

INTRODUCTION

The Tuen Mun Sewerage - Eastern Coastal Sewerage Extension (the Project) is to be implemented under the Tuen Mun Sewerage Stage I Phase IV and Stage II in accordance with the recommendations of the Tuen Mun Sewerage Master Plan (EPD, 1993). The Project includes the construction of the village sewerage in the Tai Lam Chung valley and in the area of So Kwun Wat to connect the existing network. An integral element of the Project involves the construction of six new pumping stations at:

- Tai Lam Correctional Institution;
- Luen On San Tsuen;
- Tai Lam Chung Tsuen;
- Tai Lam Valley;
- So Kwun Wat Tsuen; and
- Castle Peak Villas.

The locations of the proposed pumping stations and the extent of the sewer alignment are presented in Drawings 1a, 1b and 1c. The Luen On San Tsuen, Tai Lam Chung Tsuen and So Kwun Wat Tsuen pumping station will be located on 'village' OZP designated areas under the So Kwun Wat OZP, the Tai Lam Correctional Institution pumping station will be on a G/IC site and the Tai Lam Valley pumping station on Green Belt. In addition, Castle Peak Villas Pumping Station will be located on Residential (B) land under the Tuen Mun OZP. All necessary planning approvals under the Town Planning Ordinance have been obtained except for the So Kwun Wat Tsuen pumping station.

The proposed Tai Lam Chung Tsuen, Luen On San Tsuen, Tai Lam Valley and Castle Peak Villas pumping stations are classified as designated projects under Schedule 2, section F.3 (b)(i) of the Environmental Impact Assessment Ordinance. The other elements of the project are not designated. An environmental review of the Project completed by the Director of Environmental Protection concluded that an Environmental Impact Assessment (EIA) Study should be carried out. Mouchel Asia Environmental were commissioned to carry out an EIA under Agreement No. CE 43/98 commencing on 14th October 1998. The following criteria were

assessed as part of the EIA:

- air quality;
- noise;
- water quality;
- waste management;
- ecology;
- heritage; and
- landscape and visual.

ASSESSMENT OF ALTERNATIVES

Alternative sites for three of the proposed pumping stations in Tai Lam Valley, Tai Lam Chung Tsuen and Luen On San Tsuen were identified at the commencement of the Study as a result of consultation with village representatives. Preliminary environmental assessment of the sites concluded that all the sites would not give rise to any insurmountable environmental impacts and would be environmentally acceptable with mitigation.

PROJECT DESIGN

The pumping stations will consist of a single storey superstructure built on top of the wet well. The wet well will be enclosed and provided with an outlet deodorised by activated carbon, which will be vented through an external wall. The vent will be located away from adjacent residential properties as far as possible. Each pumping station will have one active and one stand-by pump, with the exception of the Castle Peak Villas and Tai Lam Valley pumping stations which have two active pumps. Each station will also be supplied with emergency power supply and a telemetry system linked to the manned Pillar Point Sewage Treatment Works with the exception of the Tai Lam Correctional Institution pumping station which is linked to the Tai Lam Correctional Institution.

SUMMARY OF ENVIRONMENTAL ASSESSMENT

AIR QUALITY

Representative Air Sensitive Receivers (ASRs) have

been identified in accordance with criteria set out in the Technical Memorandum on the Environmental Impact Assessment Process. The construction and operational ASRs are shown in Drawings 2a to 2h. Operational impacts relate to odour emissions from the pumping stations, and thus, ASRs are restricted to those close to the proposed pumping station locations.

Based upon the recent enactment of the Air Pollution Control (Construction Dust) Regulation, the Contractor will be responsible for ensuring that the dust concentrations during construction activities comply with the regulatory standards. The key areas for control will be during the construction activities in the villages themselves due to the proximity of the sensitive receivers, particularly residents in Tai Lam Chung Tsuen, Luen On San Tsuen, Wong Uk, Wu Uk, the residents along Lok Chiu Street, So Kwun Wat Tsuen and So Kwun Wat San Tsuen. Mitigation measures will include frequent watering of exposed surfaces and material to control dust generation. However, the works will be of short duration in any one location and as such impacts can be controlled to within acceptable levels with appropriate mitigation measures and no residual impacts are expected.



Aerial View of Tai Lam Chung Area

Air pollution emissions during operation of the Project will be restricted to odours being vented from the pumping stations but with all discharges being directed through a deodoriser. Odour monitoring at the existing pumping station at So Kwun Wat and computer odour modelling have been undertaken to assess the operational impacts

from the pumping stations. Both assessments concluded that the odour from the proposed pumping stations would be within the criteria of 5 odour units at all existing and future sensitive receivers. Thus, no unacceptable impacts are predicted.

NOISE

Representative construction and operational noise sensitive receivers (NSRs) are the same as the ASRs. Noise may be generated from different stages of the construction works, namely pumping station construction, main sewer alignment construction and the construction of sewers within the villages themselves.

The key activities associated with the construction of the pumping stations will include concrete breaking, where existing paved surfaces need to be broken, and excavation. Noise modelling has predicted that the majority of properties would not be adversely affected during the various stages on construction. However, mitigation measures, including silencers and mufflers on equipment and the use of temporary noise barriers to contain the sites, are recommended to protect the closer NSRs subject to noise impacts.

With this mitigation, the noise levels at all residential NSRs during the construction of the pumping stations would meet the statutory 75 dB(A) limit. However, certain construction activities will be required to be scheduled outside the normal hours of the kindergarten in Luen On San Tsuen and outside exam periods at the kindergarten and school to comply with the noise criteria for these educational facilities. Residual impacts are not predicted.

Construction of the trunk sewers will involve similar works as for the pumping stations along with additional equipment for paving works. Work in the villages, however, will be completed by hand digging, but with some equipment required to break the concrete and compact the soil after backfilling of the trenches. Unmitigated noise predictions determined that the closest NSRs would be exposed to noise in excess of the criteria and mitigation measures would be required during sewer laying.

The predictions for the trunk sewer alignments show that, with the same mitigation as assumed for the pumping station construction applied, the noise levels at all but 8 representative NSRs within approximately 11m of the alignment, will be within the 75dB(A) standard. Thus, additional measures, which could include the use of an acoustic enclosure or hand digging, would be required for some NSRs. Based upon a combination of further mitigation measures, compliance with the noise standards is considered to be achievable in most cases. However, it is recommended that main sewer alignment work adjacent to the Luen On San Tsuen school and kindergarten should be scheduled outside normal school hours where noise levels exceed the limits and all other measures have been exhausted and outside the exam periods.

Within the villages, only properties facing the works will be affected by noise, with residents behind being screened. A large proportion of the village houses, however, will be within 1-2 m of the trenches and the application of standard mitigation measures such as the barrier may be constrained by space limitations. Thus, other measures, which could include manual concrete breaking, would be needed to reduce noise levels. In areas where the concrete thickness precludes hand digging and space constraints do not allow the use of barriers or acoustic enclosures, the Contractor will be responsible for implementing all practicable means to minimise noise. However, residual impacts may occur at the closest NSRs. The duration of the works will be short, lasting in the region of 1-2 hours close to any one property. Therefore, based upon the short duration of the works and the overall beneficial effects of the project, the residual impacts are considered to be acceptable.

Noise modelling undertaken to determine the noise impacts associated with the pumps in the pumping stations, has predicted that the noise levels during the operational phase will be within the acceptable daytime and nighttime noise limits as the pumping station structure itself would provide a barrier to the noise. No residual impacts are predicted.

WATER QUALITY

Care will be taken during construction to avoid

impacts on the water quality of the water bodies within the study area. However, there is potential for suspended solids runoff from excavation sites and spoil heaps and from dewatering of trenches and foundations to be discharged into the water courses. Suitable mitigation including the use of sand/silt removal traps and limiting works in water courses to the dry season and periods of low flow, can, however, mitigate all impacts to acceptable levels.

Once operational, the Project will serve to eliminate the discharge of untreated or partially treated sewage to surface water courses in the area and so offers significant environmental benefits to the area in terms of improvements to water quality in inland streams and coastal waters. The only potential water quality issue during the operational stage will arise from the emergency overflow of sewage into the local receiving waters. The overflow bypass will not be used during regular maintenance.



Main Estuary in Tai Lam Chung

To protect against this, all pumping stations have been designed to include a stand-by pump, emergency power supply and a telemetry system. In the case of the rare failure of the dual power supply, portable generators will be arranged to supply electricity to the pumping stations. Based upon these mitigation measures, it is extremely unlikely that a failure will occur and due to the telemetry system, any failure would be repaired promptly and the discharge would be short-term. All overflows in the Tai Lam Valley have been designed to discharge into a large water body, where the sewage will be suitably diluted and any impact would be short-term and localised to the point of discharge only. The emergency overflow

at the Castle Peak Villas pumping station is designed to flow into a small existing drainage channel which flows to a non-gazetted beach and will ultimately drain into the sea. Due to topographical and technical constraints, the pumping station has been located at the lowest point on Lok Chui Street and this dictates the location of the emergency outfall. While all possible measures to avoid a discharge have been made, in the unlikely event of an overflow occurring, the discharge would be rapidly diluted and flushed out of the bay within no more than 1-2 days and will not cause a significant impact to water quality or marine ecology. In So Kwun Wat, the location of the emergency overflow into the channelised stream below So Kwun Wat Tsuen will avoid damage to the more natural upper stream. Recovery of the streams fauna would be expected to occur relatively quickly from any discharge as species re-colonise from the more diverse and natural upstream areas.

WASTE MANAGEMENT

Activities during the construction phase will result in the generation of a variety of wastes. A large proportion of the soil material that will be excavated will be recycled for use as backfill material for the sewer alignment. The remaining earth and the broken surface material will require off-site disposal. A total of only 18,000 m³ of surplus material from the pumping stations and sewer alignments is predicted which would equate to approximately 4 trips per day over the entire site. In practice, only one lorry trip would be expected in any one location and this will not result in any significant environmental impacts. Management of the handling and storage of waste material can be achieved through good site practices and no impacts are predicted. Recycling of all material will be encouraged.

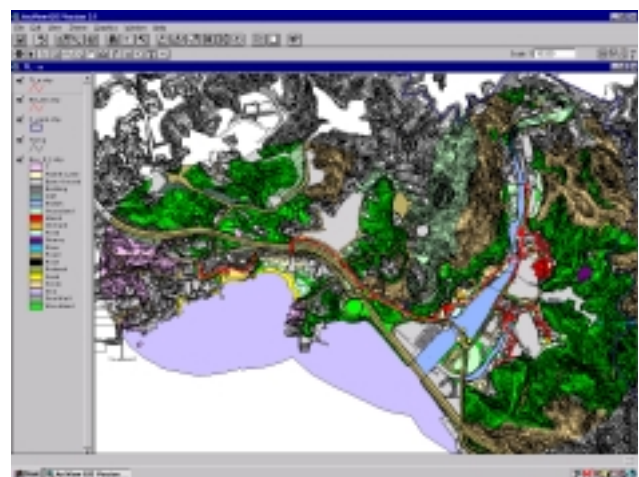
ECOLOGY

Following a comprehensive literature review and initial site survey, detailed ecological surveys were carried out to provide ecological baseline data on woodland, birds and fish habitats and species.

Through refinement of the sewer alignment and the site boundary, adverse impacts identified as a result of the potential loss of woodland habitat

north of Tai Lam Chung, east of Wong Uk and east of So Kwun Wat Tsuen have been avoided. The loss of a very small area of marshland (5m²) south of Tai Lam Chung Tsuen will be of minor significance given the total loss is less than 0.2% of the marsh in this area. Nevertheless, the magnitude of this impact can be reduced by minor changes to the site boundary during construction. Drainage impacts on the marsh can also be avoided during construction by returning drained water back to the marsh.

The stream east of So Kwun Wat Tsuen may experience impacts of minor significance as a result of disturbance of the stream bed and generation of suspended solids during construction. These impacts can be mitigated by confining laying of the sewer across the stream to periods of low stream water flow. Construction of the Tai Lam Valley pumping station will result in the loss of a brackish water fish pond resulting in an impact of minor significance. No mitigation is possible but the residual impacts are not unacceptable given the size and quality of the habitat loss, the availability of similar habitats in the area and the overall benefits of the scheme. Overall, the ecological assessment concluded that the majority of significant ecological impacts predicted can be successfully mitigated and no adverse residual impacts will occur.



All the ecological findings are input into the Geographical Information System (GIS)

HERITAGE

A total of 54 buildings and structures of cultural and historical importance were identified and

recorded in the villages of So Kwun Wat, Tai Lam Chung and Wong Uk, including 8 buildings identified by the Historic Buildings Survey, as shown in Drawings 3a-3f. The assessment concluded that the proposed works will not directly impact on any of the historic structures but indirect impacts could occur as the works will be carried out in close proximity to many of the structures. Any possible damage will be mitigated against by means of a monitoring programme to be carried out during the construction period. The following structures, with their drawing reference in brackets, will require monitoring:

So Kwun Wat (Ching Ka Tsuen)

- Ching family ancestral hall (TMS-99-02)
- Fung Shui Shrine (TMS-99-03)

So Kwun Wat (East Section)

- Chan family ancestral hall (TMS-99-04)
- Village house (TMS-99-05)
- Pig sty (TMS-99-06)
- Village house (TMS-99-07)
- Row of terraced houses (TMS-99-08)

So Kwun Wat (Main Village)

- Ching Ying study hall (TMS-99-12)
- Green brick house (TMS-99-13)
- Green brick house (TMS-99-14)
- Village house (TMS-99-15)
- Terraced house (TMS-99-16)
- Village house (TMS-99-19)
- Former study hall/stables (TMS-99-20)
- Storage shed (TMS-99-21)
- Village house (TMS-99-22)
- Village house (TMS-99-24)
- Renovated gate (TMS-99-26)
- Village house (TMS-99-28)
- Village house (TMS-99-29)
- Tse Tong (TMS-99-30 a/b)
- Terraced house (TMS-99-52)

Tai Lam Chung

- Row of terraced houses (TMS-99-33)
- Village house (TMS-99-34)
- Village house (TMS-99-35)
- Village house (TMS-99-39)
- Village house (TMS-99-40)
- Village house (TMS-99-41)
- Wu's ancestral hall (An Ding Ga Suk) (TMS-99-43)

Tai Lam Chung Road

- Fung Shui shrine (TMS-99-47)

Wong Uk

- Village house (TMS-99-49)
- Row of village houses (TMS-99-50)

Investigation of both the sewer alignment and proposed pumping station sites not covered by concrete did not reveal any surface finds or archaeological deposits and it was concluded that no further assessment was required.

However, two pumping stations and a substantial proportion of the sewer alignment is currently under concrete and, thus, these areas were not investigated. It has been recommended, therefore, that monitoring of the soil as it is removed during excavation works be undertaken for the Tai Lam Correctional Institution and Luen On San Tsuen Pumping Stations and those areas under concrete which have been assessed as being of high archaeological potential including Wong Uk Tsuen and Ching Ka Tsuen, So Kwun Wat. All impacts are considered acceptable with the mitigation applied.

LANDSCAPE AND VISUAL

Pipe laying is not predicted to cause any landscape or visual impacts upon completion. Thus, the main landscape and visual impacts are expected to arise instead from the intrusion of the pumping stations and compounds. The visual intrusion of the pumping stations can be minimised, however, by the following measures:

- integration of the proposed pumping stations into their surrounding environment by the use of a suitable colour scheme;
- a boundary wall/fence; and
- planting of trees and shrubs around the perimeter.

Trees which may be affected by the pumping stations or the trunk sewer alignment have been identified at Castle Peak Villas, Tai Lam Chung Tsuen pumping station site, in the lanes of the older villages in So Kwun Wat Tsuen and close to the refuse collection point near the Tai Lam Correctional Institution. With the exception of the

latter, all these trees can be avoided either by minor realignment of the sewer or care during construction.

With respect to the mature trees adjacent to the refuse collection point on Tai Lam Chung Road, these will have to be cleared for the sewer alignment and future access area. However, due to the proposed planting at the adjacent pumping station, it is judged that these trees will be adequately compensated and the impact is not significant.

The location of the Tai Lam Valley pumping station will require the resumption and filling in of a brackish fish pond. While the visual and landscape quality of this pond is medium and its loss is not considered significant, it does add something to the visual and landscape environment. The loss can be compensated by the planting of trees and shrubs around the boundary of the compound.



Photomontage of Tai Lam Valley Pumping Station – Before (upper) and at completion with mitigation (lower)

The proposed sewerage works are located mainly within low-lying areas in the Tai Lam and So Kwun Wat valleys. The pipe alignments are typically located below existing roads and footpaths and

avoid woodland. The pumping stations are either located in land that has been disturbed previously or in areas of relatively low ecological or landscape amenity value. Accordingly, there does not appear to be any conflict with existing traditional fung shui elements such as hillsides, ridges, knolls, woodland or religious buildings, temples or shrines within the study area.

All landscape and visual impacts are considered to be acceptable or acceptable with mitigation.

ENVIRONMENTAL MONITORING AND AUDIT

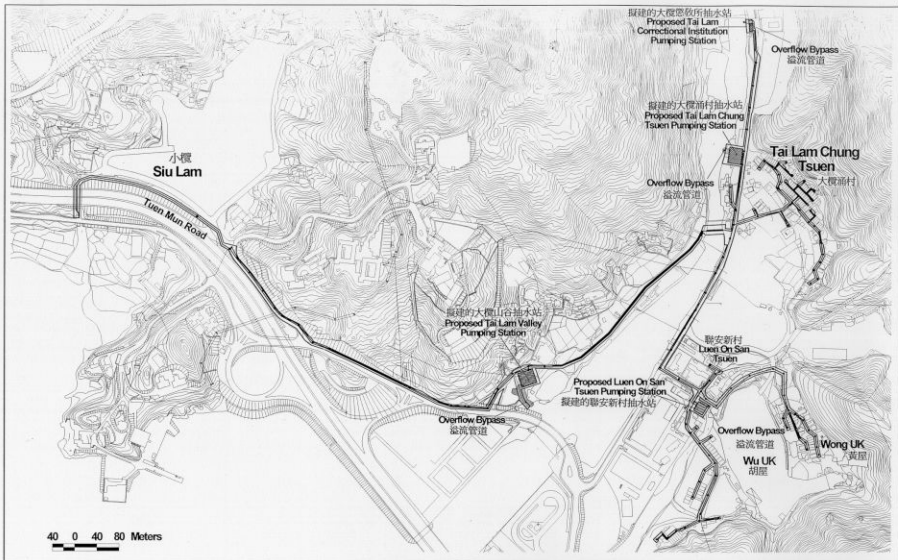
Based on the findings of the EIA, EM&A requirements for the construction and operational phases of the project have been specified. The construction EM&A requirements relate to dust, noise, water quality and landscape and visual resources to ensure mitigation measures are being implemented and effective. Also, in areas of medium and high archaeological potential and some pumping stations, which were not included in the survey due to being covered by hardstanding, it is recommended that the excavation works are supervised for archaeological artifacts and soil deposits.

In addition, landscape and visual monitoring and auditing will be extended into the first year of the operation of the pumping stations to ensure that the recommended planting is nourished and watered through the established period.

ASSESSMENT CONCLUSIONS

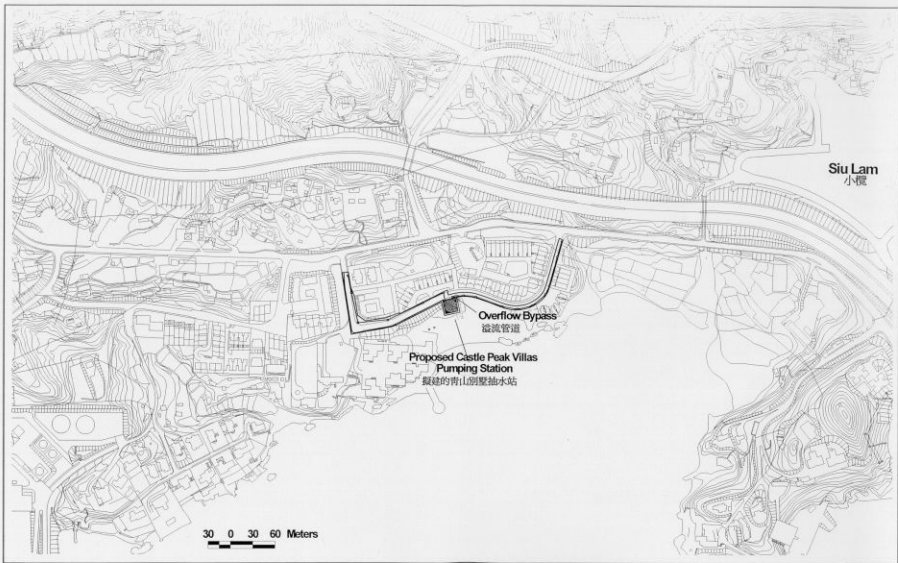
The overall conclusion of the EIA is that the project will be environmentally acceptable with mitigation measures applied and no adverse residual impacts are predicted.

The Project will serve to collect sewage from existing villages and ultimately future development and transfer it into the existing sewerage network. This will eliminate the discharge of untreated or partially treated sewage into local water courses. This represents a significant benefit to the local environment in terms of improvements to water quality and associated aquatic flora and fauna and eliminating unhealthy, malodorous and potentially visually unpleasant discharges.



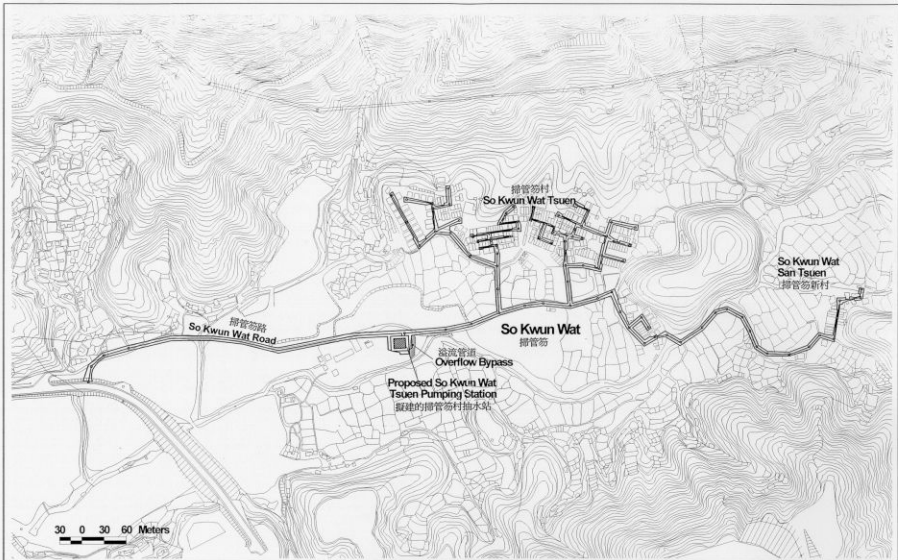
The Study Area and Proposed Sewer Layout

擬建污水渠伸延路線及研究地點



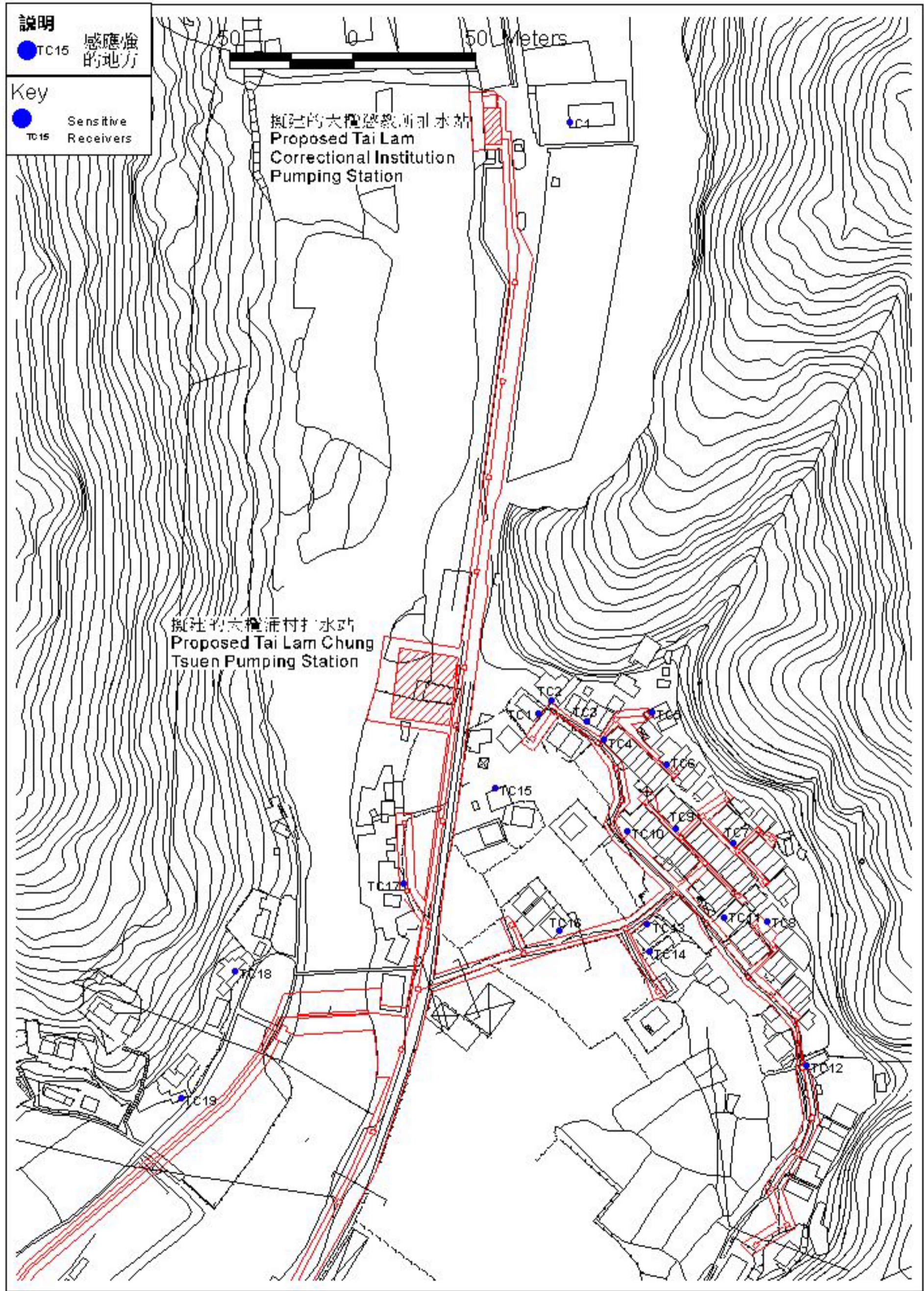
The Study Area and Proposed Sewer Layout

擬建污水渠伸延路線及研究地點



The Study Area and Proposed Sewer Layout

擬建污水渠延伸路線及研究地點



說明
● TC15 感應強
的地方

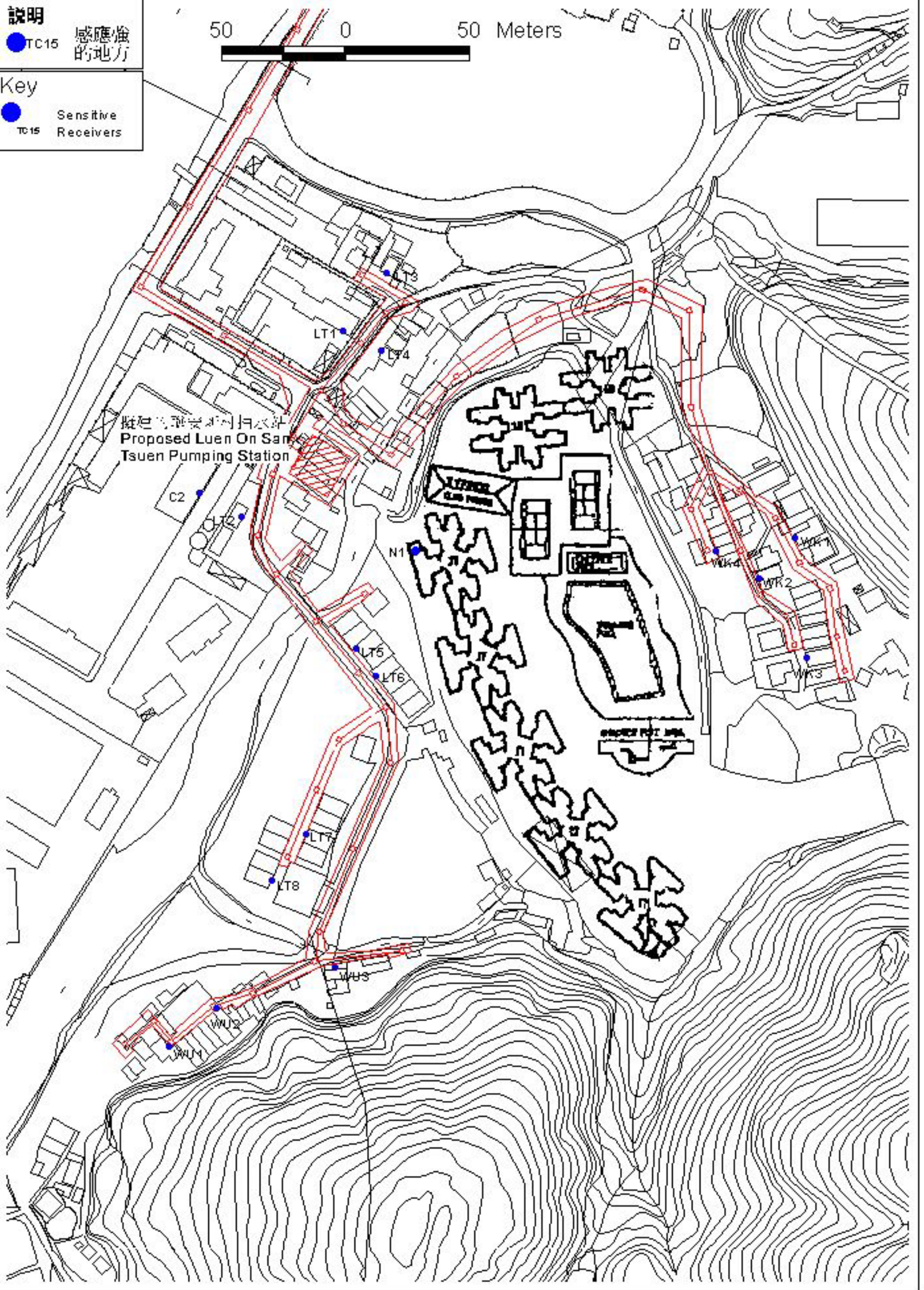
Key
● Sensitive
TC15 Receivers

建議的噪音監察地點 (1 of 8)
Location of Sensitive Receivers (1 of 8)

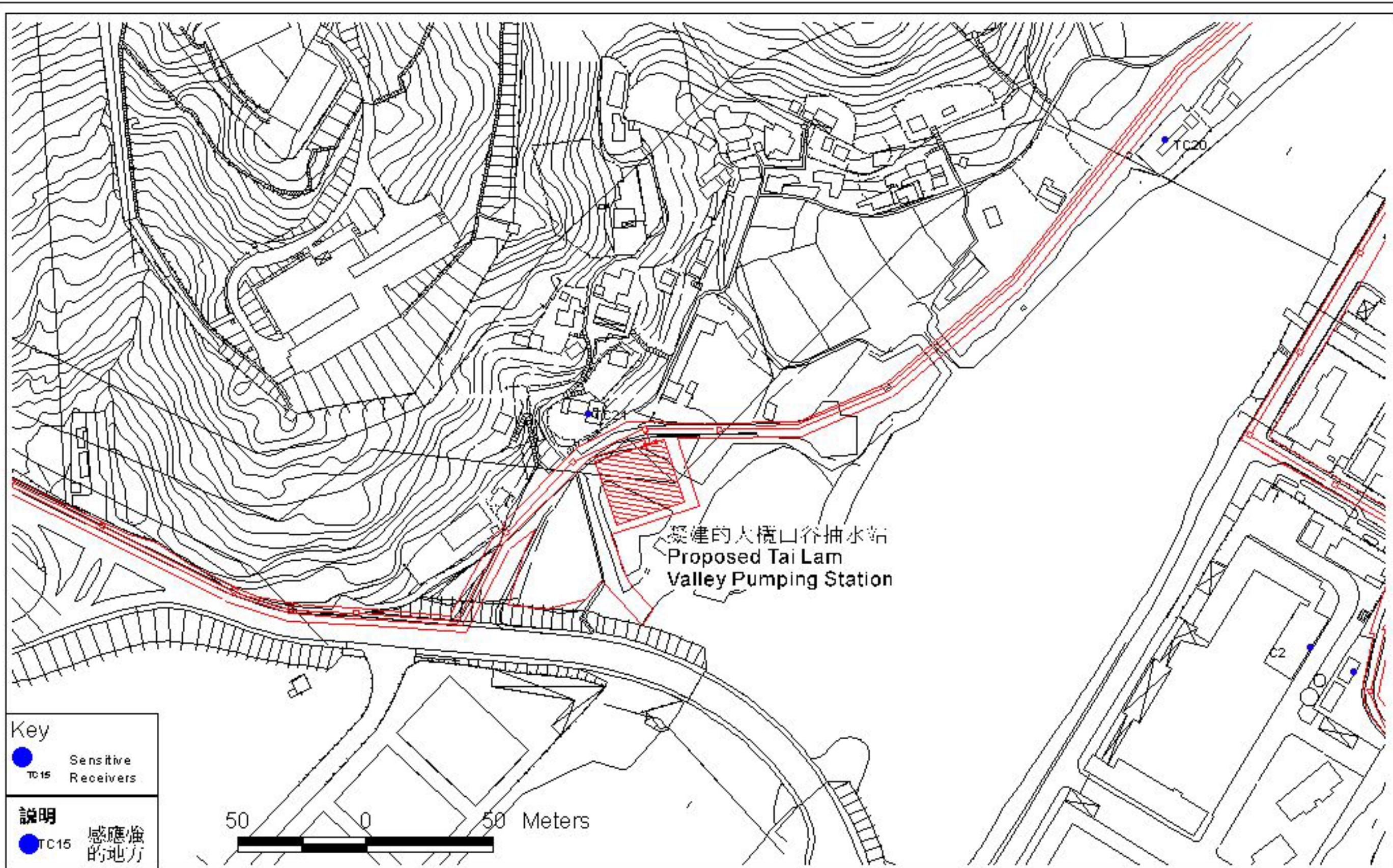
說明
● TC15 感應強的地方

Key
● Sensitive Receivers
TC15

50 0 50 Meters



建議的噪音監察地點 (2 of 8)
Location of Sensitive Receivers (2 of 8)



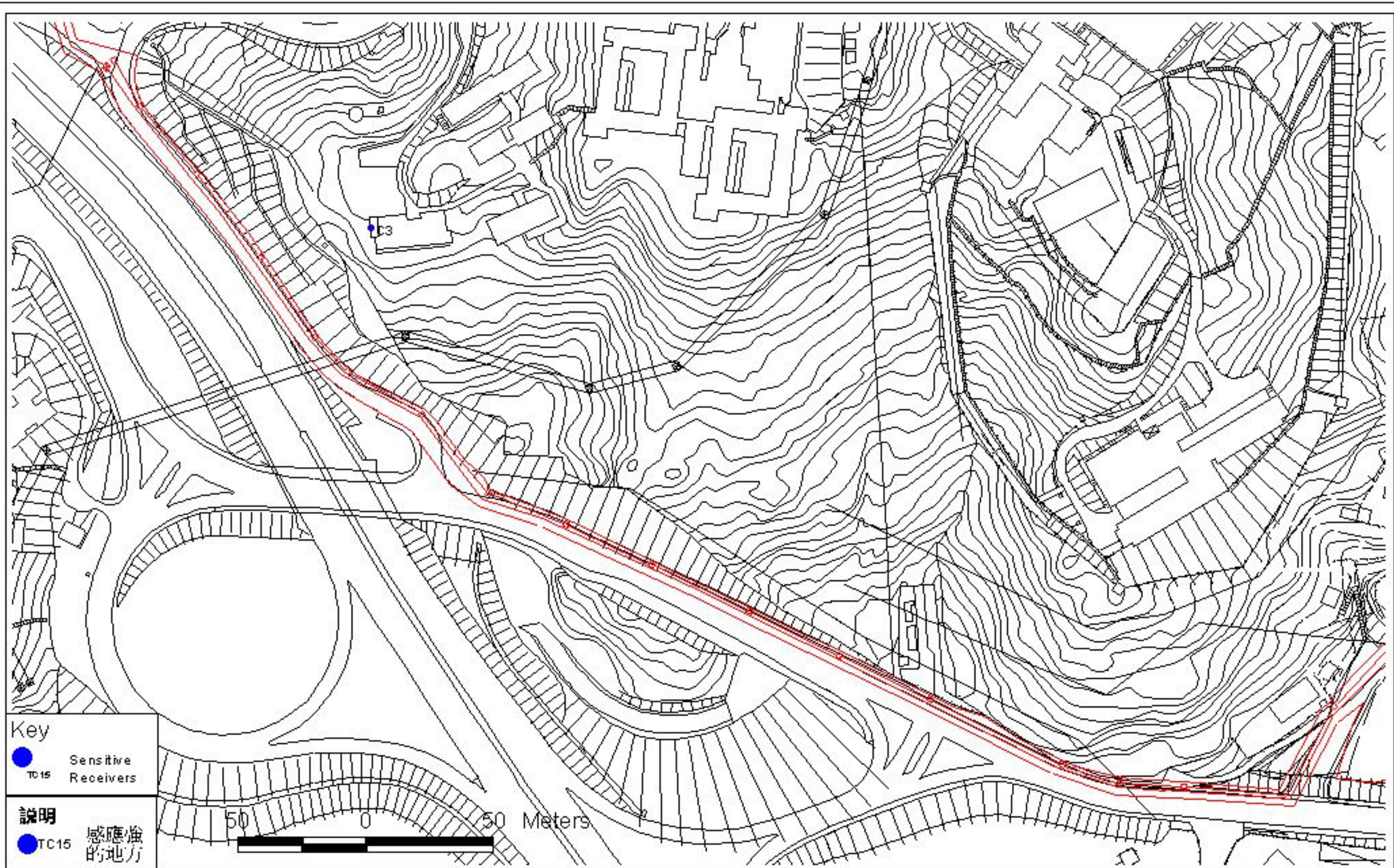
擬建的大欖山谷抽水站
Proposed Tai Lam
Valley Pumping Station

Key
● TC15 Sensitive Receivers

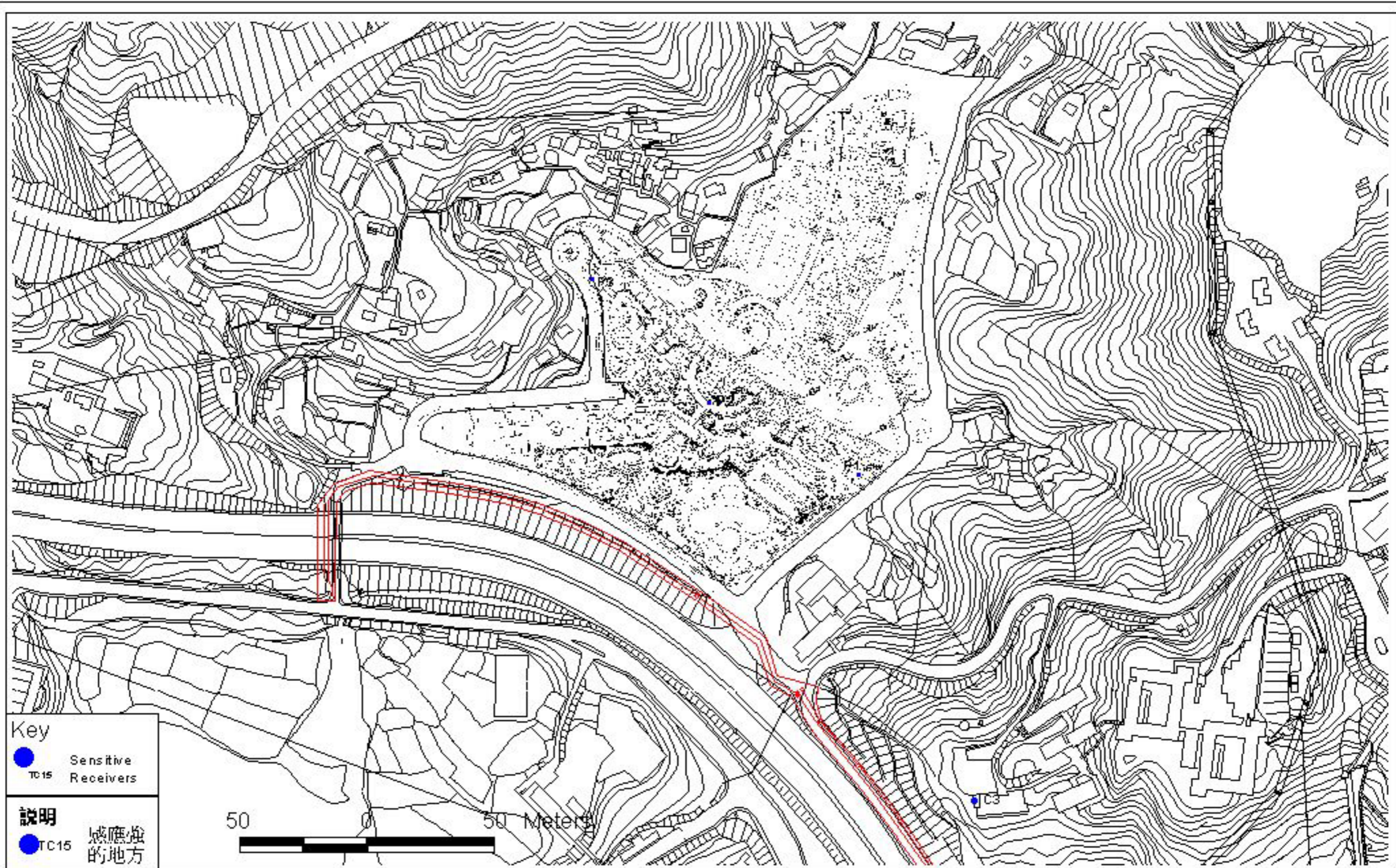
說明
● TC15 感應強的地方

50 0 50 Meters

建議的噪音監察地點 (3 of 8)
Location of Sensitive Receivers (3 of 8)



建議的噪音監察地點 (4 of 8)
 Location of Sensitive Receivers (4 of 8)



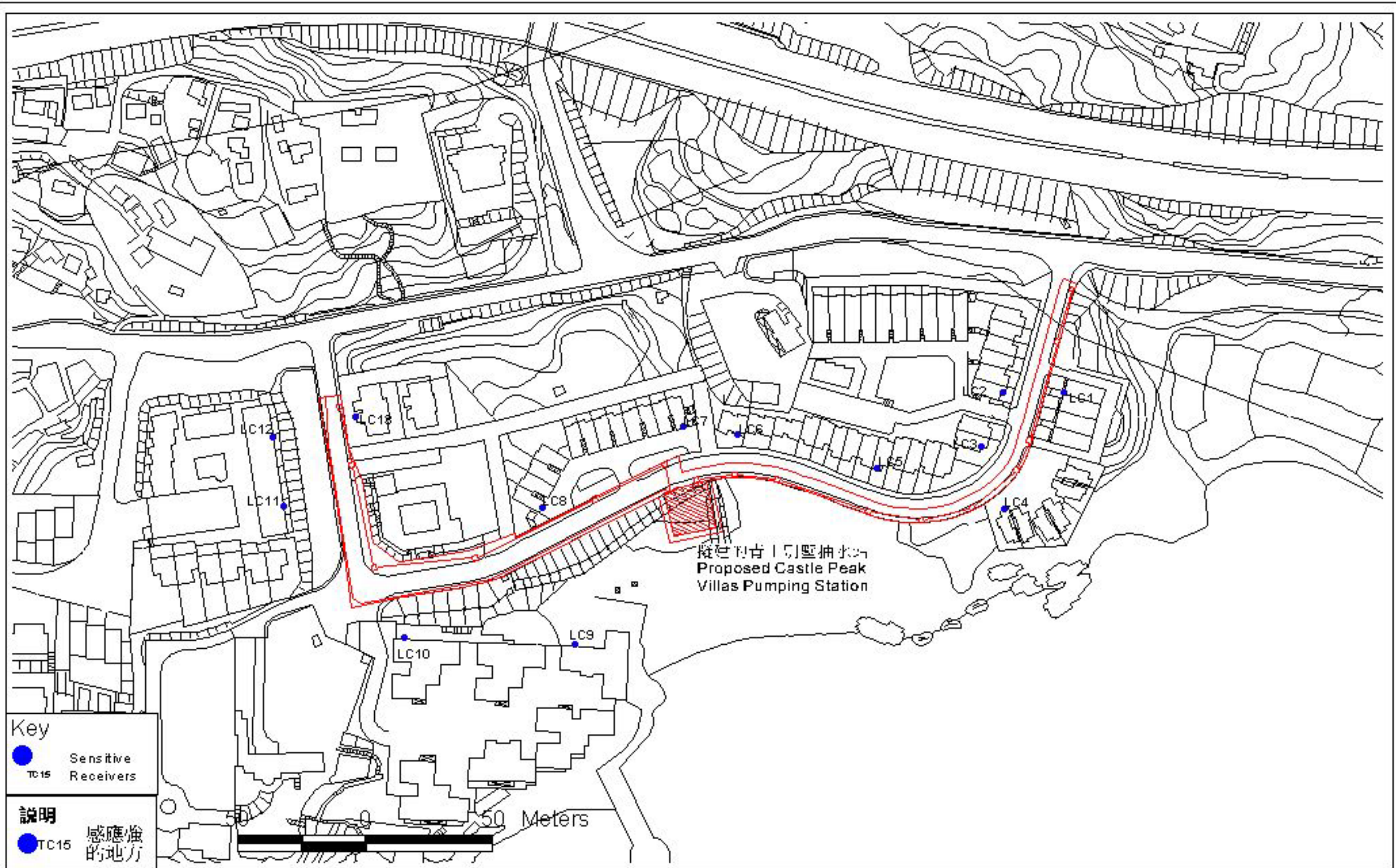
Key

● Sensitive Receivers TC15

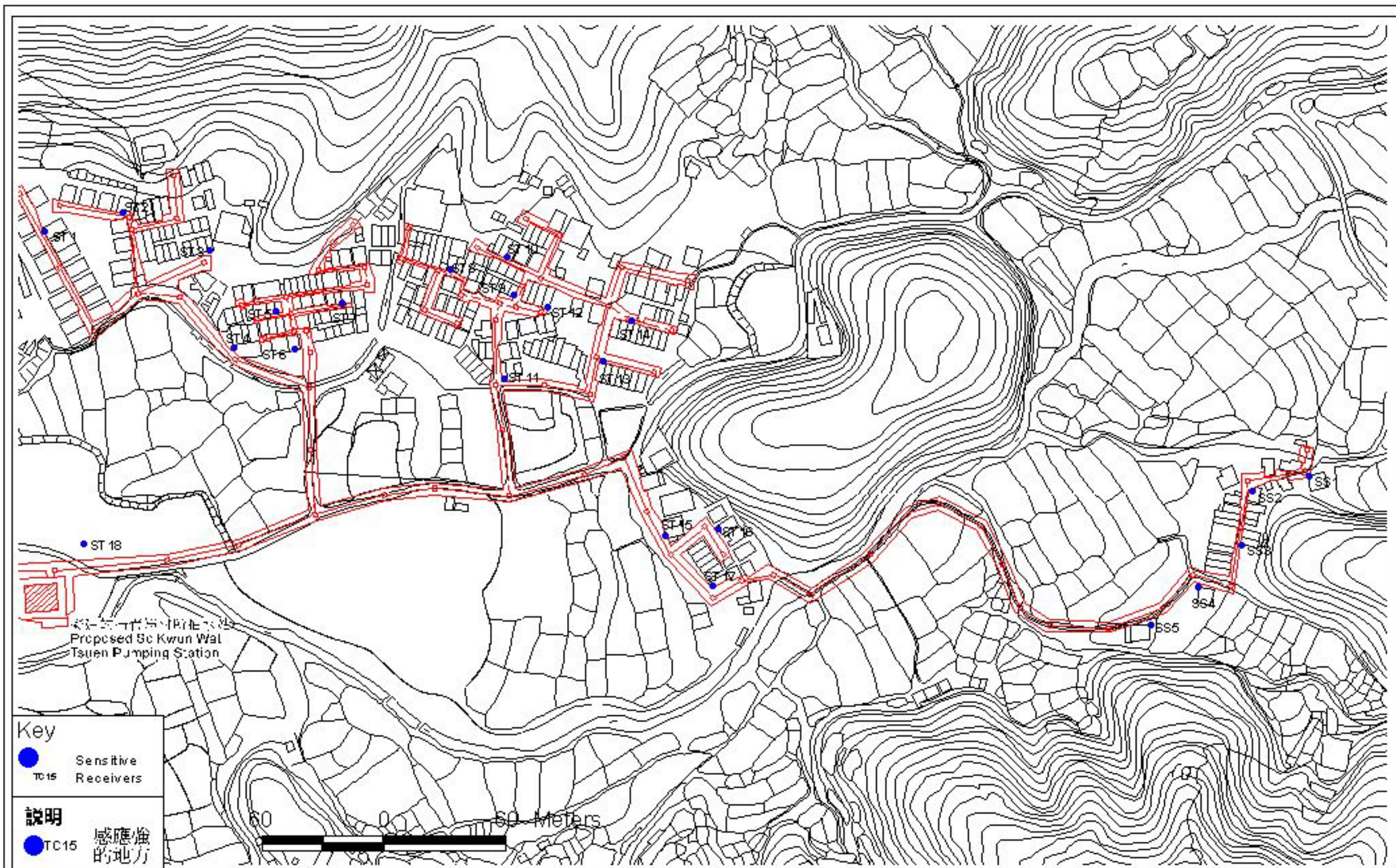
說明

● TC15 感應強的地方

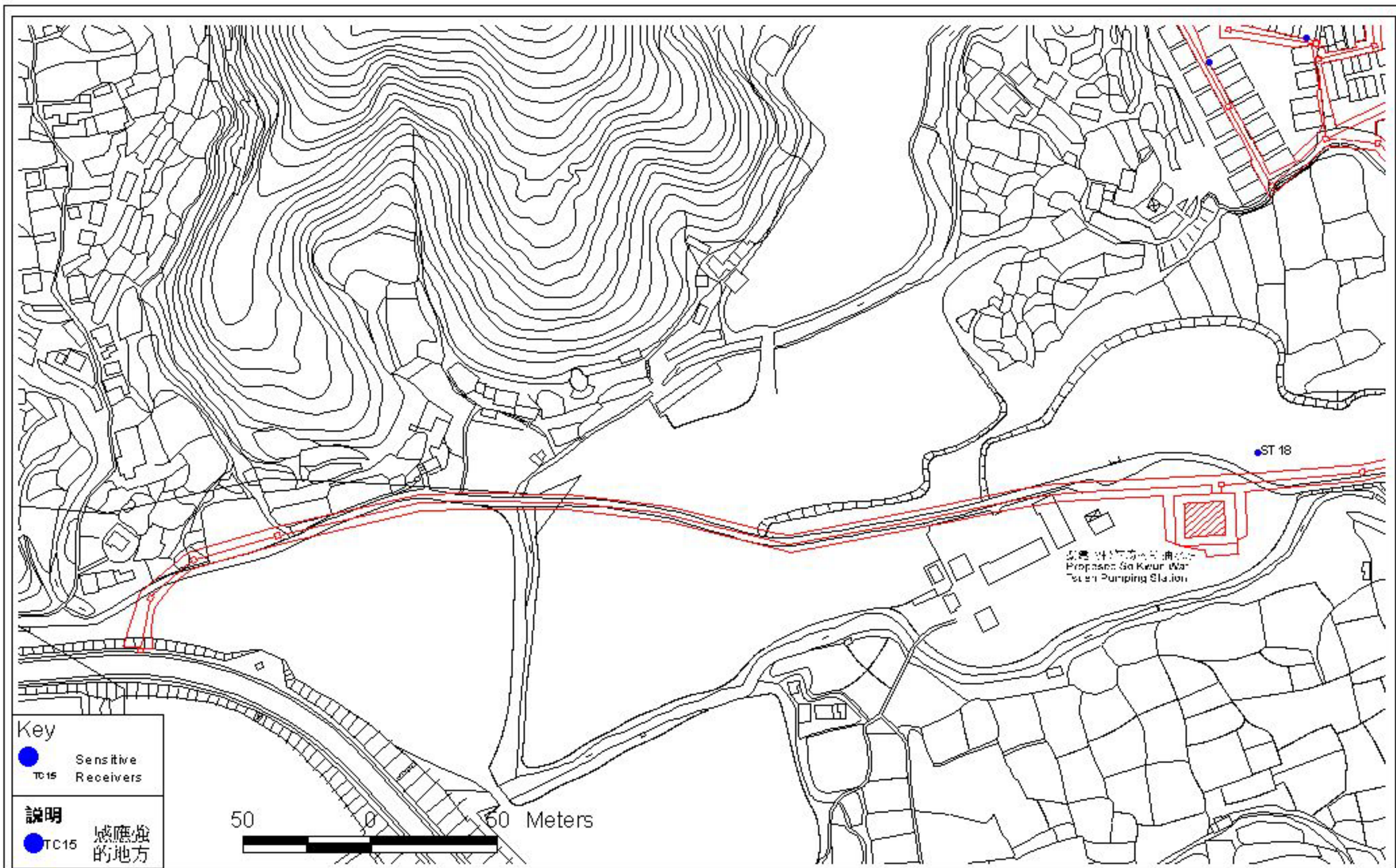
建議的噪音監察地點 (5 of 8)
 Location of Sensitive Receivers (5 of 8)



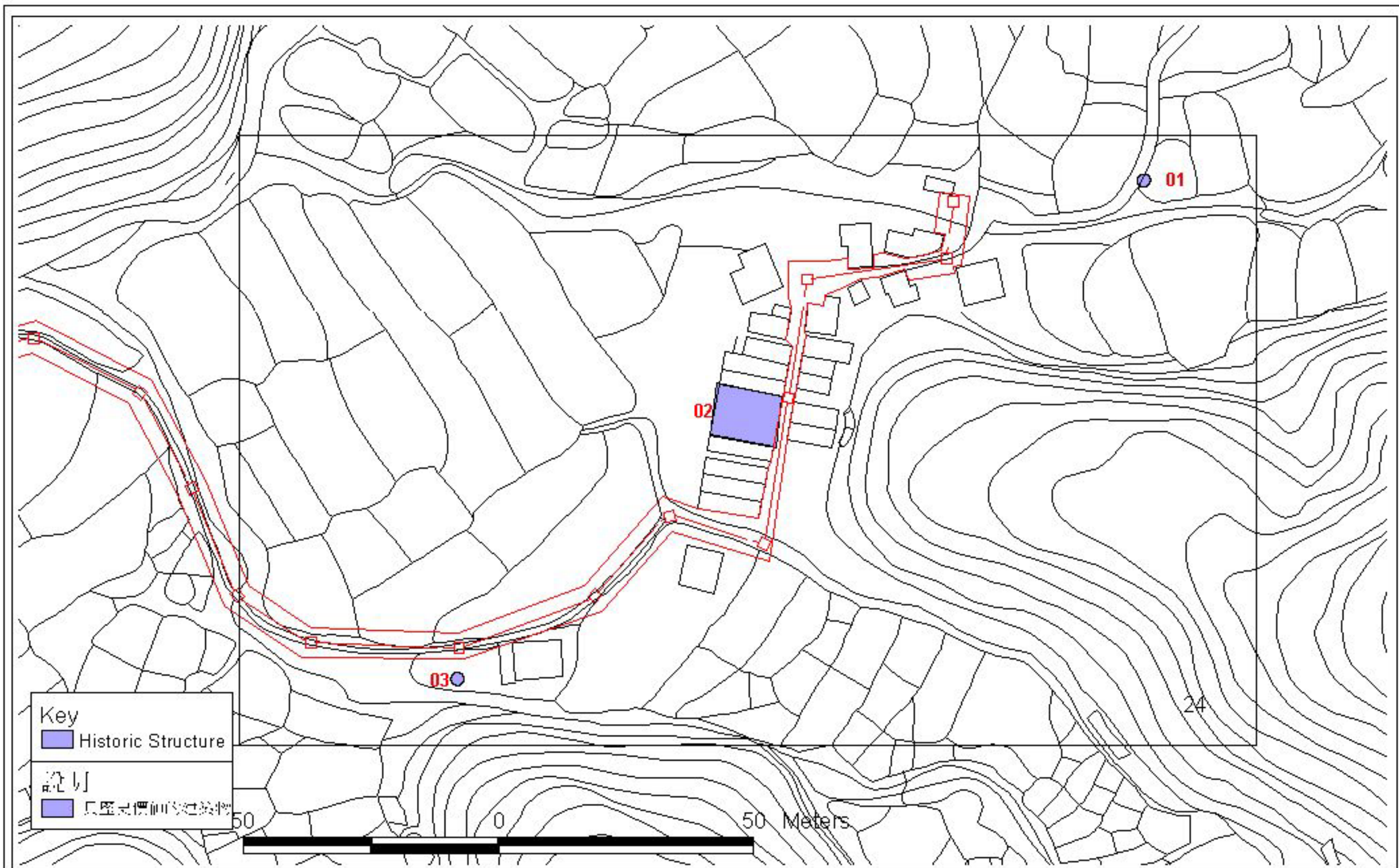
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Location of Sensitive Receivers (6 of 8)



建議的噪音監察地點 (7 of 8)
 Location of Sensitive Receivers (7 of 8)



建議的噪音監察地點 (8 of 8)
 Location of Sensitive Receivers (8 of 8)



Historical Building Locations in Ching Ka Tsuen

在程家村具歷史價值的建築物

Mouchel

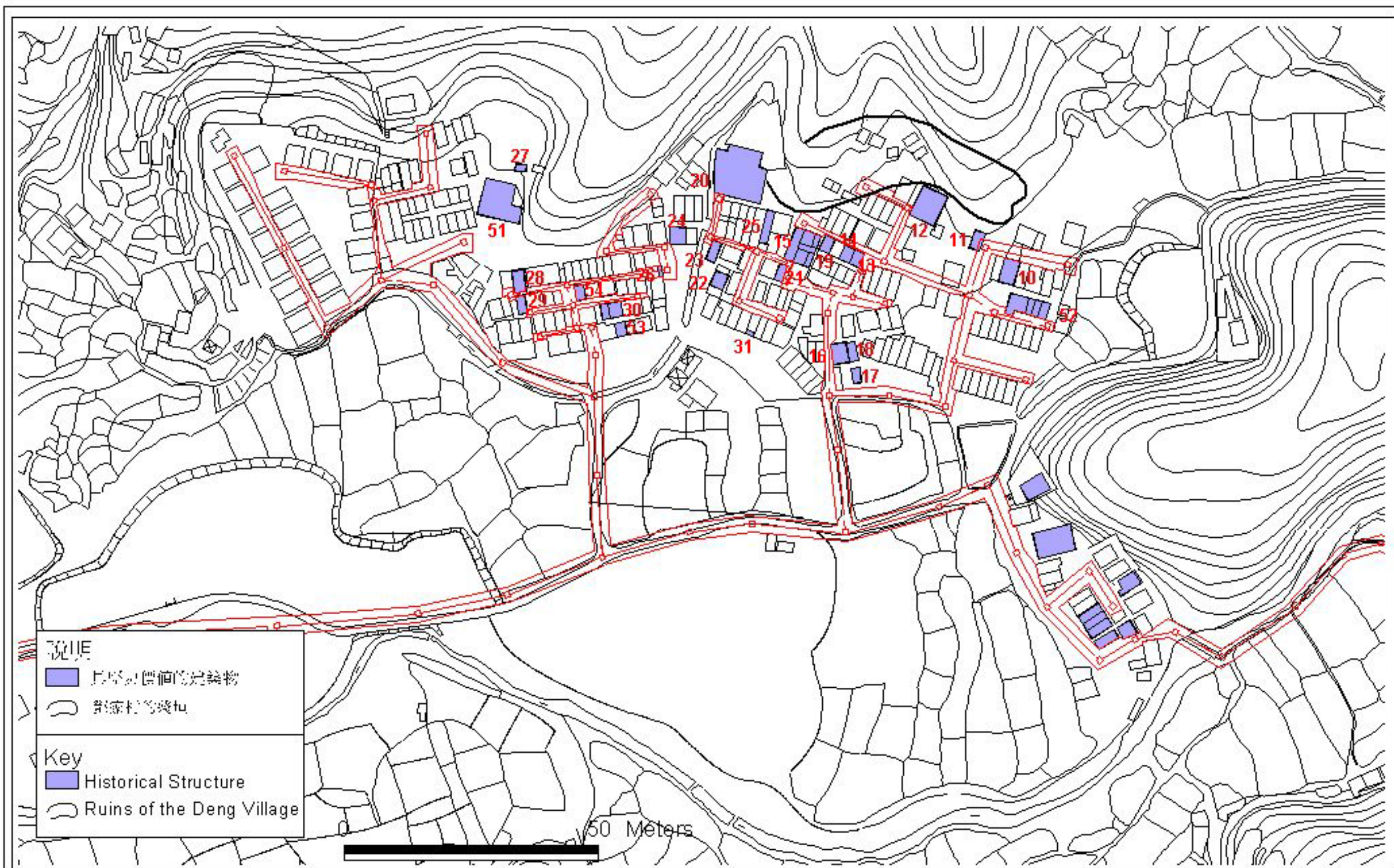
Drawing No.

3a



Historical Building Locations in So Kwun Wat (East Section)

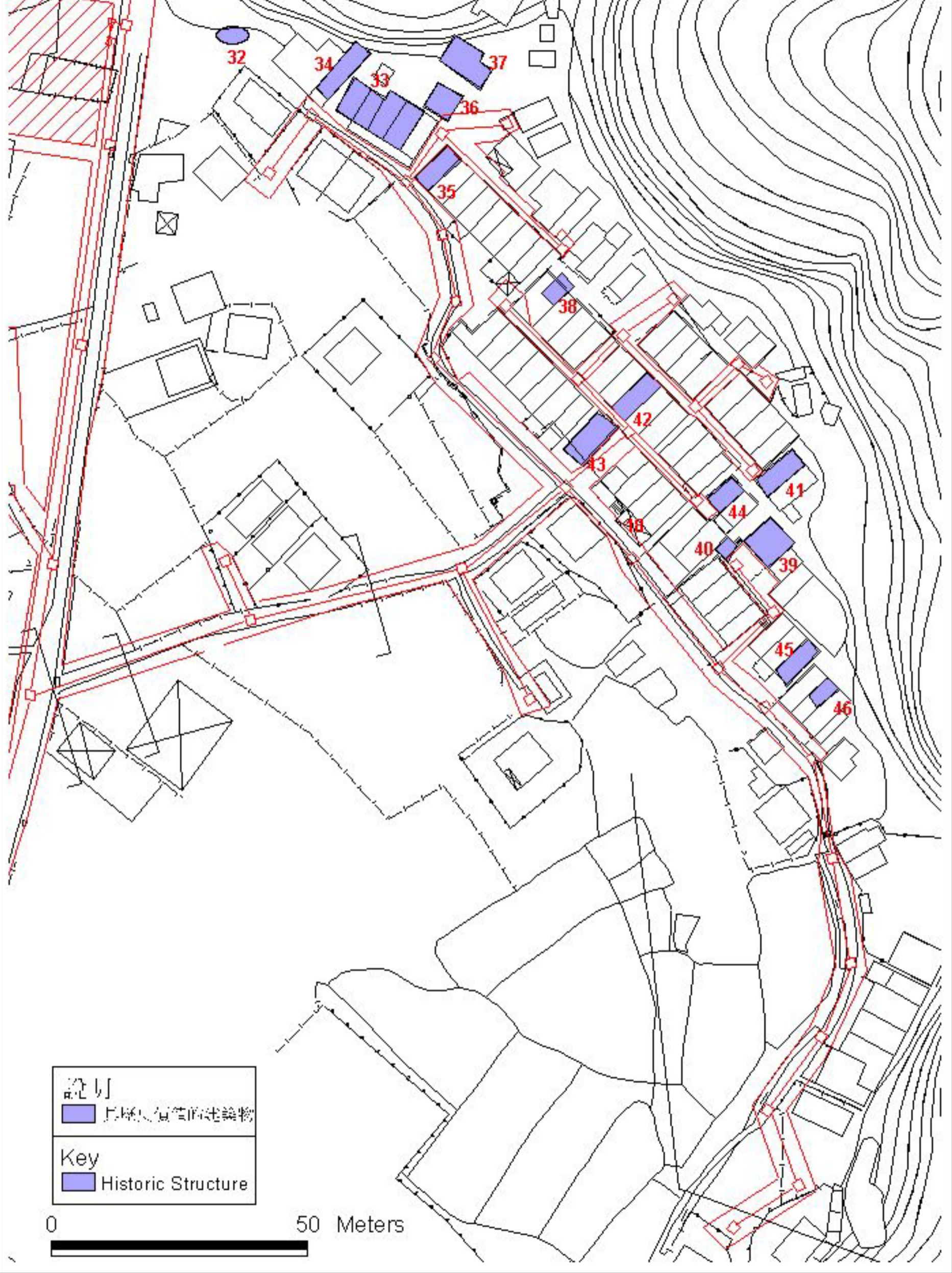
在掃管笏(東部)具歷史價值的建築物



Historical Building Locations in So Kwun Wat (Main Village) including the abandoned village of the Deng

在掃管笏主要村落具歷史價值的建築物包括已棄置的鄧家村

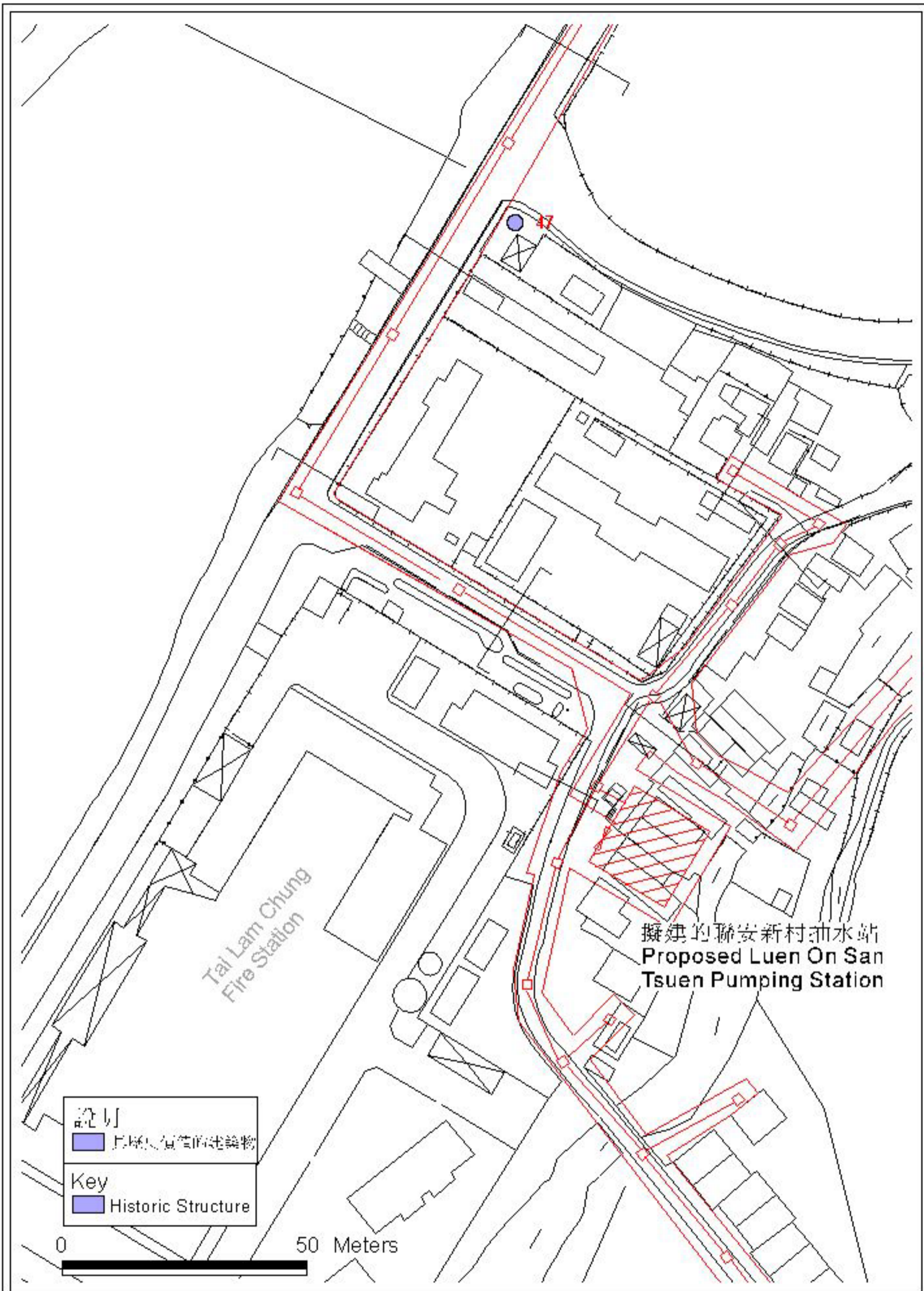
擬建的大概涌村抽水站
Proposed Tai Lam Chung
Tsuen Pumping Station



說明
■ 具歷史價值的建築物
Key
■ Historic Structure

0 50 Meters

Historical Building Locations in Tai Lam Chung Tsuen
在大欖涌村具歷史價值的建築物

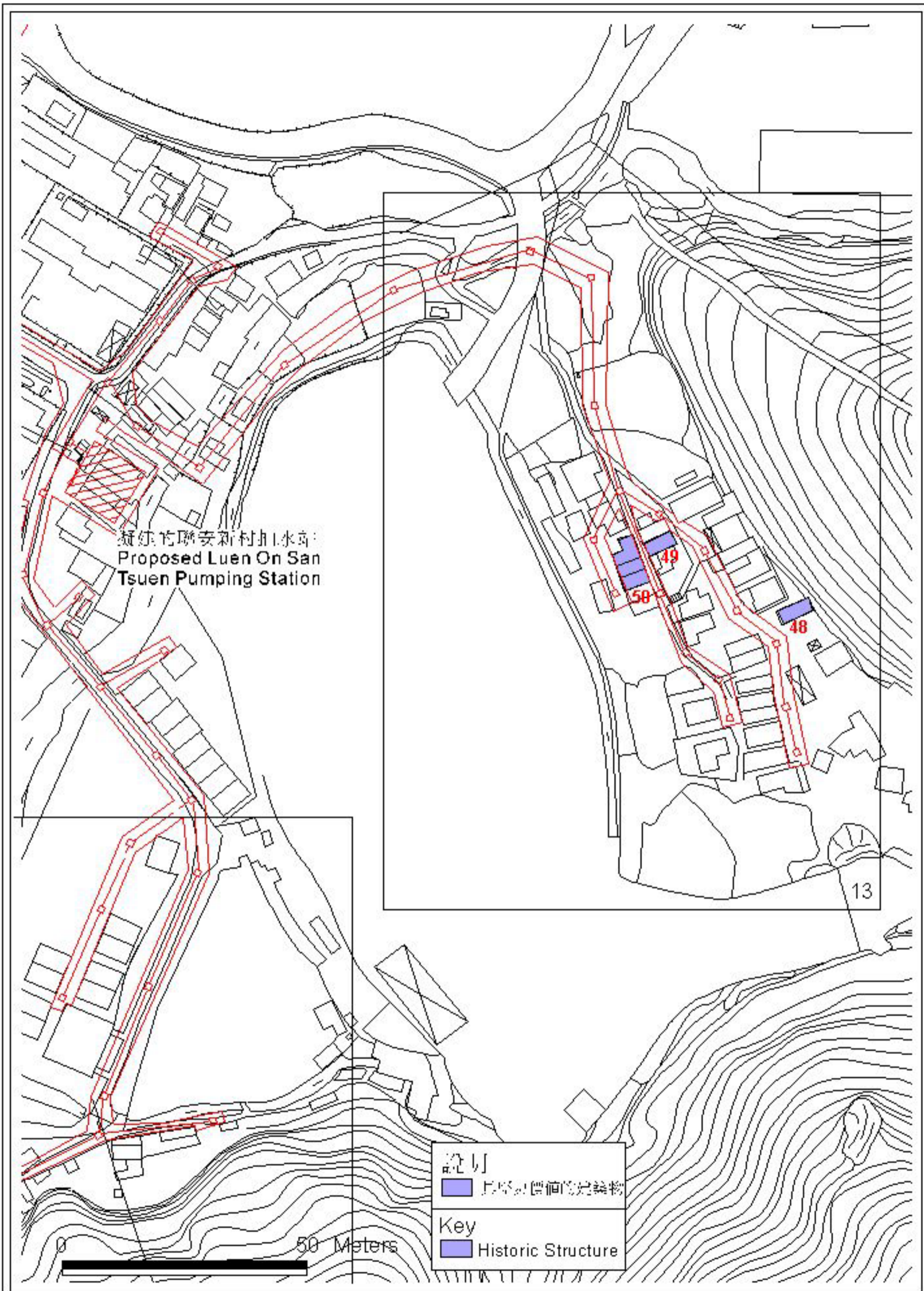


Fung Shui Shrine on Tai Lam Chung Road

在大欖道的功能

Mouchel

Figure No. **3e**



擬建的聯安新村抽水站
Proposed Luen On San Tsuen Pumping Station

說明
 上層圖標的建築物
 Key
 Historic Structure

50 Meters

Historical Building Locations in Wong UK
 在黃區具歷史價值的建築物