classification and Engineering Geology Maps

A series of eleven 1:20 000 scale terrain classification maps (TCM) covering the whole of the HKSAR was produced by the GEO in the 1980s. Each map covers an irregular area based on catchment boundaries. Derivative maps and accompanying reports have been published for each area as the Geotechnical Area Studies Programme (GASP) series. The series contains 12 volumes, of which Volume XII is a summary report for the whole of the HKSAR. They are available for consultation in the Geotechnical Information Unit (GIU) of the CEL. Limited copies are available for sale at the Map Publications Centres of the Survey and Mapping Office, and online Government Bookstore.

Nine catchments with extensive colluvial deposits were also identified for GAS mapping at 1:2 500 scale. These maps contain details of old landslide scars. In 1990, a 1:5 000 scale terrain classification mapping exercise was carried out for eleven 1:5 000 scale map sheets in North Lantau. These are available for viewing in the CEL and have been incorporated into three Engineering Geology Reports on the North Lantau Area (Franks, 1991, 1992; Woods, 1992).

4.3 Other Geological Records and Information

The GEO Planning Division is the repository for geological records for the HKSAR. These include the field observations embodied in the geological maps and memoirs, manuscript geological maps, and offshore data. Requests for information should be directed to the Chief Geotechnical Engineer of the Planning Division. The GEO also holds a collection of representative rock types and thin sections. These are available for inspection by arrangement. An on-line version of the geology of Hong Kong, based on the two recent memoirs but with additions from the current map updating programme now underway, has recently been published on the internet (Lee & Sewell, 2007). The on-line geological memoir of Hong Kong can be

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accessed at: http://www.cedd.gov.hk/eng/about/organisation/org_geo_pln_map.htm. The most up-to-date review of the geology of Hong Kong is contained in the recent memoirs (Fyfe et al, 2000; Sewell et al, 2000) and the accompanying 1:100 000 geological maps produced by the Hong Kong Geological Survey. A summary of the nature and occurrence of Hong Kong rocks and superficial deposits is also given in Appendix A of Geoguide 3 (GCO, 1988).

5. NAUTICAL CHARTS AND MARINE DEPARTMENT NOTICES

The Hydrographic Office of the Marine Department compiles and publishes paper charts and electronic navigational charts. Further information on the products and services of the Hydrographic Office can be found at the website <http://www.mardep.gov.hk>.

Marine Department Notices are issued as and when required concerning information relating to navigational safety and other marine activities in Hong Kong waters. Copies of the Notices can be downloaded from the website <http://www.mardep.gov.hk>.

6. METEOROLOGICAL, SEISMOLOGICAL AND TIDE INFORMATION

The Hong Kong Observatory (HKO) collects and publishes meteorological information in Hong Kong. It issues daily weather reports and forecasts as well as warnings on tropical cyclone, thunderstorm, rainstorm, landslip, strong monsoon, fire danger, frost, tsunami, cold and very hot weather. Rainfall records are published monthly and annually. The HKO also maintains a local seismological network to monitor earthquakes near Hong Kong.

Predicted tide levels at selected locations are published annually in 'Tide Tables for Hong Kong' which are available at the online Government Bookstore.

Further information on the services of the HKO can be found at the website <http://www.hko.gov.hk>.

7. HYDROLOGICAL INFORMATION

The Drainage Services Department and Water Supplies Department operate and maintain separate systems of stream/river gauging stations in the main catchment areas of the HKSAR.

8. PAST RECORDS

8.1 Records from Previous Investigations

The GIU of the GEO holds reports of previous ground investigation, which usually include borehole logs and sometimes results from geophysical surveys and laboratory testing of soils, rocks and sediments.

The GIU also contains a large amount of other information of direct relevance to site

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investigation, and this is described in Section 12.1.

8.2 **Design and Construction Records**

Several Government Departments possess information that is of value to the planning and execution of site investigation in Hong Kong, but this is often not readily accessible. However, arrangements can usually be made for specific information to be made available to bona fide users.

For example, each Government Department retains its own files on projects that are carried out under its control. Copies of design reports and record drawings of completed projects are also kept.

A brief summary of information possessed by some of the Government Departments is given below.

The Architectural Services Department maintains records of Government buildings.

Except for pre-war buildings and New Territories Exempted Houses, the Buildings Department keeps a repository of building plans and related documents of existing buildings in Hong Kong. The related documents include, among others, occupation permits, record plans, structural calculations and ground investigation reports. These documents may be available for viewing by the public in the Buildings Department upon application.

Environmental Infrastructure Division of the Environmental Protection Department maintains records of all known landfills in Hong Kong. The GEO holds all the Landslip Preventive Measures study reports, information on slopes and records of all known disused tunnels and quarries.

Plans showing the locations of disused tunnels are available for viewing in the CEL. The GEO has prepared a catalogue of major tunnels in Hong Kong. This catalogue can be accessed at the CEDD Website http://www.cedd.gov.hk/eng/publications/geo_spr_tn_report/index.htm. Designers should obtain the design and construction details of such tunnels from the relevant owners and maintenance agents.

The Drainage Services Department holds records of all sewerage tunnels (see also Section 10.4).

The Highways Department holds records of the majority of public roads and road tunnels.

The Water Supplies Department holds records of water tunnels, water mains, catchwaters, impounding reservoirs, service reservoirs, water treatment works, pumping stations, and ancillary structures.

8.3 **Hong Kong Rainfall and Landslide Studies**

Since 1984, the GEO has compiled annual reports to document information on rainfall and landslides occurring in the HKSAR. GEO has also prepared detailed/forensic investigation

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reports on some selected major landslide incidents and incidents involving casualties. Since 1997, GEO has started engaging consultants to carry out investigation of some selected landslides and to prepare landslide study reports. The annual reports, detailed/forensic investigation reports and landslide study reports are either published as GEO Reports or produced as GEO internal reports. GEO Reports can be purchased from the online Government Bookstore or downloaded from the CEDD Website <http://www.cedd.gov.hk>. GEO internal reports can be viewed in the CEL. Summary of findings of selected landslide studies are also uploaded onto the Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk> for viewing.

8.4 Slope Maintenance Records

Slope maintenance records (e.g. records of routine maintenance and Engineer Inspections, records of monitoring of special measures such as permanent prestressed ground anchors and designed horizontal drains) are kept by the slope owners or their maintenance agents (GEO, 2003).

8.5 Other Public Records

The GRS is the central repository for the permanent archives and selected official publications of the HKSAR Government. In January 2001, its Reference Library was reorganized to become the Central Preservation Library for Government Publications. A majority of both its archival and library holdings date from 1945, but GRS does have some much earlier material. It maintains catalogued collections of maps and photographs dating from 1860, together with almost complete collections of the Hong Kong Government Gazette, Blue Books, Sessional Papers, Administrative Reports, Historical & Statistical Abstracts of Hong Kong, Legislative Council Minutes, Annual Departmental Reports, Ordinances and Regulations, and Hong Kong Hansard. The Sessional Papers are of particular interest because, from 1889, they include the Annual Reports of the Director of Public Works, which give information on failures and remedial works. Also of great value is the comprehensive newspaper collection held by the GRS. In November 2002, GRS introduced an integrated information access system to facilitate online searching of all catalogues and access to selected visual images via the Internet.

The Photo Library of the Information Services Department has in place some old photographs which may be reproduced for use by members of the public.

Lists of declared monuments and deemed monuments as well as archaeological sites are maintained by the Antiquities & Monuments Office (AMO) of the Leisure and Cultural Services Department (see also Section 3.2).

9. NOTES AND CIRCULARS RELATED TO GROUND INVESTIGATION WORKS

For private development, the general requirements for carrying out ground investigation works, including the site supervision requirements, are given in PNAP 132 which can be downloaded from Buildings Department Website <http://www.bd.gov.hk>. For public development, the requirements are given in WBTC No. 13/90. Ground Investigation Note No. 1/2006, which can be downloaded from CEDD Website <http://www.cedd.gov.hk>, gives the details of procurement of ground investigation and laboratory testing services provided by CEDD for government

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projects.

10. **SCHEDULED AND DESIGNATED AREAS AND OTHER CONCERNED AREAS**

10.1 **Mid-levels Scheduled Area**

Ground investigation works in scheduled areas, including the Mid-levels Scheduled Area, are subject to special geotechnical control under the Buildings Ordinance. The Mid-levels Scheduled Area is specified as Area Number 1 of the Scheduled Areas in the Fifth Schedule of the Buildings Ordinance. A plan showing the boundary of the Mid-levels Scheduled Area is on display in Buildings Department and in the GIU of the CEL.

The Mid-levels Consultants' study was summarised in a report entitled "Mid-levels Study: Report on Geology, Hydrology and Soil Properties" (GCO, 1982). The report is available for sale at the online Government Bookstore. All factual data on geology, hydrology and soil properties collected in the course of the Mid-levels Study between 1979 and 1981 are available for inspection in the GIU.

For private development, the requirements on the special geotechnical control for ground investigation works in the Mid-levels Scheduled Area are given in PNAP 85. For public development, the requirements are specified in ETWB TC (Works) No. 29/2002A.

10.2 **North-western New Territories and Ma On Shan Areas**

The designated areas in North-western New Territories and Ma On Shan are specified as Area Numbers 2 and 4 respectively of the Scheduled Areas in the Fifth Schedule of the Buildings Ordinance. The plans illustrating the exact extent of these Areas are on display in the Buildings Department and in the GIU.

Considerable information exists on the geology of the Scheduled Areas. Twenty 1:5 000 Geological Map sheets, together with the Hong Kong Geological Survey Sheet Report No. 1 - Geology of Yuen Long, covers Area Number 2. Scheduled Area 4 is covered by 1:5 000 Geological Map Sheets 7-NE-C and 7-NE-D, together with a report on the geology. These can be obtained from the GEO Planning Division.

10.3 **Mass Transit Railway Areas**

To safeguard the safety and stability of the Mass Transit Railway (MTR) structures operated and maintained by the MTR Corporation Limited (MTRCL), a "protection boundary" for the railways has been drawn on plans or determined by a figure and a set of building/engineering guidelines produced. The areas within the "protection boundary" are commonly known as the railway protection areas.

The MTR includes the following existing operating railways of Tsuen Wan Line, Kwun Ting Line, Island Line, Tseung Kwan O Line, Tung Chung Line, Airport Express, Disneyland Resort Line, East Rail Line, East Rail Line Extensions – Hung Hom to Tsim Sha Tsui, West Rail Line,

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Ma On Sham Line, Lok Ma Chau Spur Line and Light Rail.

Amongst the railway protection areas, some areas are designated as Scheduled Area No. 3 in the Fifth Schedule of the Buildings Ordinance (Scheduled Area No. 3). The areas within the “protection boundary” have been designated as Scheduled Area No. 3 includes Tsuen Wan Line, Kwun Ting Line, Island Line, Tseung Kwan O Line, Tung Chung Line, Airport Express, East Rail Line Extensions – Hung Hom to Tsim Sha Tsui and West Rail Line. The plans illustrating the extent of these areas are available for inspection in the Buildings Department (BD) and the MTRCL. Information on the “alignment of the railways as constructed” may be obtained direct from MTRCL. For private development, the additional requirements for ground investigation works within Scheduled Area No. 3 are given in PNAP 77 and PNAP 279. WB Technical Circular No. 19/2002, ETWB Technical Circular (Works) Nos. 33/2003 and 2/2005 shall be referred to for guidance on ground investigation works near the MTR and liaison with the Railway Protection & Land Survey Manager of the MTRCL.

The survey and Mapping Office of Lands Department maintains a set of digital land records covering the whole territory of Hong Kong. Useful information, e.g. lot boundaries, the railway reserves and others, is recorded in this database.

10.4 Sewage Tunnel Protection Areas

The sewage tunnel protection areas are designated as Area Number 5 of the Scheduled Areas in the Fifth Schedule of the Buildings Ordinance (Scheduled Area No. 5). The plans illustrating the extent of these areas are available for inspection in the Buildings Department and the Drainage Services Department. For private development, the additional requirements for ground investigation work within Scheduled Area No. 5 are given in PNAP 165. For ground investigation works proposals of Government Departments in the vicinity of the sewage tunnels, the project proponents shall refer to ETWB Technical Circular (Works) No. 28/2003 for the procedures for forwarding proposals to Drainage Services Department and GEO for comment/agreement.

10.5 Designated Area of Northshore Lantau

The Designated Area is underlain by locally complex geological conditions that require due attention to be given to the potential problems associated with high-rise buildings and other structures involving deep foundations. Technical recommendations on the area and the plan illustrating the exact extent of the area are given in GEO TGN No. 12.

10.6 Water Gathering Grounds

A water gathering ground (WGG) means any surface of land (a) in or by which rain or other water is collected and from which water is, or is intended to be, drawn for the purposes of a supply; and (b) which is mapped as a gathering ground under Section 23 of the Waterworks Ordinance. Information on the limits of the WGG and the required conditions for protection of the WGG against pollution should be obtained from the relevant regional office of the Water Supplies Department. Maps showing WGG are also held by the relevant District Lands Offices

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of the Lands Department.

10.7 **Marine Ground Investigation in Difficult Ground Areas**

Difficult ground conditions generally refer to the existence of unfavourable subsoil strata on site. Technical guidelines on the areas and the plan illustrating the extent of the areas are given in Port Works Design Manual issued by CEDD.

11. **SERVICES AND UTILITIES**

Information on gas, electricity, telephone, cable television and similar services, including both the locations and details of existing facilities and the provision of further services, should be sought from the private companies supplying these services (see local telephone directories or the Yellow Pages for their latest addresses and telephone numbers).

Information on the locations of water mains, water tunnels, reservoirs and other waterwork facilities maintained by the Water Supplies Department (WSD) should be sought from the Department. Applications for water supply should be directed to the Department. Application forms and further information on the customer services of the WSD can be found at the website <http://www.wsd.gov.hk>.

As-built records of public stormwater drains and foul sewers should be sought from the Drainage Services Department (DSD). Similar records for private lots can be obtained from the Buildings Department. As-built records of exclusive road drainage should be sought from the Highways Department.

Tentative limits of allowable settlement, groundwater drawdown and vibration may be obtained from DSD, WSD, public corporations and private utility undertakers.

12. **LOCAL LIBRARIES**

12.1 **The Civil Engineering Library and the Geotechnical Information Unit**

The CEL is the central reference library of the Civil Engineering and Development Department. The CEL contains over 130 000 documents, including periodicals, books, conference proceedings, manuals, standards, codes of practice, geotechnical reports, maps, documents submitted to GEO in support of private developments, and documents produced by or for Government Departments. Notable examples of the latter are the various Landslide Studies Reports and the Mid-levels Study Report, which were commissioned by the Government. Digital copies for some of the ground investigation reports and the reports of deep directional drillholes sunk for tunnel projects are also available.

The GIU forms part of the CEL and comprises a collection of geotechnical data from ground investigations throughout the HKSAR. The following GIU materials are among those available for inspection within the Public Section of the CEL.

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- (a) ground investigation and geophysical survey reports;
- (b) reports on the laboratory testing of soil and rock;
- (c) reports on chemical and biological testing of sediments and contaminated soils;
- (d) landslip record cards;
- (e) piezometric and rainfall monitoring data;
- (f) an inventory of landslides on natural terrain;
- (g) a list of Dangerous Hillside Orders recommended by the GEO; and
- (h) location plans for government slopes which have been upgraded or which are included in the current Landslip Preventive Measures contracts for upgrading works.

The Bibliography on the Geology and Geotechnical Engineering of Hong Kong (to the end of 2001), produced by the GEO, lists more than 3 300 items that are known to have been published specifically on aspects of the geology and geotechnical engineering of Hong Kong. The Bibliography can be found under the publication section of the CEDD Website <http://www.cedd.gov.hk>.

Members of the public are free to view documents held within the Public Section of the CEL and search for library materials using the Online Public Access Catalogue computer terminals. Searching of ground investigation and laboratory testing reports in the GIU can be carried out efficiently using a computerised data management system, the Geotechnical Information Library System. Photocopying facilities are available.

Further information on the services of the CEL and GIU can be found at the website <http://www.cedd.gov.hk>.

12.2 Other Libraries

The City Hall Public Library, the Hong Kong Central Library and the Kowloon Public Library each houses a reference section which contains a number of published documents on the geology and geotechnical engineering of Hong Kong, together with some unpublished reports. They also house Hong Kong Collections of considerable interest. Direct access is permitted to the shelved items, and bibliographic information of the items can be accessed through the Online Public Access Catalogue. Photocopying facilities are available for public use.

The University of Hong Kong, the Chinese University of Hong Kong, the Hong Kong Polytechnic University, the Hong Kong University of Science and Technology and the City University of Hong Kong each has a large library which contains a collection of general geological and geotechnical information. The first three, however, can only be accessed by special permission, although for bona fide visitors this is usually not difficult to obtain. The

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University of Hong Kong maintains the Hong Kong Collection, which contains considerable unpublished information, as well as master and doctoral degree theses on geological and geotechnical topics.

13. **ADDRESSES OF LOCAL ORGANISATIONS AND GOVERNMENT DEPARTMENTS**

Antiquities and Monuments Office,
Leisure and Cultural Services Department,
136 Nathan Road,
Tsim Sha Tsui,
Kowloon.
(Tel.: 2721 2326)
(Website: <http://www.amo.gov.hk>)

Architectural Services Department,
Queensway Government Offices,
66 Queensway,
Hong Kong.
(Tel.: 2867 3628)
(Website: <http://www.archsd.gov.hk>)

Buildings Department,
12th to 18th and 21st to 22nd Floors,
Pioneer Centre,
750 Nathan Road,
Kowloon.
(Tel.: 2626 1616)
(Website: <http://www.bd.gov.hk>)

City Hall Public Library,
City Hall High Block,
Edinburgh Place,
Hong Kong.
(Tel.: 2921 2672)
(Website: <http://www.hkpl.gov.hk>)

Chinese University of Hong Kong Library,
122 Milestone, Tai Po Road,
Sha Tin, New Territories.
(Tel.: 2609 7301)
(Website: <http://www.lib.cuhk.edu.hk>)

City University of Hong Kong,
Run Run Shaw Library,
Tat Chee Avenue,
Kowloon.
(Tel.: 2788 8311)
(Website: <http://www.cityu.edu.hk>)

Civil Engineering Office,
Civil Engineering and Development
Department,
Civil Engineering and Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2762 5111)
(Website: <http://www.cedd.gov.hk>)

District Lands Offices,
Lands Department,
20th Floor, North Point Government Offices,
333 Java Road, North Point
Hong Kong.
(Tel. 2525 6694)
(Website: <http://www.landsd.gov.hk>)

**Geotechnical Engineering Office, Civil Engineering and Development Department
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Drainage Services Department,
43rd Floor, Revenue Tower,
5 Gloucester Road,
Wan Chai, Hong Kong.
(Tel.: 2877 0660)
(Website: <http://www.dsd.gov.hk>)

Environmental Infrastructure Division
Environmental Protection Department
4/F, East Wing, Island West Transfer Station,
88, Victoria Road,
Kennedy Town
Hong Kong
(Tel.: 2872 1807)
(Website: <http://www.epd.gov.hk>)

Government Records Service,
Hong Kong Public Records Building,
13 Tsui Ping Road,
Kwun Tong, Kowloon.
(Tel.: 2195 7801)
(Website: <http://www.grs.gov.hk>)

Geotechnical Engineering Office,
Civil Engineering and Development
Department,
Civil Engineering and Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2762 5111)
(Website: <http://www.cedd.gov.hk>)

Geotechnical Information Unit,
Civil Engineering Library,
LG1, Civil Engineering and Development
Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2762 5148)
(E-mail: librarian@cedd.gov.hk)

Geotechnical Projects Division, GEO
23rd Floor, 410 Kwun Tong Road,
Kwun Tong, Kowloon.
(Tel. 2716 8612)
(E-mail: ykshiu@cedd.gov.hk)

Highways Department,
5th Floor, Homantin Government Offices,
88 Chung Hau Street,
Homantin, Kowloon.
(Tel.: 2926 4111)
(Website: <http://www.hyd.gov.hk>)

Hong Kong Observatory,
134A Nathan Road,
Tsim Sha Tsui,
Kowloon.
(Tel.: 2926 8200)
(Website: <http://www.hko.gov.hk>)

Hong Kong Central Library,
66 Causeway Road,
Causeway Bay, Hong Kong.
(Tel.: 2921 0222)
(Website: <http://www.hkp1.gov.hk>)

Hong Kong Geological Survey,
Geotechnical Engineering Office,
11th Floor, Civil Engineering and
Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2762 5380)
(E-mail: jsewell@cedd.gov.hk)

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The Hong Kong Polytechnic University
Pao Yue-kong Library,
Yuk Choi Road,
Hung Hom, Kowloon.
(Tel.: 2766 6863)
(Website: <http://www.lib.polyu.edu.hk>)

Hong Kong University of Science &
Technology Library,
Clear Water Bay,
Kowloon.
(Tel.: 2358 6762)
(Website: <http://library.ust.hk>)

Kowloon Public Library,
5 Pui Ching Road,
Homantin,
Kowloon.
(Tel.: 2926 4062)
(Website: <http://www.hkp1.gov.hk>)

Lands Department,
1st, 2nd, 6th, 18th to 24th Floors,
North Point Government Offices,
333 Java Road,
North Point, Hong Kong.
(Tel.: 2231 3294)
(Website: <http://www.landso.gov.hk>)

Lands Information Centre
Survey and Mapping Office,
Lands Department,
23rd Floor, North Point Government Offices,
333 Java Road,
North Point, Hong Kong.
(Tel.: 2231 3452)
(E-mail: lic_enquiry@landso.gov.hk)

Landslip Preventive Measures Division 1,
GEO, 12th Floor, Civil Engineering and
Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2760 5778)
(E-mail: kenho@cedd.gov.hk)

Leisure and Cultural Services Department,
1-3 Pai Tau Street,
Sha Tin,
New Territories.
(Tel.: 2603 4567)
(Website: <http://www.lcsd.gov.hk>)

Map Publications Centre (Hong Kong),
Survey and Mapping Office
Lands Department
23rd Floor,
North Point Government Offices,
333 Java Road,
North Point, Hong Kong.
(Tel.: 2231 3187)
(E-mail: smosale1@landso.gov.hk)

Map Publications Centre (Kowloon),
Survey and Mapping Office,
Lands Department
382 Nathan Road,
Yau Ma Tei,
Kowloon.
(Tel.: 2780 0981)
(E-mail: smosale2@landso.gov.hk)

Marine Department,
Harbour Building,
38 Pier Road,
Hong Kong.
(Tel.: 2542 3711)
(Website: <http://www.mardep.gov.hk>)

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Mines Division, GEO,
25th Floor, 410 Kwun Tong Road,
Kwun Tong, Kowloon.
(Tel.: 2716 8666)
(E-mail: mines@cedd.gov.hk)

MTR Corporation Limited
MTR Tower Telford Plaza,
Kowloon Bay, Kowloon.
(Tel.: 2993 2111)
(Website: http://www.mtr.com.hk/engtxt/ra/ilway/protection_index.html)

Online Geological Memoir
(Website: http://www.cedd.gov.hk/eng/about/organisation/org_geo_pln_map.htm)

Online Government Bookstore,
(Website: <http://www.bookstore.gov.hk>)

Planning Division, GEO,
11th Floor, Civil Engineering and
Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2762 5400)
(E-mail: samuelkcng@cedd.gov.hk)

Publications Sales Unit,
Information Services Department,
Room 402, 4th Floor, Murray Building,
Garden Road, Central, Hong Kong.
(Tel.: 2537 1910)
(Website: <http://www.isd.gov.hk>)

Slope Maintenance Responsibility Information
Centre,
Lands Department,
1st Floor, North Point Government Offices,
333, Java Road,
North Point, Hong Kong.
(Tel.: 2231 3333)
(Website: <http://www.landsd.gov.hk>)

Slope Safety Division, GEO,
7th Floor, Civil Engineering and
Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2760 5760)
(Hong Kong Slope Safety Website:
<http://hkss.cedd.gov.hk>)
(E-mail: hkss@cedd.gov.hk)

Standards and Testing Division, GEO,
12th Floor, Civil Engineering and
Development Building,
101 Princess Margaret Road,
Homantin, Kowloon.
(Tel.: 2762 5345)
(E-mail: ykhui@cedd.gov.hk)

The University of Hong Kong Library,
Pokfulam Road,
Hong Kong.
(Tel.: 2859 2203)
(Website: <http://lib.hku.hk>)

Water Supplies Department,
Immigration Tower,
48th Floor,
7 Gloucester Road,
Wan Chai, Hong Kong.
(Tel.: 2829 4500)
(Website: <http://www.wsd.gov.hk>)

Waste Facilities Business Unit,
Environmental Protection Department,
4th Floor,
West Wing, 88 Victoria Road,
Kennedy Town, Hong Kong.
(Tel.: 2872 1888)
(Website: <http://www.epd.gov.hk>)

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- Chan, W.L., Ho, K.K.S & Sun, H.W. (1998). Computerized database of landslides in Hong Kong. Proceedings of the Annual Seminar on Slope Engineering in Hong Kong, Hong Kong. A.A. Balkema Publishers, Rotterdam, pp 213-220.
- Fyfe, J.A., Shaw, R., Campbell, S.D.G., Lai, K.W. & Kirk, P.A. (2000). The Quaternary Geology of Hong Kong. Geotechnical Engineering Office, Hong Kong, 208 p. plus 6 maps.
- Franks, C.A.M. (1991). Engineering Geology of North Lantau: Tsing Chau Tsai Peninsula to Ta Pang Po (Special Project Report SPR 4/91). Geotechnical Engineering Office, Hong Kong, 148 p. plus 9 drgs.
- Franks, C.A.M. (1992). Engineering Geology of North Lantau: Ta Pang Po to Tai Ho Wan (Special Project Report SPR 2/92). Geotechnical Engineering Office, Hong Kong, 109p. plus 5 drgs.
- GCO (1982). Mid-levels Study: Report on Geology, Hydrology and Soil Properties (1982). Geotechnical Control Office, Hong Kong, 265 p. plus 54 drgs.
- GCO (1987). Guide to Site Investigation (Geoguide 2). Geotechnical Control Office, Hong Kong, 365 p.
- GCO (1988). Guide to Rock and Soil Descriptions (Geoguide 3). Geotechnical Control Office, Hong Kong, 189 p.
- GEO (1998). GEO Emergency Manual. Geotechnical Engineering Office, Hong Kong. (Amended from time to time).
- GEO (2003). Guide to Slope Maintenance (Geoguide 5). (Third Edition). Geotechnical Engineering Office, Hong Kong, 132 p.
- King, J.P. (1999). Natural Terrain Landslide Study, the Natural Terrain Landslide Inventory (GEO Report No. 74). Geotechnical Engineering Office, Hong Kong, 127 p.
- Lam, C.C.L., Mak, S.H. & Wong, A.H.T. (1998). A new slope catalogue for Hong Kong. Proceedings of the Annual Seminar on Slope Engineering in Hong Kong, Hong Kong. A.A. Balkema Publishers, Rotterdam, pp 235-242.

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- Lee, C.W. & Sewell, R.J. (2007). On-line Geological Memoir of Hong Kong. Episodes, Vol.30, no.1, 62p.
- Pang, P.L.R., Evans, N.C., Lam, T.W.K., Au, D. & Man, K.S. (2000). Upgrading of an automatic raingauge system. Proceedings of the Symposium on Slope Hazards and their Prevention, Hong Kong, pp 297-302.
- Scott Wilson (Hong Kong) Ltd (1999a). Specialist API Services for the Natural Terrain Landslide Study – Task B Factual Report. Report to Geotechnical Engineering Office, Hong Kong, 9 p. plus 4 Appendices.
- Scott Wilson (Hong Kong) Ltd (1999b). Specialist API Services for the Natural Terrain Landslide Study – Interpretive Report. Report to Geotechnical Engineering Office, Hong Kong, 32 p. plus 6 Appendices.
- Sewell, R.J., Campbell, S.D.G., Fletcher, C.J.N., Lai, K.W. & Kirk, P.A. (2000). The Pre-Quaternary Geology of Hong Kong. Geotechnical Engineering Office, Hong Kong, 181 p. plus 4 maps.
- Woods, N.W. (1992). Engineering Geology of North Lantau: Tung Chung, Vol. I & II (Special Project Report SPR 1/93). Geotechnical Engineering Office, Hong Kong, 94 p. plus 8 drgs.

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Table 1 - Selected Maps, Plans and Aerial Photographs Available from the Lands Department

Map/Plan	Coverage	Paper Map Products				Digital Map Products	
		Series No.	Size (mm)	No. of Sheets	Colour	Product Name	No. of Sheets
Topographic Maps							
1. 1:1 000	Full	HP1C	750 x 850	3254	B & W	B1000	3254
2. 1:5 000	Full	HP5C	750 x 850	166	B & W	B5000	189
3. 1:10 000 (Street Map)	Full	SM10C	685 x 980	59	B & W	B10000	57
4. 1:20 000	Full	HM20C	685 x 980	16	Colour	B20000	16
5. 1:50 000	Full	HM50CL	1010 x 690	2	Colour	N.A.	N.A.
6. 1:100 000	Full	HM100CL	655 x 850	1	Colour	N.A.	N.A.
7. 1:200 000	Full	HM200CL	327 x 425	1	Colour	N.A.	N.A.
8. 1:300 000 (Hong Kong in its regional setting)	As per title	HM300C	610 x 860	1	Colour	N.A.	N.A.
Digital Orthophotos / Orthophoto Maps							
1. 1:5 000	Full	N.A.	N.A.	N.A.	N.A.	DOP5000	189
2. 1:10 000	Full	N.A.	N.A.	N.A.	N.A.	DOP10000	55
3. 1:50 000	Full	OPM50	1080 x 1400	1	Colour	N.A.	N.A.
4. 1:100 000	Full	OPM100	600 x 770	1	Colour	N.A.	N.A.
Aerial Photos	Full#	N.A.	250 x 250	Numerous	B & W/ Colour	DAP	Numerous
Geological Maps							
1. 1:5 000*	Selective Areas	HGP5, 5A, 5B	760 x 1000	34	Colour	N.A.	N.A.
2. 1:20 000*	Full	HGM20 & 20S	775 x 1000	15 & 1	Colour	N.A.	N.A.
3. 1:100 000	Full	HGM100	660x 1000	1	Colour	N.A.	N.A.
Town Planning Plan by Planning Department	N.A.	471	Various	Various	B & W	N.A.	N.A.
Legend: * See Figure 1 for area coverage # See Table 2 for further details							

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Table 2a - Aerial Photographs Available from the Lands Department (Low Attitude Photographs)

Year	Scale(s)	Approximate Coverage (%)			Remarks
		HKI	K	NT	
1924	Approx. 1:14 000	60	10	30	Medium to low resolution, single frames with incidental stereo overlap.
1945	1:12 000	95	60	95	Medium to good resolution. Almost all areas except east-west strip from Tuen Mun to Sai Kung.
1949	1:4 800 1:11 600	100	95	30	Good resolution. Excellent coverage of north-west New Territories. Good coverage of lowland areas.
1956 1959	1:10 000 1:13 300	10	50	5	Good resolution; some stereo overlap.
1961-1962	1:10 000	100	100	10	Good resolution; small relief exaggeration.
1963	NT = 1:7 800 HKI + K = 1:5 400	100	100	95	Excellent resolution, full stereo coverage. Coverage of all areas except Mai Po to Sha Tau Kok.
1964	1:3 600	5	5	10	Coverage of trunk roads.
1967	1:7 800 - 1:12 500	90	90	20	Coverage of main Urban Area only.
1968-1970	1:5 000 - 1:10 000	40	100	20	Coverage of Urban Areas.
1972	1:6 000 - 1:13 000	40	80	20	Coverage of trunk road.
1973	1:3 000 1:10 000 - 1:12 000	70 70	100 100	5 90	Urban Areas only. Most of HKSAR.
1974	1:5 000	10	70	30	Coverage of north-west and west New Territories.
1975	1:4 600 - 1:10 000	5	40	30	Coverage of north-west and west New Territories.
1976	1:2 000 - 1:8000	100	100	40	Coverage of Urban Areas and New Towns.
1977	1:2 800 - 1:8 000	100	100	50	Detailed coverage of north-west and north New Territories plus New Towns.
1978-1987	1:4 000 - 1:8 000	100	100	60	Annual coverage of Urban Areas including New Towns and lowland areas.
1988 to present	1:2 000 - 1:12 000	100	100	45-90	Annual coverage of New Territories varies from year to year.
Note: Colour aerial photographs have also been taken routinely since 1993.					

Table 2b - Aerial Photographs Available from the Lands Department (High Altitude Photographs)

Year	Scale(s)	Approximate Coverage (%)	Remarks
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**Geotechnical Engineering Office, Civil Engineering and Development Department
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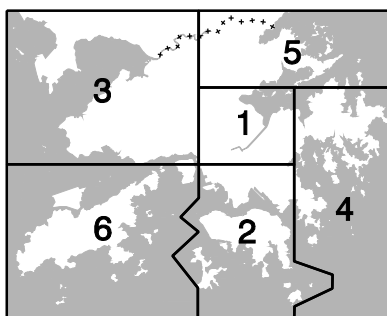
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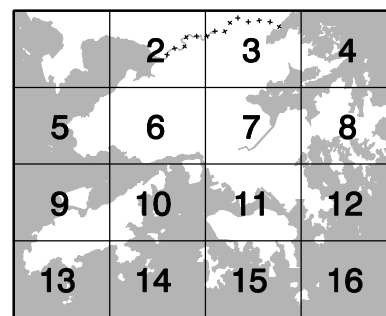
		HKI	K	NT	
1954	1:25 000	2	80	90	Good resolution.
1964	1:25 000	100	100	100	Excellent resolution. Mosaic of aerial photographs available. East to west flight lines, 4 to 5 km apart.
1973	1:25 000	100	100	90	Good resolution. East to west flight lines 3 to 5 km apart.
1974-1976	1:25 000	100	100	100	Good resolution. Annual coverage. East to west flight lines, 1 to 4 km apart.
1977	1:25 000	20		20	Obliques only of Urban Area. Coverage of Lantau, west New Territories and Sha Tin.
1978	1:25 000	100	100	100	Complete coverage.
1979	1:20 000	100	100	100	Complete coverage.
1980	1:20 000	100	80	20	Southern half of HKSAR only.
1981	1:20 000	100	100	100	Complete coverage.
	1:50 000	80	80	10	Urban Area and Lantau only.
1982	1:20 000	100	100	100	Complete coverage
1983	1:20 000	100	100	100	Complete coverage.
	1:40 000	100	100	95	Almost complete coverage.
1984	1:20 000	30	40	15	Coverage of Urban Area, Clearwater Bay and Sai Kung Peninsula.
1985	1:20000	100	100	100	Complete coverage
	1:30 000				
1986	1:20 000	100	100	100	Complete coverage.
1987	1:40 000	100	100	100	Complete coverage.
1988 – 1997*	1:20 000 - 1:40 000	100	100	100	Complete coverage.
1998 to present	1:16 000 - 1:40000	100	100	100	Complete coverage.

Note: Colour aerial photographs have also been taken routinely since 1993.

*Year 1996: only 1:20 000 available



Geological Memoir Nos.

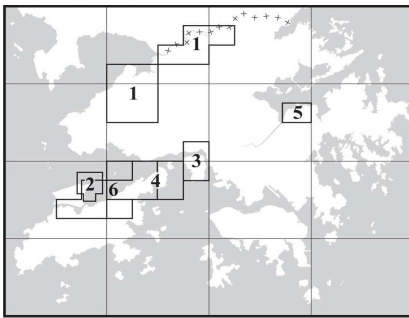


1:20 000 Map Sheet Nos.

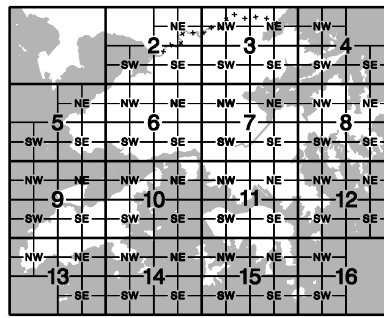
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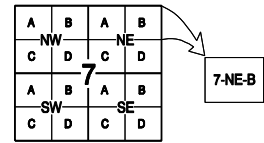
Geological Memoir Nos.	Area of Coverage	Map Coverage 1:20 000 Sheet Nos.
1	Sha Tin	7
2	Hong Kong Island and Kowloon	10, 11, 14, 15, 16
3	Western New Territories	2, 5, 6
4	Sai Kung and Clearwater Bay	8, 12, 16
5	Northeastern New Territories	3, 4
6	Lantau District	9, 10, 13, 14



Sheet Report Nos.



1:5 000 Map Sheet Nos.



Numbering System of 1:5 000 Series

Sheet Report Nos.	Area of Coverage	Map Coverage 1:5 000 Sheet Nos.
1	Yuen Long - Scheduled Area No. 2	14 map sheets
2	Chek Lap Kok	9-NE-C and 9-NE-D
3	Tsing Yi and surrounding offshore area	6-SE-B and 10-NE-B,D
4	North Lantau Island and Ma Wan	10-NE-A,C, 10-NW-B,C,D, and 10-SW-A
5	Ma On Shan - Scheduled Area No. 4	7-NE-D and 7-NE-C
6	Tung Chung and Northshore Lantau Island	9-SE-A, 9-SE-B and 5 offshore part map sheets

Figure 1 - Geological Maps, Memoirs and Sheet Reports