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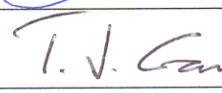
Constructing and Operating Three Automatic Weather Stations at Pak Kung Au, Tai Fung Au and Ngong Ping on Lantau Island

Project Profile

December 2005

	Name	Signature
Reviewed & Checked:	Fred K.K. Ng	
Approved:	Dr. Tim Cramp	

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1. BASIC INFORMATION

Project Title

1.1 The title of this project is known as "Constructing and Operating Three Automatic Weather Stations at Pak Kung Au, Tai Fung Au and Ngong Ping on Lantau Island".

Purpose and Nature of the Project

1.2 Three automatic weather stations (AWSs) are required by the Hong Kong Observatory (HKO) for windshear detection of Chek Lap Kok airport and to collect wind data to assist in aviation weather services for the airport. Three locations on Lantau Island were selected for the proposed AWSs: Pak Kung Au, Tai Fung Au and Ngong Ping. Each AWS comprises two masts (one for mounting wind sensors and one for mounting wind generator), concrete plinths for setting up the two masts and HKO equipment and underground ductwork, surrounded with chain link fence with gate.

Name of Project Proponent

1.3 HKO and Architectural Services Department (ArchSD) of the Hong Kong Special Administration Region Government.

Location and Scale of Project

1.4 The proposed locations of the three AWSs are at Pak Kung Au, Tai Fung Au and Ngong Ping on Lantau Island. Drawing No. 1.1 shows the three site locations in Lantau. **Drawings No. 1.2 to 1.4** show the site locations of Pak Kung Au, Tai Fung Au and Ngong Ping respectively covering areas with a radius of 300m from the site.

1.5 The site area of each AWS is about 10m x 10m. Each AWS comprises the following items:

Items for each AWS	Number
10m high mast for mounting wind sensors	1
Concrete plinths for the 10m high mast and guy wires anchorage	4
5m high mast for mounting wind generator	1
Concrete plinths for the 5m high mast and guy wires anchorage	4
Underground (around 50mm in diameter and about 10cm below ground) cable ducts	3
Screen box	1
Concrete plinth for screen box	1
Equipment and battery bank	1
Concrete plinth for equipment and battery bank	1
Solar panels	1
Concrete plinth for solar panels	1
Chain link fence with gate surrounding the AWS	1

1.6 The conceptual design plan of the AWS is shown in **Drawing No. 1.5**.

Number and Types of Designated Project Covered by the Project Profile

1.7 The Project Profile covers three designated projects.

1.8 These three projects are designated under item Q.1 of Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance, as the site locations are within existing country parks, namely Lantau North and South Country Parks.

Name and Telephone Number of Contact Person(s)

1.9 All queries regarding the Project can be addressed to the project proponent:

Mrs. Miranda Wan
Project Manager 150
Architectural Services Department
Tel: 2867 3984
Fax: 2180 9646

2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

Implementation and Planning of the Proposed Project

2.1 Architectural Services Department is responsible for the planning and supervision of the proposed project. The proposed works will be implemented by ArchSD's contractor.

Tentative Project Timetable

2.2 The programme of the proposed work are as follows:

AWS Site	**Pak Kung Au**	**Tai Fung Au**	**Ngong Ping**
Planning and Design	up to February 2006	up to February 2006	up to February 2006
Construction and Commissioning	February 2006 – May 2006	May 2006 – August 2006	August 2006 – November 2006
Operation	May 2006	August 2006	November 2006

2.3 All construction works will only be carried out between 8:00am to 6:00pm.

Interactions with Other Projects

2.4 There is no known interaction with other projects in the vicinity of the proposed location.

3. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

General Description

3.1 The proposed site location at Pak Kung Au is on a terrain level of +376 mPD with a distance of about 117m from the closest section of Tung Chung Road. The proposed site location at Tai Fung Au is on a terrain level of +351 mPD with a distance of about 57m from the closest section of Ngong Ping Road. The proposed site location at Ngong Ping is on a terrain level of +597 mPD with a distance of about 600m from the Ngong Ping area centre. The project sites are all located within the Country Park area of Lantau Island and currently not under any zoning category according to the latest Outline Zoning Plan.

Ecology

3.2 The three proposed weather stations would fall within a recognised site of conservation importance: Lantau North and South Country Parks. As such, an ecological assessment is required for the proposed works, as stipulated in Appendix A, *Annex 16* of the EIAO-TM.

3.3 Ecological baseline for the three proposed works areas and immediately adjacent habitats (hereafter referred to as the Study Areas) was determined through a review of relevant literature and field surveys. Scoping surveys of ecological conditions at each of the three Study Areas were conducted in August 2005, comprising habitat / vegetation and wildlife (including avifauna, herpetofauna / mammals and terrestrial insects) surveys. Surveys were conducted by direct observation, listening for calling animals and searching potential microhabitats.

3.4 Representative photographs of the three Study Areas are given in **Appendix 3.1.** Plant species and faunal species recorded in the Study Areas are listed in **Appendix 3.2** and **Appendix 3.3** respectively. Key findings of the ecological surveys were as follows:

Areas of Recognised Conservation Importance

- The works proposed for this Project would be conducted within Lantau North and South Country Parks (CP) (Drawing No. 1.1 refers). Natural areas of woodland exist within the Lantau North and South CP, principally on the lower slopes of Lantau and Sunset Peaks (these were designated as "Special Areas" in January 1980). Extensive afforestation work has been carried out in many places and plantations have been established mainly in Chi Ma Wan and around the water catchment areas of Shek Pik Reservoir. Low shrub and coarse grassland cover much of Lantau Island, the latter being predominant on the higher areas exposed to strong winds. On the more sheltered lower slopes, and in stream valleys, the surface lends itself more to scrub growth.

Habitats & Vegetation

- Habitats in all three Study Areas were dominated by grassland/shrubland mosaic. Vegetation in this habitat was species poor and dominated by grasses (*Elephantopus* sp.), herbs (e.g., *Dicranopteris pedata*) and low-growing woody plants (e.g., *Rhodomyrtus tomentosa*, *Melastoma* spp.). Habitats within the proposed works areas are already disturbed by the presence of temporary weather stations. However, the ecological impact is considered minor given the low ecological value and very small size of the affected areas. In addition to grassland/shrubland mosaic, small patches of plantation habitat (dominated by *Acacia confusa*) were recorded in the Pak Kung Au and Tai Fung Au Study Areas. All plant species recorded in the Study Area are common and widespread in Hong Kong, and none of the recorded species are considered of conservation importance.

Fauna

- Fauna recorded in and around the Study Areas are listed in **Appendix 3.3**. All recorded species are common and widespread in Hong Kong, and none of the recorded species are considered of conservation importance. The habitats recorded in the Study Areas were not considered as valuable habitat for fauna.

Landscape and Visual

3.5 Two of the sites, Pak Kung Au and Tai Fung Au are located in remote locations of Lantau South Country Park while Ngong Ping is located in Lantau North Country Park. For Pak Kung Au and Tai Fung Au, there is no residential settlement in vicinity, but only small hiking trails and hiking rest pavilions. For Ngong Ping, Tian Tan Buddha Statue and the associated temple group are several hundred meters away down the hill. The sites are in exposed locations on hilltops and are dominated by grasses and herbs with few hillside trees and shrubs, such as *Acacia confusa, Baeckea frutescens Casuarina equisetifolia, Clerodendrum inerme*, *Mallotus paniculatus, Melastoma candidium, Pinus elliotii, Rhodomyrtus tomentosa* etc.. The height and density of ground vegetation decreases from Pak Kung Au, Tai Fung Au, to Ngong Ping, which is mostly of grasses. Landscape and Visual Plan refer to **Drawings No. 3.1 to 3.3**. Site Photos respectively refer to Photo 13, 46 and 77 of **Appendices 3.4, 3.5 and 3.6**.

Existing and Planned Sensitive Receivers

Noise

3.6 For the purpose of noise impact assessment, representative noise sensitive receiver (NSR) within 300 m from the Project site boundary was identified. One existing NSR at Ngong Ping is selected in accordance with the criteria in the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) to evaluate the potential noise impact. There was no existing or planned sensitive receivers identified within 300m from the Project site boundary at Pak Kung Au and Tai Fung Au. **Table 3.1** presents details of the selected NSR for noise impact assessment. Location of the representative NSR and the proposed works areas are illustrated in **Drawing No. 3.4**.

Table 3.1 Representative Noise Sensitive Receiver

NSR	Location	Horizontal Separation from Site Boundary (m)	Use
N1	Temple at Ngong Ping	200	Place of Public Worship

Air Quality

3.7 For the purpose of noise impact assessment, representative air sensitive receiver (ASR) within 500 m from the Project site boundary was identified. One existing ASR at Ngong Ping is selected in accordance with the criteria in the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) to evaluate the potential air quality impact. There was no existing or planned sensitive receivers identified within 500m from the Project site boundary at Pak Kung Au and Tai Fung Au. **Table 3.2** presents details of the selected ASR for air quality impact assessment. Location of the representative ASR and the proposed works areas are illustrated in **Drawing No. 3.4**.

Table 3.2 Representative Air Sensitive Receiver

ASR	Location	Horizontal Separation from Site Boundary (m)	Use
A1	Temple at Ngong Ping	200	Place of Public Worship

Ecology

3.8 In accordance with the EIAO-TM *Annex 8* criteria, the ecological importance of the Study Areas has been evaluated in **Table 3.3** below.

Table 3.3 Ecological Value of the Study Areas

Criteria	**Ecological Value**
Naturalness	Grassland/shrubland habitat in Lantau is maintained by extensive and frequent hill-fires. The proposed works areas are already disturbed by the presence of temporary weather stations
Size	Grassland/shrubland habitat dominates the upland areas of Lantau, although the three Study Areas are very small in size.
Diversity	Low.
Rarity	No significant records.
Recreatability	Grassland/shrubland habitat regenerates naturally after hill-fires.
Fragmentation	The habitat is not fragmented.
Ecological linkage	Habitat falls partially within Lantau South Country Park.
Potential value	Low.
Nursery ground	No significant records.
Age	N/A.
Abundance/ Richness of Wildlife	Very Low.
Ecological value	**Low**

3.9 Habitats in the Study Areas support a low diversity of flora and fauna, and no species of conservation importance were recorded from the Study Areas. Overall, the Study Areas were considered of low ecological value.

Landscape and Visual

3.10 For Pak Kung Au and Tai Fung Au, existing landscape and visual sensitive receivers are hikers and drivers of adjacent roads that are expected to become less infrequent only during weekends. For Ngong Ping, the receivers will be the monks, visitors and tourists to Tian Tan Buddha Statue and the associated temple group. The sensitivity and population of receivers increase for this site. For all three sites, their sensitivities do not change after the completion of the works. Site Photos respectively refer to Photos 24, 97 and 75 of **Appendices 3.4, 3.5 and 3.6**.

4. POSSIBLE IMPACT ON THE ENVIRONMENT

Noise

Construction Phase

4.1 The use of powered mechanical equipment (PME) for various construction activities would be the major source of construction noise impact during the construction phase of the Project.

4.2 The proposed construction activities would generally be small in scale, and no heavy machinery will be used during the construction of the stations. The construction activities at each site would last for no longer than 3 months. Only mechanical equipment to be used would be electric drill, generator and vibrator for the station set up and in-situ concrete mixing. The construction noise assessment result is shown in Table 4.1.

Table 4.1 Ranges of Unmitigated Construction Noise Levels

PME	Sound Power Level, dB(A)	Total Sound Power Level, dB(A)	Distance to the nearest NSR, m	Predicted Noise Level at the NSR, dB(A)
CNP 101 Generator	108	114.3	200	63.3
CNP 065 Electric Drill	98			
CNP 170 Poker, vibratory (hand-held)	113			

4.3 The day time construction noise criteria stipulated in the EIAO-TM for public place of worship is 70 dB(A). Hence the predicted construction noise level at the sensitive receiver would comply with the criteria.

4.4 The facilities of the existing temporary HKO weather station at each project site will be removed two weeks before the completion of the new AWS. Removing of these existing facilities will not involve any PME and hence no significant noise impact is expected during the decommissioning of the existing stations.

4.5 Indirect noise disturbance during the construction phase are expected to be minor in scale. The most substantial potential impact would result from helicopter flights for transportation of masts and construction materials. It is estimated that the total flight hours to each site would not exceed 10 hours, and flights for each works area would be completed within 2-3 days. Hence, the noise disturbance due to the helicopter flights should be minimal.

Operation Phase

4.6 No noise emission from the stations during operational phase would be expected.

Air Quality

Construction Phase

4.7 Fugitive dust would be arisen from the excavation of the ground for the sitting of the plinths and the cable ducts, and from concrete mixing. A total of 7-10m^3 of soil will be generated from excavation and the volume of concrete to be mixed would be less than 5m^3 at each site. Due to the small scale

of excavation and concrete mixing, the air quality impact at the representative ASR located at a distance of 200m is expected to be insignificant.

Operation Phase

4.8 No air emission from the stations during operational phase would be expected.

Water Quality

Construction Phase

4.9 The soil generated from excavation of plinth sittings will be properly handled to ensure that there will be no water quality impacts from surface run-off arising from rainfall.

4.10 Given the scale and duration of the construction works, there will be no sewerage impacts from the construction workforce as only a few workers will be involved. Also generation of liquid chemical waste such as fuel and oil will not be anticipated from the works.

Operation Phase

4.11 The battery to be used in each AWS is a 12V monoblock lead-acid battery with epoxy-sealed posts and recessed terminals. Hence no leakage from the battery is expected. No water quality impact during the operation of the stations would be expected.

Waste Management

Construction Phase

4.12 It is envisaged that during construction a total of 7-10m^3 of soil generated from excavation need to be disposed of from each site. This small quantitiy of soil will be properly removed from the site for disposal at public filling facility at Wui Wo or others as appropriate.

Operation Phase

4.13 As all the three stations will be operated automatically without any personnel to stay permanently, no significant waste issues would be expected.

Ecology

Construction Phase

4.14 Several ecological impacts resulting from construction phase activities have been identified. These would include:

- Limited impact to approximately 30m^2 grassland/shrubland mosaic habitat (10m^2 at each of the three works areas) due to construction of concrete plinths for weather station equipment, construction of chain-link fence and foundations for masts.
- Indirect disturbance to habitats and associated fauna adjacent to works areas resulting from increased human activity, helicopter flights, and noise-generating construction plant.
- Indirect disturbance to habitats resulting from storage or dumping of construction material.

4.15 No tree felling would be required for the construction of the AWSs.

Operation Phase

4.16 No operational phase impacts are anticipated.

Prediction and Evaluation of Impacts

4.17 Using the basic design parameters described in **Section 1** and illustrated in **Drawing No. 1.5** for reference, potential ecological impacts resulting from construction/operation phase activities have been evaluated according to *Table 1 of Annex 8* of the EIAO-TM, and are summarised in **Table 4.2** below.

Table 4.2 Overall Impact Evaluation to Study Areas

Evaluation Criteria	**Overall Impact Evaluation**
Habitat quality	Low.
Species	No impacts to species of conservation importance
Size/Abundance	Approximately 30m^2 of grassland/shrubland habitat directly impacted by the proposed works.
Duration	Direct impacts would be permanent.
Reversibility	Direct impacts would be irreversible.
Magnitude	Very Minor.
Overall impact conclusion	**Very Low.**

4.18 No substantial direct impacts would result from the Project. Each weather station would only be about 10m^2 in size, and within that area, permanent direct impacts would be limited to small patches of low ecological value grassland/shrubland habitat falling within the footprint of concrete plinths and foundations. The affected areas have already been disturbed by the construction of temporary weather stations, and all potentially affected plant species are common, widespread, and are not considered of conservation importance. Overall, direct impacts would be very minor.

Landscape & Visual

Construction Phase

4.19 Landscape and visual impacts during the construction phase will be negligible. No existing trees will needed to be felled or transplanted due to the work. Each station will require a site area of about 10m x 10m in a remote area and is negligibly small when compared with the scale of vast exposed hilltop. No heavy machinery except hand tools will be used for the construction. All construction materials and weather equipment will be carried up to the site by hands or by helicopters. There will also be no workshop on site and components shall be prefabricated and preassembled offsite as many as possible. Concrete will be mixed on site and may potentially contaminate existing soil due to excessive bleeding. As the amount of concrete is small, no significant impact is anticipated.

4.20 Labour access to the project sites will be via existing footpaths and trails. No temporary access road and haul road will be required. No tree felling would be involved for the construction of the AWSs.

Operation Phase

4.21 For Pak Kun Au and Tai Fung Au, the landscape and visual impacts during operation phase will be negligible. The permanent loss of ground vegetation is very small for those hilltops of vast scale. There are also only infrequent hikers and road users, who are not sensitive to weather stations.

4.22 For Ngong Ping, the landscape impacts are even more negligible because the existing area is highly dominated by grasses. The visual impacts for this site will be more than those for the other two sites, and they are considered to be slight. Due to the relative small size and permeability of the bulk of the weather station, it is not a readily noticeable structure for visually sensitive receivers.

4.23 The colours of the HKO equipment are as follows:

Items of the AWS	**Colour**
Mast for mounting wind sensors and wind generator	Tarnish metallic
Concrete plinths for masts and guy wires anchorage	Concrete grey
Screen box	White
Equipment and battery bank	Grey
Solar panels	Aluminium

4.24 The equipment boxes and the solar panels are low lying and in any case will not be more than 1 m above the concrete plinths on which they are seated. They are hardly observable from a distance.

4.25 Despite the heights of the wind sensor and wind generator masts which are 10m and 5m respectively, their diameters are small, approximately 75 - 100 mm. Experiences in other existing sites reveal that their existence in their natural tarnish metallic colour will not interfere the skyline nor disturb the surrounding landscape.

4.26 According to the recommendations of the World Meteorological Organisation, it is operationally required to have the screen box painted both inside and outside with white, non–hygroscopic paint.

5. ENVIRONMENTAL PROTECTION MEASURES TO BE INCORPORATED IN THE DESIGN AND ANY FURTHER ENVIRONMENTAL IMPLICATIONS

Noise

Construction Phase

5.1 Although no adverse noise impact is anticipated during construction, it is still recommended to carry out the good site practices listed below during the construction phase of the Project:

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program.
- Silencers or mufflers on construction equipment should be utilized and should be properly maintained during the construction program.
- Powered mechanical equipment that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum.
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.
- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

5.2 No adverse construction noise impact would be anticipated during the construction phase of the station.

Operation Phase

5.3 No mitigation measures would be required during operation phase of the station.

Air and Water Quality and Waste

Construction Phase

5.4 In order to minimize the air quality impact during the construction of the Project, the dust mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation should be implemented whenever necessary.

5.5 The practices outlined in ProPECC PN 1/94 Construction Site Drainage will be adopted during the construction of the Project where appropriate. Water quality impact will be minimized during construction stage with the adoption of good site management practices.

5.6 The Contractors will be required to observe and comply with the Waste Disposal Ordinance and its subsidiary regulations, as well as good waste management practices.

Operation Phase

5.7 No mitigation measures would be required during operation phase of the station.

Ecology

5.8 Standard good site practice measures should be implemented throughout the construction phase. The measures should include:

- Placement of equipment or stockpile in designated works areas and access routes selected on existing disturbed land to minimise disturbance to woodland habitats.

- Construction activities should be restricted to works areas that should be clearly demarcated. The works areas should be reinstated after completion of the works.

- Open burning on works sites is illegal, and should be strictly prohibited.

- Disturbance to existing vegetation should be minimised wherever possible. In particular, adequate protection should be provided for mature trees located within or adjacent to proposed works areas.

Landscape and Visual

Design Stage

5.9 The construction contract shall designate a definite, confined site area for the contractor to limit their impacts to existing ground vegetation.

Construction Phase

5.10 Site area shall be clearly demarcated on site. Intrusion out of the limit shall be strictly prohibited and shall be effectively communicated to all frontline operatives.

Operational Phase

5.11 Any distributed area shall be reinstated with hydroseeding and woodland shrub mix, comprised of species: *Melastoma candidum, Rhapiolepis indica, Rhodomyrtus tomentosa,* and *Rhus chinensis*. Due to the technical requirement of the weather station, no tree is proposed.

Residual Environmental Impacts

5.12 Residual impacts would include limited impacts to approximately 30m^2 low ecological value grassland/shrubland habitat. Given the low ecological value and very small size of the affected area, and also that no tree felling is expected these impacts are considered very minor. With the implementation of recommended mitigation measures, it is expected that there would be no substantial residual ecological impact.

6. USE OF PREVIOUSLY APPROVED EIA REPORTS

6.1 No previously approved environmental impact assessment reports are found to be relevant to this Project.

DRAWINGS

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

SITE LOCATIONS PLAN

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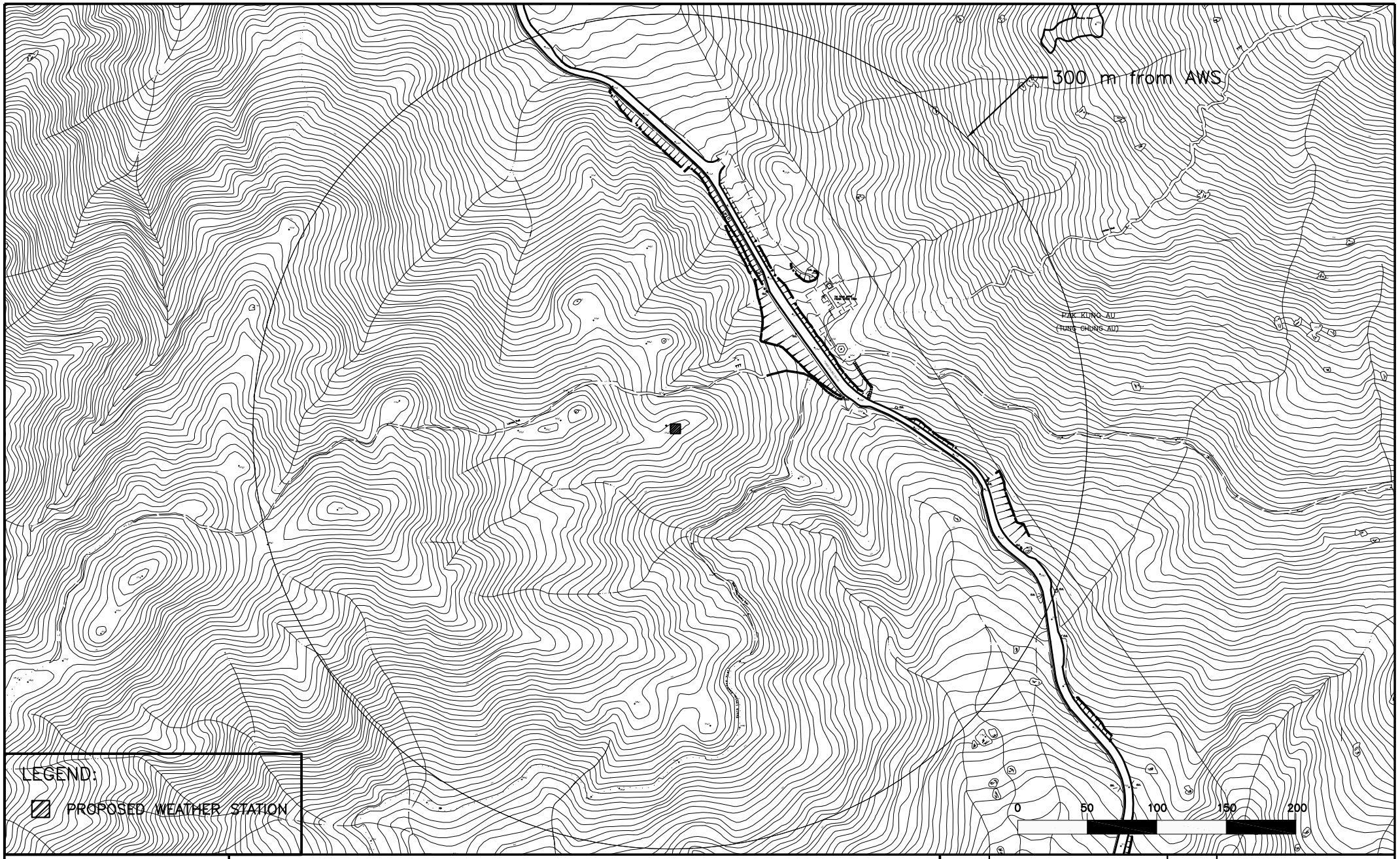

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

SITE LOCATION PLAN AT PAK KUNG AU

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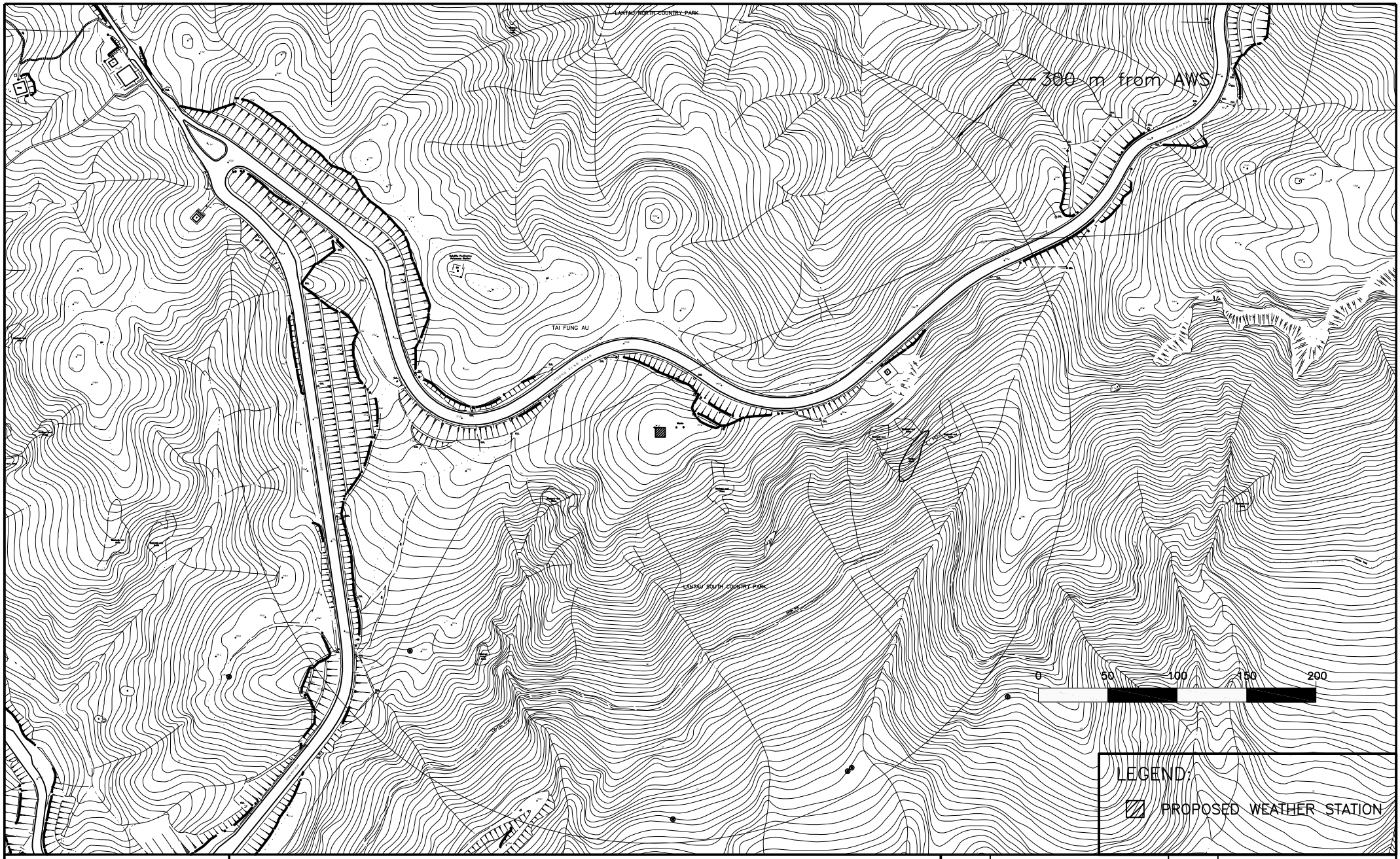

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

SITE LOCATION PLAN AT TAI FUNG AU

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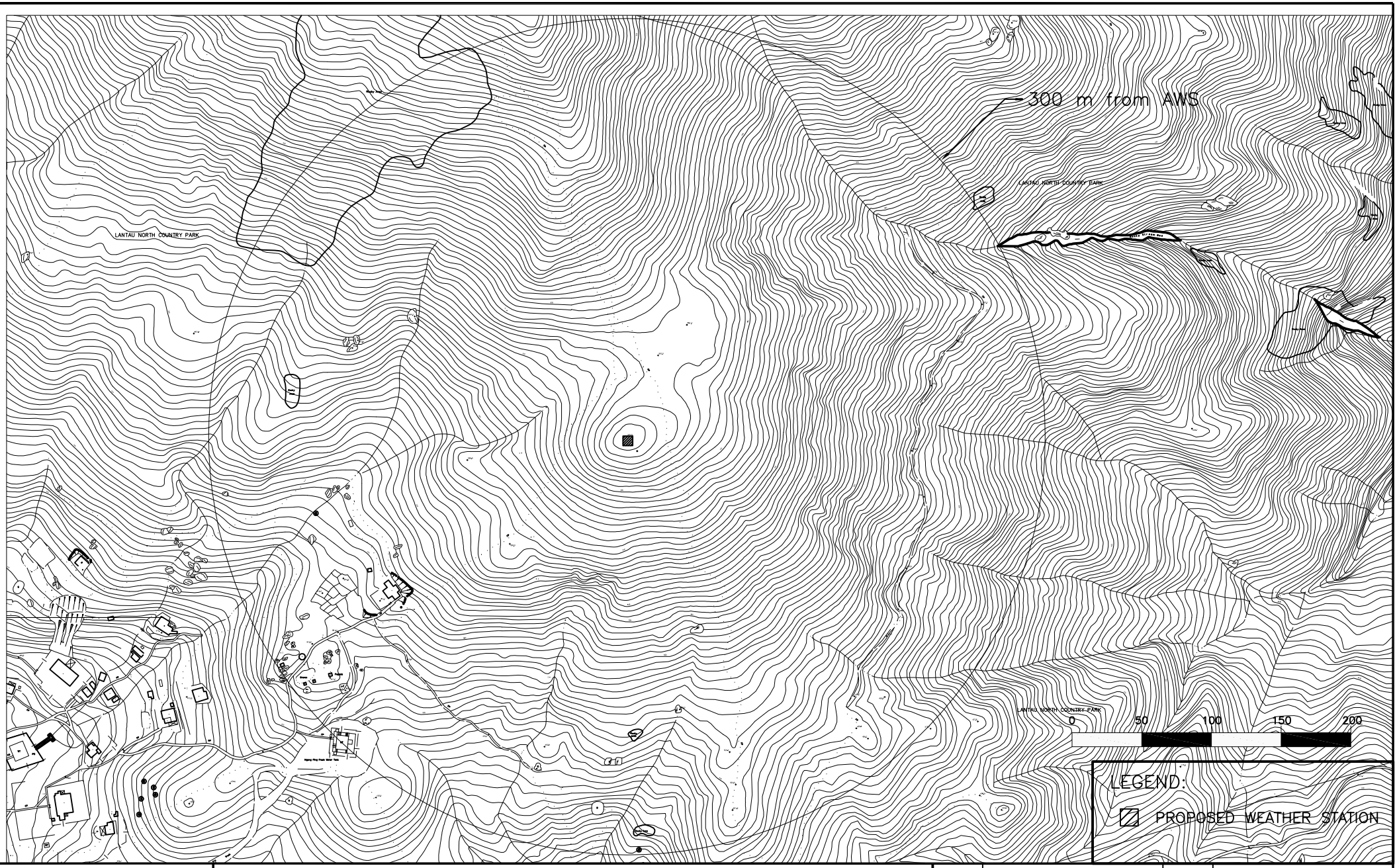

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SITE LOCATION PLAN AT NGONG PING

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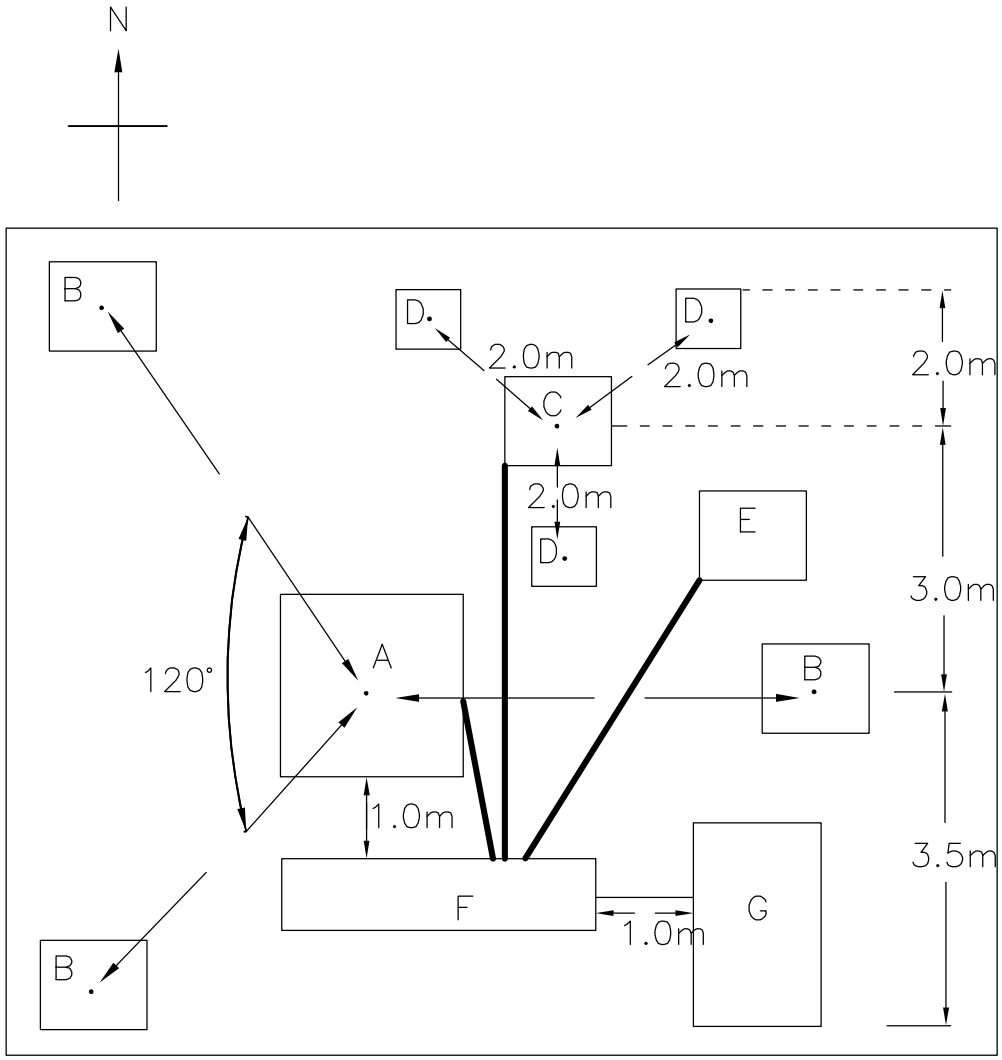

Cable duct with size around 50mm diameter at about 10cm underground

Plinth Size

notation	Used for	Dimension(L x W x D)
A	Foundation for wind mast	By contractor
B	Support concrete for wind mast	By contractor
C	Foundation for wind generator	0.5m x 0.5m x 0.8m 0.2m above ground
D	Support concrete for wind generator	0.4m x 0.4m x 0.6m ground level
E	Plinth for screen box	0.5m x 0.5m x 0.5m 0.2m above ground
F	Plinth for equipment and battery bank	2.8m x 0.7m x 0.5m 0.2m above ground
G	Plinth for solar panels	2.5m x 1.2m x 0.5m 0.2m above ground

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

CONCEPTUAL DESIGN OF THE AUTOMATIC WEATHER STATION

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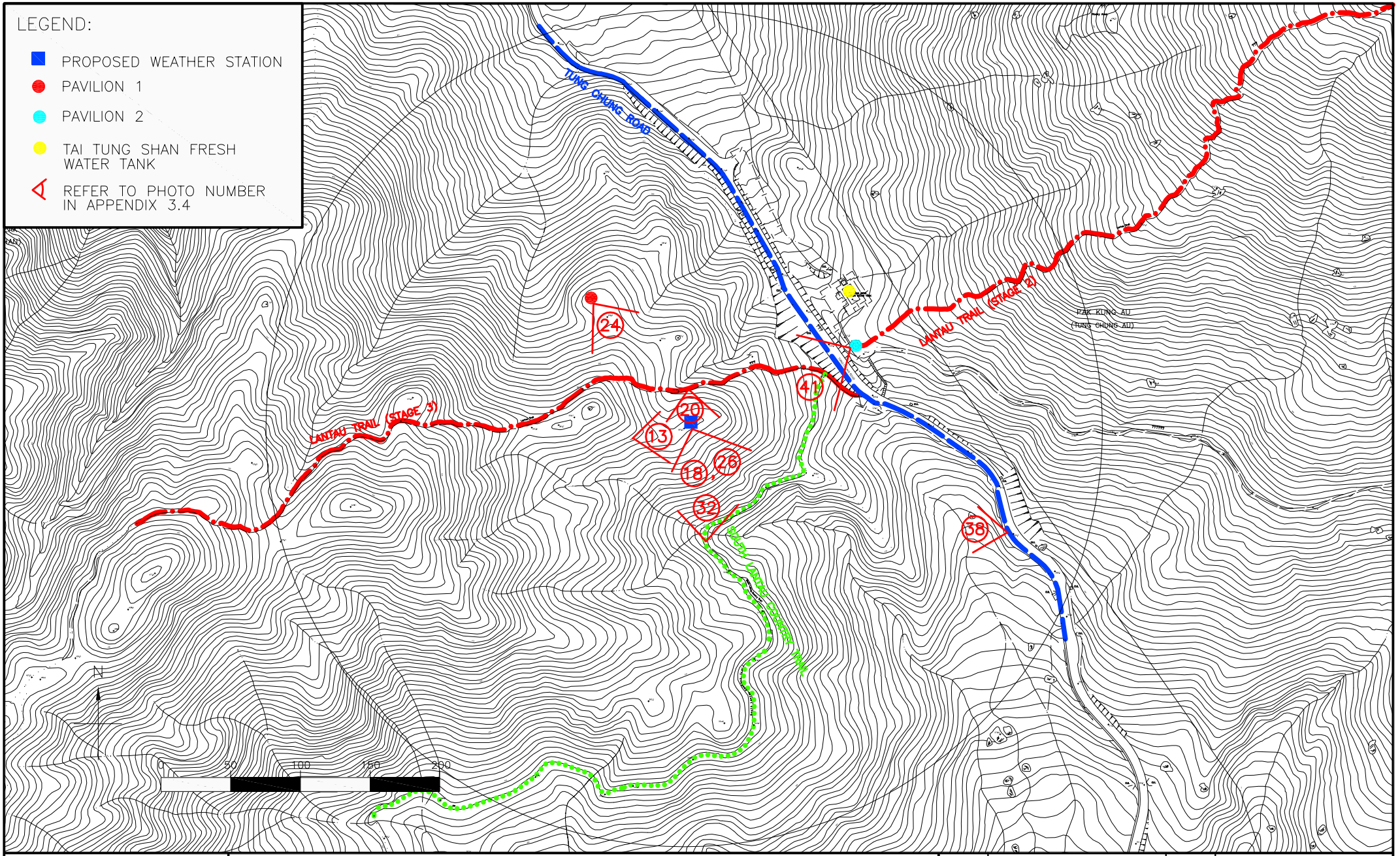

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

LANDSCAPE AND VISUAL PLAN AT PAK KUNG AU

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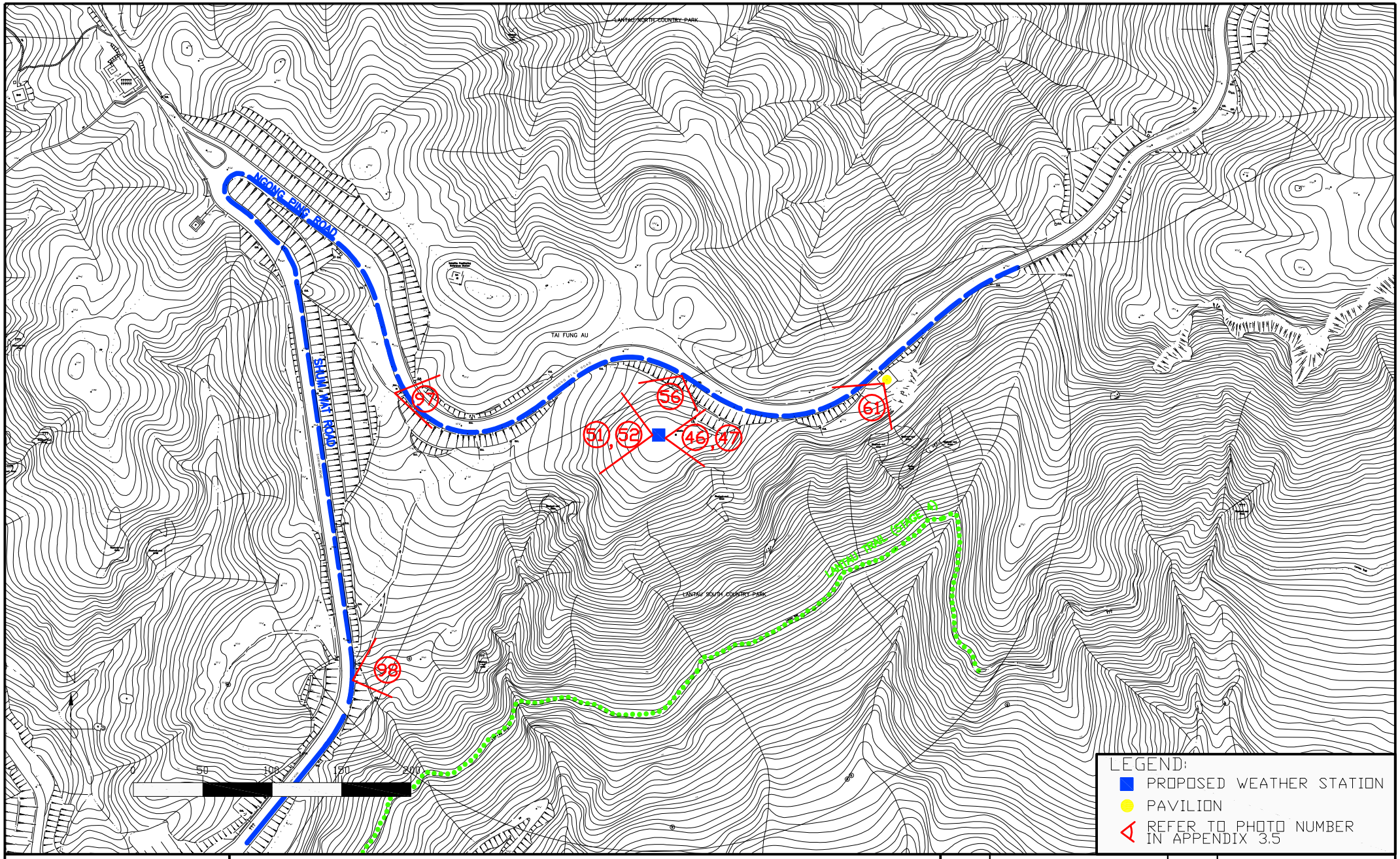

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

LANDSCAPE AND VISUAL PLAN AT TAI FUNG AU

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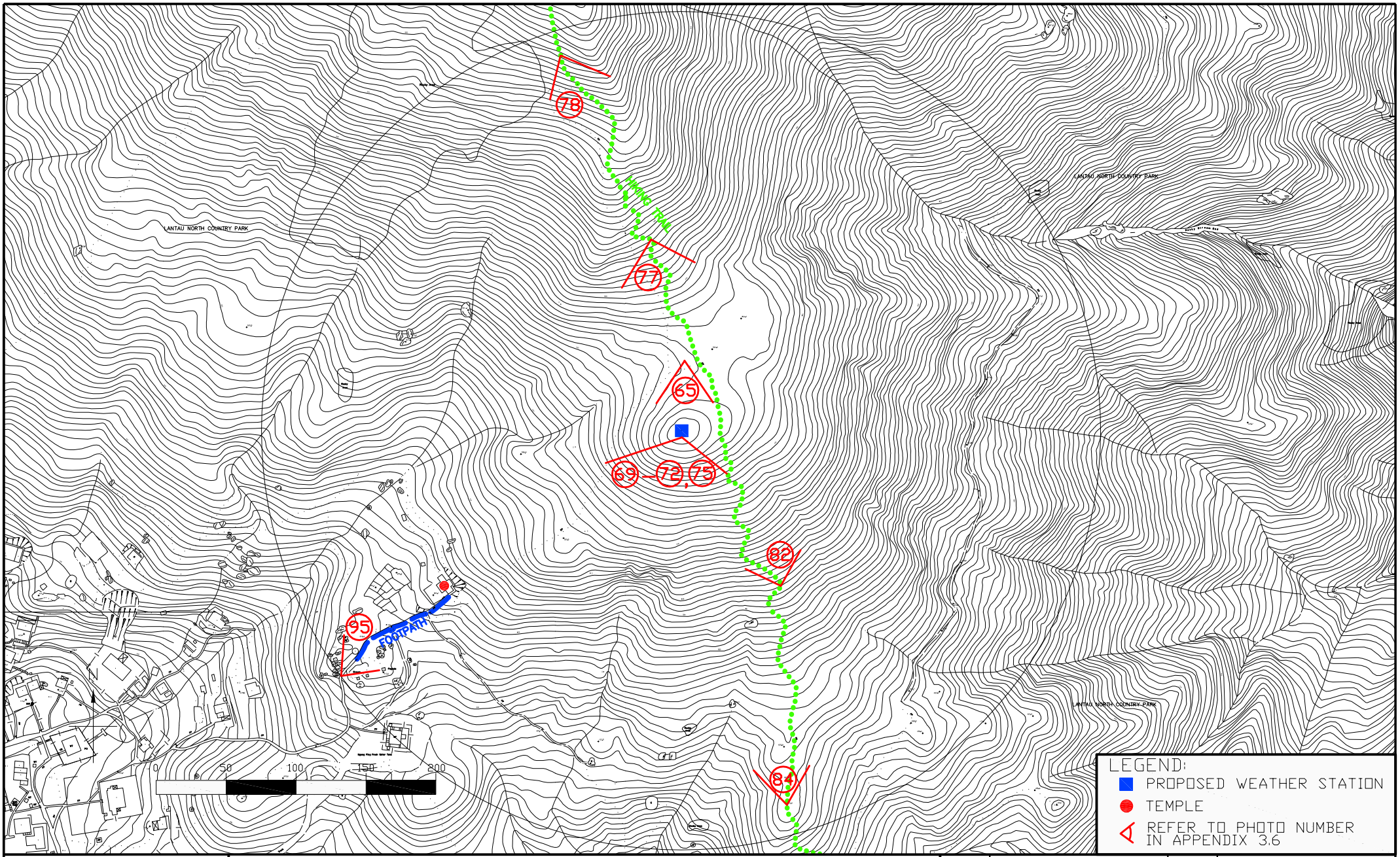

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

LANDSCAPE AND VISUAL PLAN AT NGONG PING

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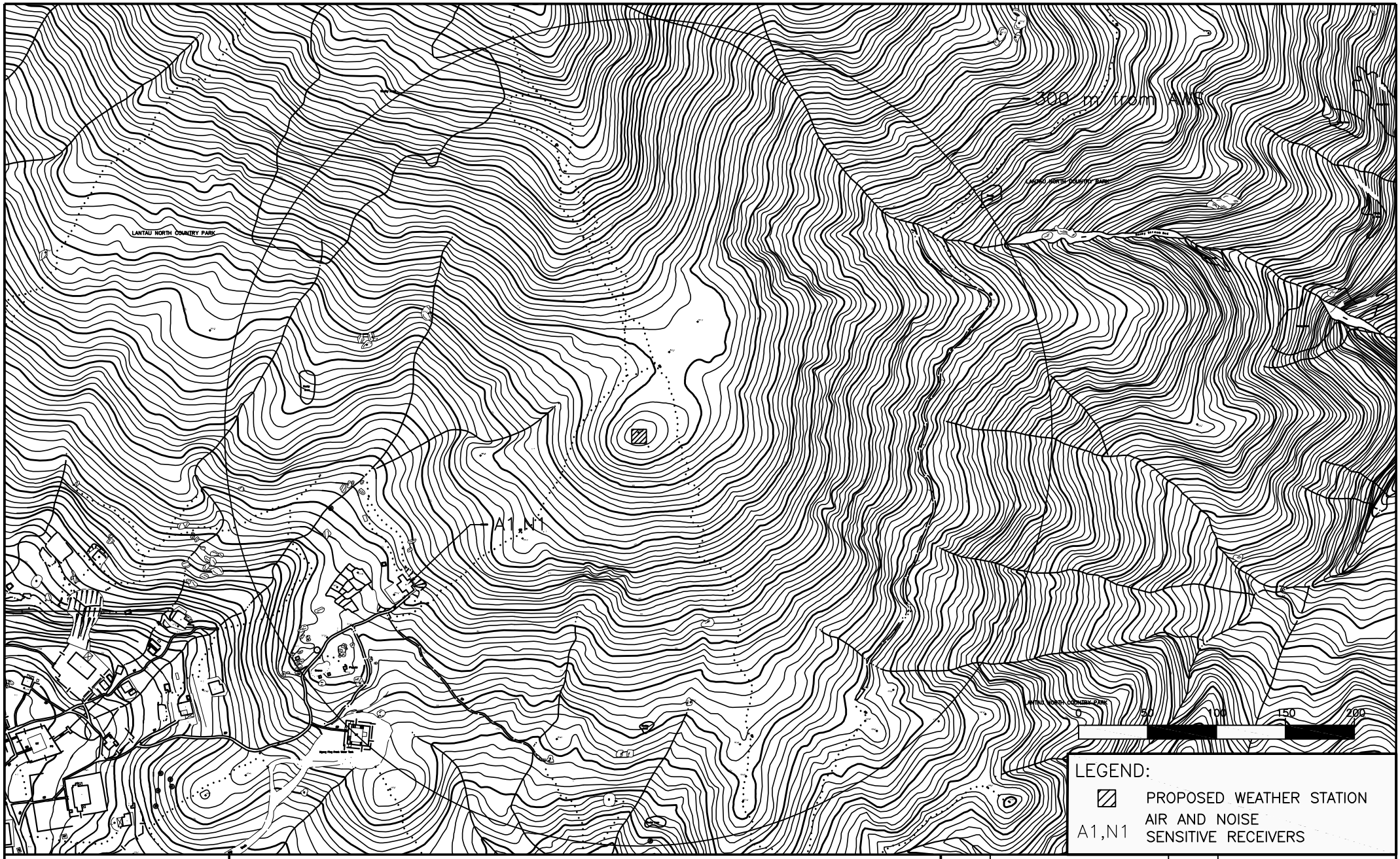

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CONSTRUCTING AND OPERATING THREE AUTOMATIC WEATHER STATIONS (AWS) AT PAK KUNG AU, TAI FUNG AU AND NGONG PING ON LANTAU ISLAND

REPRESENTATIVE AIR AND NOISE SENSITIVE RECEIVERS AT NGONG PING

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APPENDICES

Pak Kung Au

Tai Fung Au

Ngong Ping

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Appendix 3.2 Plant Species Recorded in the Study Areas

Plant Species	Growth Form	Status in Hong Kong	Pak Kung Au	Tai Fung Au	Ngong Ping
Acacia confusa	tree	exotic, common	x	x	
Ageratum conyzoides	herb	exotic, common		x	
Ardisia crenata	shrub	common		x	
Aster baccharoides	herb	very common		x	
Baeckea frutescens	shrub	very common	x	x	
Bidens pilosa	herb	very common		x	
Blechnum orientale	herb	very common	x	x	x
Breynia fruticosa	shrub	very common		x	
Casuarina equisetifolia	tree	common	xx		
Clerodendrum inerme	herb	very common	xxx		xx
Dicranopteris pedata (Dicranopteris dictotoma; Dicranopteris linearis)	herb	very common	xxx	x	x
Elephantopus sp.	herb	very common	xxx	xxx	xxx
Hedyotis acutangula	herb	very common	x		x
Helicteres angustifolia	herb	very common		xx	
Inula cappa	herb	very common	x	x	
Lantana camara	shrub	exotic, common		x	
Lindsaea orbiculata	herb	common		x	x
Liriope spicata	herb	very common	x		
Lycopodium cernuum	herb	very common	x	x	x
Lygodium japonicum	climber	very common	x		
Macaranga tanarius	tree	very common		x	
Mallotus paniculatus	tree	very common	x	x	
Melastoma candidum	herb	common	xxx	xx	
Melastoma dodecandrum	sub-shrub	common	x		
Millettia speciosa	climber: vine	common		x	
Osbeckia chinensis	herb	very common	x		x
Pinus elliotii	tree	very common	x	x	
Psychotria asiatica	semi-woody climber	very common	x		x
Rhaphiolepis indica	shrub	common	x		
Rhodomyrtus tomentosa	shrub	very common	x	x	x
Rhus chinensis	shrub	very common		x	
Rubus reflexus	climber	very common	xxx	x	x
Wikstroemia indica	shrub	common	x	x	x

Code for Abundance: xxxx=abundant; xxx=frequent; xx=ocassional; x=scarce

Appendix 3.3 Fauna Recorded Within the Study Areas

Avifauna

Scientific Name	Common Name	Occurrence in Hong Kong*	Pak Kung Au	Tai Fung Au	Ngong Ping
Hirundo rustica	Barn Swallow	1			x
Apus affinis	Little Swift	1			x
Pycnonotus sinensis	Chinese Bulbul	1	x	x	
Pycnonotus jocosus	Crested bulbul	1	x	x	
Prinia flaviventris	Yellow-bellied Prinia	1	x		x
Orthotomus sutorius	Common Tailorbird	1	x		
Garrulax canorus	Hwemei	2		x	x
Zosterops japonica(simplex)	Japanese White Eye	1	x		
Parus major	Great Tit	1	x		
Lanius schach	Long-tailed Shrike	1	x		
Dicrurus macrocercus	Black Drongo	1		x	
Corvus macrorhynchus	Jungle Crow	1	x		

* 1 - Widespread & Common, 2 - Local but not Uncommon, 3 - Very Local or Rare

Odonates

Scientific Name	Common Name	Status in Hong Kong	Pak Kung Au	Tai Fung Au	Ngong Ping
Anisoptera					
Pantala flavescens	Wandering Glider	Common & widespread		x	xx

Butterflies

Scientific Name	Common Name	Status in Hong Kong	Pak Kung Au	Tai Fung Au	Ngong Ping
Graphium sarpedon	Common Bluebottle	Common & widespread	x		
Ideopsis similis	Blue Glassy Tiger	Common & widespread	x		
Zizeeria maha	Pale Grass Blue	Common & widespread			x

Code for Abundance: xxxx=abundant; xxx=frequent; xx=ocassional; x=scarce

n.b. - no herpetofaunal or mammal species were recorded during the surveys

PHOTO 13

PHOTO 18

PHOTO 20

PHOTO 24

PHOTO 26

PHOTO 32

PHOTO 38

PHOTO 41

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VISUAL PHOTOS AT PAK KUNG AU

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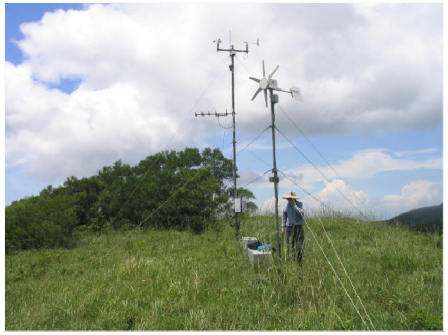

PHOTO 46

PHOTO 47

PHOTO 51

PHOTO 52

PHOTO 56

PHOTO 61

PHOTO 97

PHOTO 98

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VISUAL PHOTOS AT TAI FUNG AU

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PHOTO 65

PHOTO 69–72

PHOTO 75

PHOTO 77

PHOTO 78

PHOTO 82

PHOTO 84

PHOTO 95

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VISUAL PHOTOS AT NGONG PING

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