Highways Department
The Government of Hong Kong Special Administrative Region

Agreement No. CE 87/95

Tsing Yi North Coastal Road Environmental Impact Assessment and Drainage Impact Assessment

Revised Executive Summary

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Mouchel Asia Environmental

in association with

Aspinwall Clouston
Wilbur Smith Assoicates

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INTRODUCTION

The project involves the construction and operation of a dual 2-lane carriageway linking the Tsing Tsuen Bridge and the Lantau Fixed Crossing. The route passes along the north side of Tsing Yi Island and will be constructed partly on viaduct and partly on cut slope and embankment. The Environmental Impact Assessment addressed the:

- noise;
- air quality;
- water quality;
- waste management;
- ecology;
- traffic;
- and visual

impacts during the construction and operation of the Tsing Yi North Coastal Road. The objective of the EIA was to ensure that the project would be implemented in a way which ensured that impacts were kept within acceptable limits. The Study area is shown in Figure 1a.

Traffic Conditions

Existing traffic conditions at the eastern end of the proposed Tsing Yi North Coastal Road were measured using manual traffic counts at the Tam Kon Shan Interchange and at the intersection of Tsing King Road and Nga Ying Chau Street. The survey covered both the morning and afternoon peak periods. The morning and afternoon peak hours for road traffic at the Tam Kon Shan Interchange were 7:30 to 8:30 a.m. and 5:15 to 6:15 p.m.

For the future traffic conditions, during the operational phase, traffic forecasts for the years 2006, 2011 and 2016 were made using two transport models; Enhanced Comprehensive Transport Study Model and the SATURN traffic assignment model. By comparing the number of vehicles passing through the Tam Kon Shan Interchange for the three years, 2016 was found to be the worst case scenario.

Construction Activities

The main construction activities of Tsing Yi North Coastal Road will require:

- excavation;
- filling;
- haul road traffic movements;
- road pavement fabrication;
- retaining structure construction;
- viaduct foundation, substructure & superstructure;
- no percussive piling is expected.

The construction programme is anticipated to be commenced in September 1998 and extends for total period of approximately three years. The construction activities are expected to be between 8:00 a.m. to 7:00 p.m., and it is not expected that there will be any major working in the evenings, at night, on Sundays or public holidays.

NOISE IMPACTS AND MITIGATION

Impacts During Construction

The noise impact on NSRs within an area of 300m radius from the centre line of the Tsing Yi North Coastal Road has been considered. The NSRs locations for that area are shown in Figure 2.

Only one construction activity will be carried out in a area at any one time. Combination of noise impacts on the nearest NSRs by more than one activity is therefore not anticipated. The predicted noise levels associated with each activity were below the relevant standards after mitigation measures are applied.

Mitigation Measures During Construction

The following forms of mitigation are recommended and should be incorporated into the Contract Specifications.

(i) the construction activities should be carried out in the daytime period (8:00 a.m. -7:00 p.m.) only
(ii) silencers should be installed at the exhaust pipes of the dump trucks, excavators and loaders
(iii) mufflers should be installed at the rock drills (hydraulic) and pneumatic breakers
(iv) acoustic enclosures should be installed for the concrete pumps and generators
(v) construction of temporary noise barriers along the construction site boundary such that the construction equipment will be totally screened
(vi) good site practice to limit noise emissions at source
(vii) avoidance of simultaneous noisy activities
(viii) selection of quiet plant and working methods
(ix) reduction in the numbers of plant operating in critical areas close to NSRs

Using the above mitigation measures, the residual noise levels at the NSRs will be within the HKPSG standards except at the Queen's College Old Boys' Association

Secondary School. However, as air-conditioners have already been installed in this school, construction noise from the project will not cause a noise problem there. Besides, the Contractor will be required under the Contract to make sure that the nosie level limit will not be exceeded during the construction of the project. If necessary, they should suspend their works near the secondary school during the school hours to ensure that the noise requirements are being complied with.

Impacts During Operation

Operation noise is attributable solely to road traffic. The impact of road noise arising from the Tsing Yi North Coastal Road and other roads in the area has been calculated at the facades of the representative Noise Sensitive Receivers. Noise levels for receivers at different heights in the tower blocks were simulated to obtain a profile of noise impacts over the height of the building.

Noise Mitigation Measures During Operation

During the course of the study, we have already examined all possible direct mitigation measures for the new carriageway and all feasible and effective direct measures have been proposed under the Final Report. These conclude:

- Noise Reducing Highway Surface (NRHS)

  The new main carriageway, including the existing section of Tsing Tsuen Bridge which has been constructed but not yet opened to traffic will be covered with NRHS to minimize the noise impacts. The detailed extent of the proposed NRHS is shown on Figure 3.

- Semi-enclosure on Main Carriageway

  A semi-enclosure open on the side away from the Noise Sensitive Receivers is recommended to be constructed on the main carriageway. The length of the semi-enclosure will be around 450 metres. The location of the semi-enclosure is shown on Figure 4. Full enclosure is not recommended as it will not offer any significant noise reducing benefits over the semi-enclosure. Besides, the construction of a semi-enclosure will be less expensive than that of a full one and air pollution within the semi-enclosure will not be an issue since there will be natural ventilation through the open side.

- Acoustic Barrier on Slip Road

  An acoustic barrier is recommended to be constructed on the curbside of the northern slip road away from the carriageway. The location of the acoustic barrier is shown on Figure 4.

Other forms of direct mitigation measures in addition to the above ones have also been considered. However, they have been ruled out as being either not effective or not engineering feasible. Please refer to Section 4.6 of the Final Report for further details. To summarize, the above proposed direct mitigation measures are already the most practicable and effective solution that we can achieve as far as the new carriageway is concerned.

Residual Impacts

We notice that the residual noise levels at some NSRs will still exceed the HKPSG standard of 70 dBA after implementing the proposed direct mitigation measures. The residual noise levels at different NSRs during operation phase with the proposed mitigation measures is shown on Table 1.

An analysis according to the three Eligibility Criteria for Indirect Technical Remedies has been carried out for these NSRs. After the analysis, it is noticed that none of these NSRs are eligible for indirect technical remedies (i.e. window insulation and air-conditioning). In this regard, it is considered that the residual noise at these NSRs are mainly attributed from the traffic on the existing road network and the traffic noise from the new carriageway has already been kept to a minimum. The analysis of the three eligibility criteria for indirect remedies is shown on Table 2.

AIR POLLUTION IMPACTS AND MITIGATION

Impacts During Construction

The likely air quality impact arising from the construction of Tsing Yi North Coastal Road is related to dust nuisance, and gaseous emissions from construction plant and vehicles. Locations of the Air Sensitive Receivers are shown in Figure 5.

In the assessment, a conservative approach has been adopted assuming the worst case scenario that all activities would be carried out in parallel with a 12 hour working day. In reality, the activities are of limited duration and could vary in time.

Mitigation Measures During Construction

The construction work is likely to cause unacceptable dust impacts on Cheung On Estate. The following dust

control measures as part of good construction practice should be incorporated in the Contract Specification and implemented to minimise dust nuisance to within acceptable levels arising from the works:

- An twice daily watering with complete coverage, is estimated to reduce erosion on unpaved roads by 50%;
- watering at every 1½ hours during construction;
- where breaking of oversize rock/concrete is required, watering should be control dust. Water sprays should be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created;
- dropping heights for excavated materials should be controlled to a practical height to minimize the dust arising from unloading;
- during transportation by truck, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;
- all stockpiles of aggregate or spoil should be enclosed or covered and water applied in dry or windy condition;
- effective water sprays should be used on the site at potential dust emission sources.

After mitigation, the dust impacts are all well within the standards of the Air Quality Objectives.

Impacts During Operation

Impacts on air quality during operation of the Tsing Yi North Coastal Road are due to the vehicular emissions along the open sections and the emissions from the side openings of the semi-enclosure. Locations of the Air Sensitive Receivers are shown in Figure 5.

The air impacts are all within the standards of the Air Quality Objectives.

Mitigation Measures During Operation

Mitigation measures during operation are not required. The semi-enclosure is open throughout the entire length and the acoustic barrier is on the slip road. After our investigation, the air quality within the semi-enclosure will be acceptable. The typical cross-section of the semi-enclosure is shown in Figure 6.

Residual Impacts

The results indicate that the air pollutants will be reduced to acceptable levels over the entire study area.

WATER QUALITY IMPACTS AND MITIGATION

Impacts During Construction

The impacts during the construction phase will occur primarily in the surface water streams since there are no activities scheduled to be carried out within the marine environment itself.

The primary effects on the surface water quality will result from run-off of the site works and from disturbance of banks and stream bed material during works for realignment, bank reinforcement and widening.

Secondary effects could result from the discharge of wastewater from temporary site accommodation and from run off of the site works carrying solids contaminated from fuel and oil spills from plant used on site.

Mitigation Measures During Construction

- Areas of exposed soil should be minimised to restrict the extent of erosion and quantities of solids running off into water courses.
- Areas in which works have been completed should be restored as soon as is practicable.
- The practice of hydroseeding should be encouraged to stabilise recently exposed surfaces.
- Spoil heaps should be covered during the wet season to minimise losses, covering will also reduce the dust emissions during the dry season minimising impact on air quality.
- Stream works carried out in the streams themselves should be carried out as far as is possible during the dry season.
- Water pumped out from working areas should not be discharged directly to surface water courses but passed through settling tanks.
- Vehicle washing minimum water should be used and any drainage carried away to settlement tanks prior to discharge or reuse.
- Fuel tanks on the site should be housed within bunded containment areas which should be regularly drained of rain water.
- Vehicle maintenance should be carried out on paved areas, spillages controlled by absorbents and waste oils collected in designated tanks prior to disposal off site.

Impacts During Operation

During the operation of the Tsing Yi North Coastal Road impacts may arise from two sources. Storm water carrying dissolved and particulate material from

degradation of the road surface and tyres and from normal operational fuel and oil losses from vehicles accidents involving one or more vehicles where fuel from ruptured fuel tanks will run off or be washed off into the surface water drainage system. Similarly spilled loads, either liquid or fine solids, may be washed into the surface drains by the emergency services.

Mitigation Measures During Operation

The use of solids traps, will control both the suspended solids in the run off and the contaminants adsorbed onto them. It is critical that these traps are maintained regularly and frequently to prevent the accumulation of solids with the resultant reduction in retention time and thus efficiency.

In the event of an accident resulting in the spillage of fuel or vehicle load, the primary objective should be to contain the spillage for removal from the road and its subsequent safe disposal. Interceptor tanks with both under and overspill weirs to retain floating and settleable material will control material in the surface water drainage system. These should be readily accessible for emptying in the event of an accident.

Residual Impacts

If the mitigation measures indicated above are implemented, it is not anticipated that there will be any, residual impacts other than the presence of settlement/interceptor tanks at suitable points in the system and the requirement for vehicle access for their maintenance.

WASTE MANAGEMENT IMPACTS AND MITIGATION

Construction Waste Management

Activities during the construction phase will result in the generation of a variety of wastes.

- excavated materials suitable for reclamation and fill;
- general construction waste;
- demolition waste;
- chemical waste;
- general refuse; and
- sewage.

It is estimated that there will be a surplus of 0.6 million cu.m. of excavated material, most of which will be hard material from the rock cuttings.

Excavated material will be re-used on this project wherever possible.

General Construction waste should be sorted on-site to remove material which is suitable for re-cycling or use in public dumps. The remainder will be disposed of at the nearest landfill site. Suitable provisions should be included in the construction contracts to ensure that contractors sort and re-cycle waste.

Demolition waste should be treated in the same way as general construction waste.

The Contractor shall register with EPD as a chemical waste producer under the Waste Disposal (Chemical Waste) (General) Regulation. A licensed contractor should be employed to collect chemical waste for delivery to a licensed treatment facility. Suitable chemical waste storage areas should be formed on the site for temporary storage pending collection.

Temporary storage areas for general refuse should be enclosed to avoid environmental impacts. General refuse should be stored on site for the minimum time practical and should be disposed of to the nearest landfill. Sewage arisings from the Construction Workforce should be discharged to a foul sewer where possible. The discharge standards of effluent should comply with the requirements of the Technical Memorandum "Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters".

Sewage arising from chemical toilets should be transported by a licensed contractor to government Sewerage Treatment Works for disposal.

There will be no spoil disposal or waste management issues during the operation of the project.

ECOLOGY IMPACTS AND MITIGATION

Construction Impacts

Potential ecological impacts could arise from the following:

- loss of habitats due to the construction of the road and link and slip roads;
- loss of habitats due to the location of storage and works areas;
- the disposal of the surplus fill;
- the construction temporary access and haul roads during construction;
- any potential construction wastes and potential run off into natural stream courses;
- requirements for water during construction and any potential associated impacts on local streams;
- the possible damage caused to the vegetation as a

result of increased incidents of fire;
- the potential damage to surrounding areas from litter and construction materials;
- the potential impact to wildlife caused by increased disturbance.

Mitigation Measures

Mitigating for the loss of ecological resources is required to minimise the loss of species, habitat and ecological function. Mitigation measures should be incorporated into the detailed design of the road, where land resumption, topography and development pressures permit. Specific mitigation measures for individual sites under this project have been given in Section 8.34 of the Final Report.

These mitigation measures focus on impact avoidance, impact minimisation and compensation for impacts.

Other mitigation measures which are proposed to reduce short-term impacts include:

- avoiding working during the peak rainy period;
- phasing the works so as to ensure that earthworks, carried out in the least sensitive areas.

Operation Impacts

Potential Impacts of Operation

The following operational impacts could arise:

- habitat fragmentation
- contaminated surface water runoff
- vehicle generated airborne pollution

There are very few habitats of ecological value to be affected by operation. The main operational impact is the contaminated runoff potentially affecting the key streams of local ecological value.

Mitigation is centred on the design of the road drainage system to intercept contamination and spillage by using petrol interceptors, and silt traps.

Traffic Impact Assessment

The Tam Kon Shan roundabout currently experiences congestion during the morning peak hour but operates satisfactorily in the evening peak hour.

The impact of the construction traffic on the surrounding road system will be negligible due to the relatively low construction traffic volumes involved.

In the operational phase, the year 2016 represents the worst case scenario. Both the Tsing Yi North Coastal Road and Tam Kon Shan roundabout, however, will operate within capacity in this forecast year during both the morning and evening peak periods.

Visual Impact Assessment

The residents of Cheung On Estate (west) will be most effected by the TYNCR due to the proximity to the development. The lower blocks will have their views obscured. The visual impact on these highly sensitive viewpoints is considered to be substantial and is likely to be unacceptable. This issue will require further consideration although there are no apparent opportunities to modify the alignment to minimise impacts.

After the proposed TYNCR has been completed, the road will permanently alter landscape character of the hillsides zoned Green Belt and create a man-made intrusion into a previously undisturbed hillside; one of the few in the area. The mitigation measures which are detailed under Section 11.5 of the Final Report should be incorporated into the scheme and would minimise any potential long term, direct physical effects. The overall landscape impact is therefore expected to be moderate. Residents of Yau Kom Tau and Cheung Shue Tau will be significantly affected. The road will be permanent and significant visual intrusion. This issue will be required further consideration although there are no apparent opportunities to modify the alignment to mininise impacts.

Sensitive viewpoints on the north side of the Rambler Channel will be affected to a lesser extent. The proposed development would appear as a noticeable linear man-made feature contrasting strongly with a prominent green backdrop. While it would not be visually dominant owing to its distant location and the visual impact is therefore considered to be moderate.

Drainage Impact Assessment

The existing engineered drainage systems are provided along the Tam Kon Shan Road and Cheung On Estate to collect the runoff from the rural hinterland and the urban area.

Potential Drainage Impacts & Mitigation Measures

- The existing drainage systems in Tam Kon Shan Road have been assessed and reviewed for 1 in 200 years stormwater events.

- Sections of the existing pipes are proposed to be upgraded to mitigate the potential drainage impact and improve the existing unsatisfactory drainage system condition along Tam Kon Shan Road.

Environmental Monitoring and Audit (EM&A)

The EIA has identified and quantified the potential environmental effects of the Project and proposed mitigation measures. To ensure the effective implementation of the measures and monitor un-anticipated effects, an EM&A programme is required during construction phase which will undertake the following specific activities:

- Monitoring of the environmental performance of the construction works and the effectiveness of mitigation measures;
- Verifying the environmental impacts predicted in the EIA;
- Determining compliance with regulatory requirements and government policies; and
- Initiating remedial action if un-anticipated impacts arise.

Monitoring should be undertaken during the construction phase of the Project and should consist of:

- Baseline monitoring of noise and air quality, to determine the conditions immediately prior to the commencement of the construction works;
- Impact and compliance monitoring to determine the effect of the activities and the effectiveness of the mitigation measures and compliance with regulatory requirements and standards.

The results of environmental monitoring programme should be subject to independent audit and reported to EPD.

EM&A programme is not required during operation phase of the Tsing Yi North Coastal Road. Monitoring and audit works are also not required in the Drainage Impact Assessment (DIA) Study.

CONCLUSIONS AND RECOMMENDATIONS

Noise

The results show that the residual noise levels at some of the Noise Sensitive Receivers still exceed the standards of Hong Kong Planning Standards and Guidelines after implementing the proposed mitigation measures. However, according to the results of the three Eligibility Criteria for Indirect Technical Remedies, all the NSRs are not eligible for Indirect Mitigation Measures.

Air Quality

The air impacts at the Air Sensitive Receivers during operation phase are within the standards of the Air Quality Objectives. The air quality inside the semi-enclosure is acceptable.

Water Quality

Water quality impacts are expected, at worst, to be limited to short term increases in suspended solids in the surface waters during the construction phase. Mitigation measures proposed for both construction and operational phases should enable impacts to be kept to within acceptable limits.

Ecology

The ecological impacts will arise during the construction phase of the project. However, impacts in these areas will be minimal.

Visual Impact

It is strongly recommended that the TYNCR should demarcate the extent of any further modification to the Tsing Yi coastal hills, and the remainder of the natural backdrop be maintained in perpetuity. The visual impact will obviously arise during the construction phase of the project. Impact in these areas need to be further considered and reduced to minimal.

Drainage Impact

The proposed route alignment will not cause drainage impacts that cannot be mitigated and drainage mitigation measures will become an integral part of the highway drainage design. Off-site drainage improvements can be incorporated in strategic drainage improvement works recommended by the Drainage Master Plan.

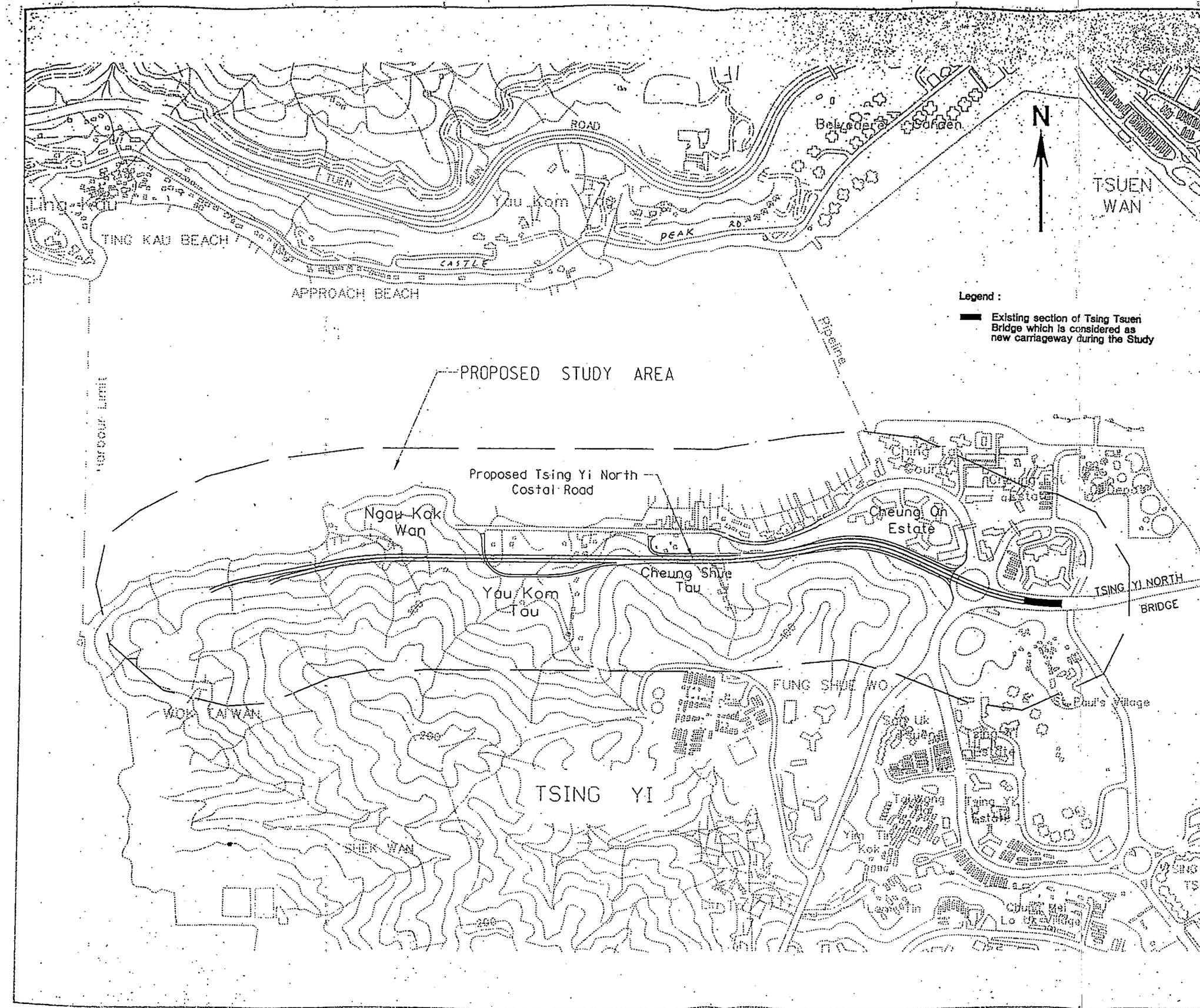
Table 1 The Maximum Noise Levels, L_{10}(1 hour), dBA, at the Noise Sensitive Receivers During Operation Phase With Noise Mitigation Measures

Sensitive Receiver	Predicted Maximum L_{10} Noise Level (1 hour) (with Noise Mitigation)
R1	77
R2	74
R3	78
R4	80
R5	82
R6	78
R7	78
R8	76
R9	73
R10	69
R10a	73
R11	66
R12	68
R13	67
R14	67
R15	64
R16	61
R17	58
R18	59
R19	70
R20	69
R21	68
R22	54
R23	67
R24	66
R25	64
R26	68
R27	67
R28	80
R29	78
R30	78
R31	74
R32	75
R32a	74
Proposed Sec Schools	62
* Proposed Hospital	72
MTR A	78
MTR B	75

Note: '*' the proposed hospital will not be directly facing the Tsing Yi North Coastal Road

Table 2 The Three Eligibility Criteria Test for the Maximum Noise Levels exceeding 70 dBA L_{10}(1 hour), dBA, at the Noise Sensitive Receivers during Operation Phase with Noise Mitigation Measures

Sensitive Receivers	Year 2016 old roads	Predicted Maximum L_{10} Noise Levels (1 hour)	Year 1998 prevailing traffic noise level	Condition 1	Condition 2	Condition3
R1	76.7	77	76.8	Yes	No	No
R2	74 (74.01)	74 (74.137)	73.5	Yes	No	No
R3	78.2 (78.188)	78 (78.212)	79.0	Yes	No	No
R4	79.6	80	80.4	Yes	No	No
R5	81.8	82	80.5	Yes	Yes	No
R6	77.5	78	78.1	Yes	No	No
R7	78.0 (77.956)	78 (77.973)	79.2	Yes	No	No
R8	75.8	76	77.0	Yes	No	No
R9	72.1	73	73.5	Yes	No	No
R10a	72.5	73	72.3	Yes	No	No
R28	80.2 (80.218)	80 (80.229)	79.3	Yes	No	No
R29	77.6	78	77.3	Yes	No	No
R30	77.2	78	76.9	Yes	Yes	No
R31	73.8	74	74.0	Yes	No	No
R32	74.6	75	73.6	Yes	Yes	No
R32a	73.6	74	72.6	Yes	Yes	No



NOTES

no.	date	description
REVISION		
drawn	W.S.NG	7.10.95
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file no.	HNT 54/125(36)	
project no.		

contract
TSING YI NORTH COASTAL ROAD

drawing title
INVESTIGATION ASSIGNMENT ENVIRONMENTAL IMPACT ASSESSMENT - STUDY AREA

Figure No. 1a

scale

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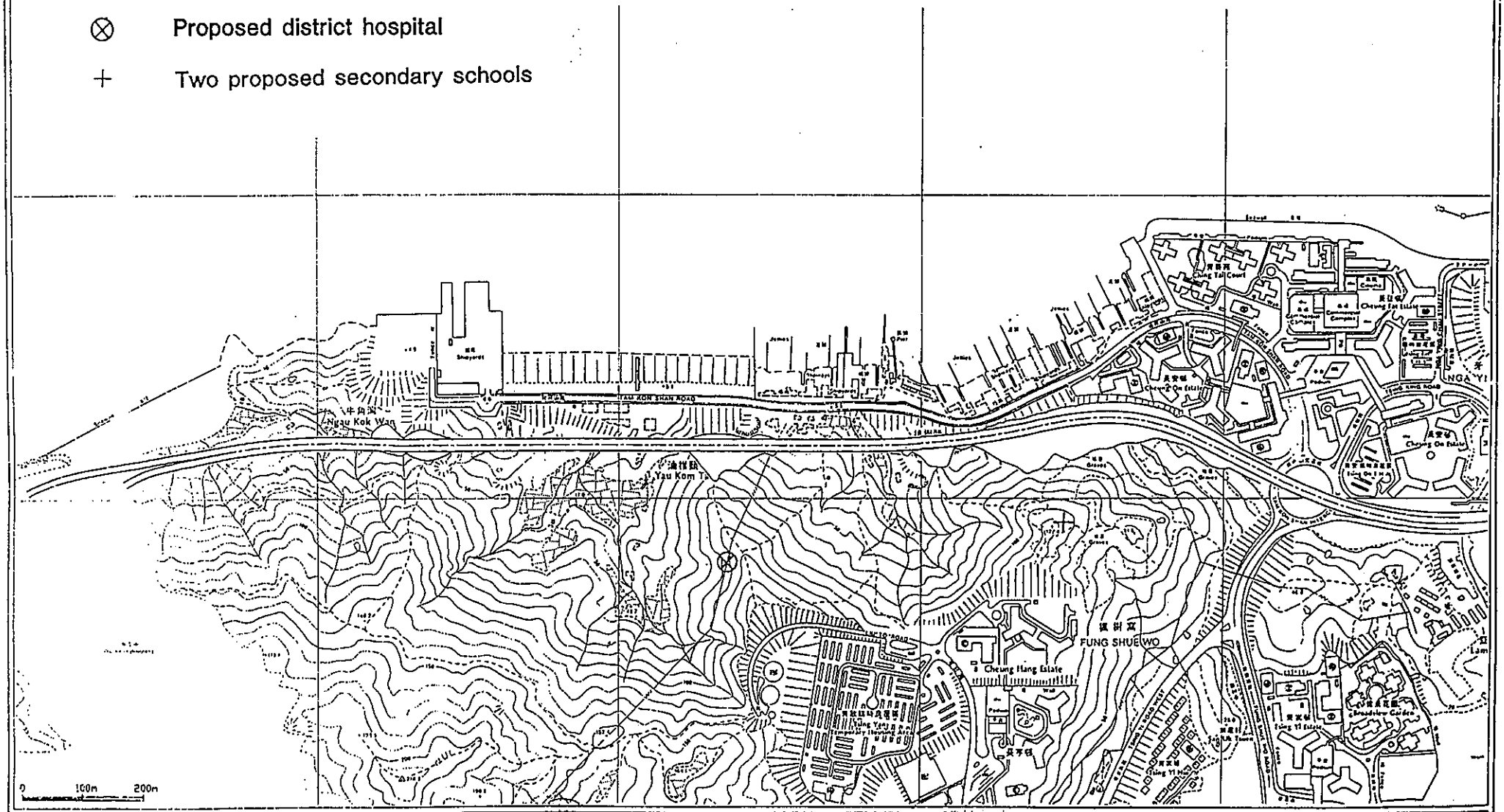

The Locations of the Proposed District Hospital and Proposed Secondary Schools in the Study Area

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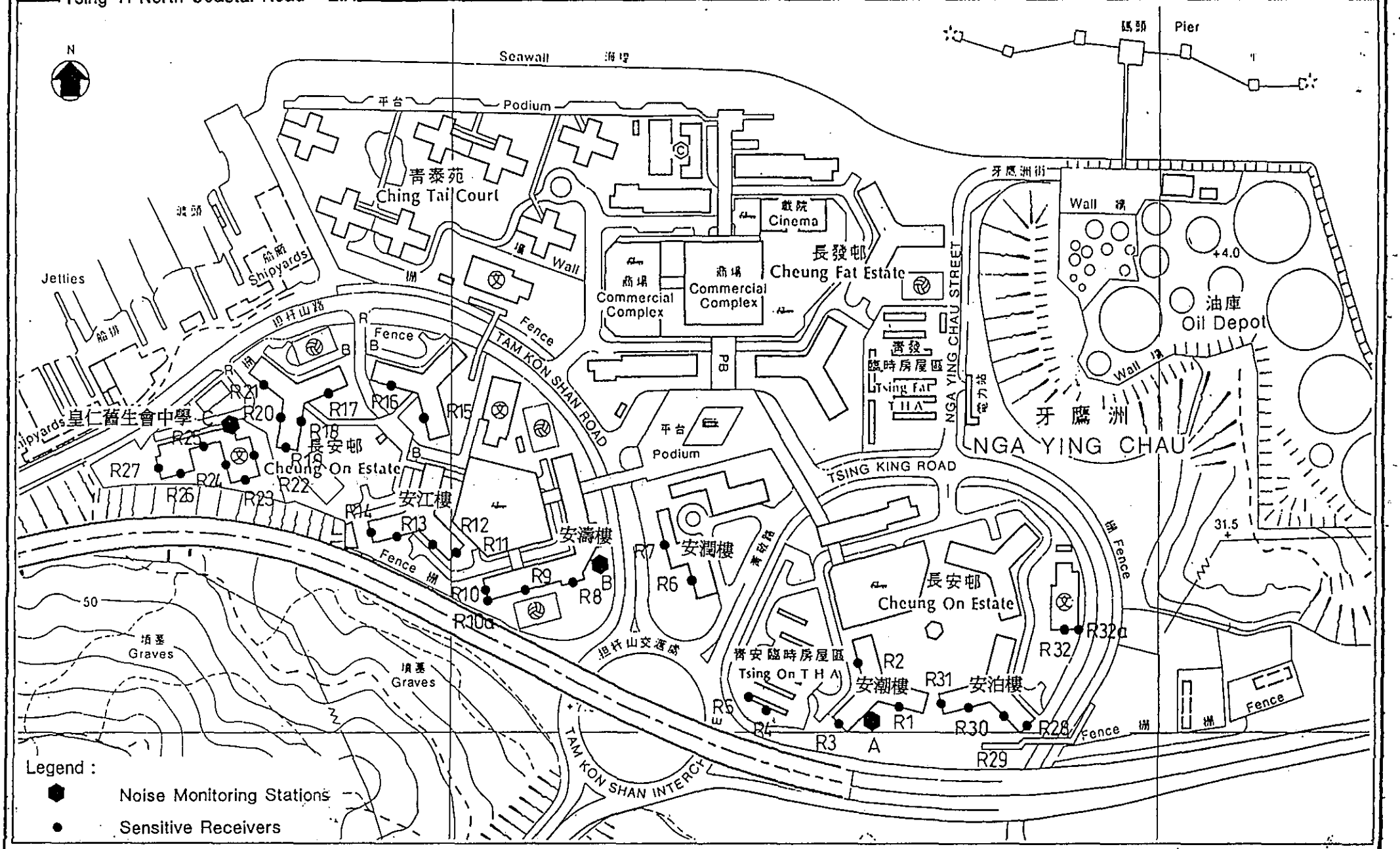
Drawing No. 1b



Legend :

- Noise Monitoring Stations
- Sensitive Receivers

Locations of Noise Monitoring Stations and Sensitive Receivers

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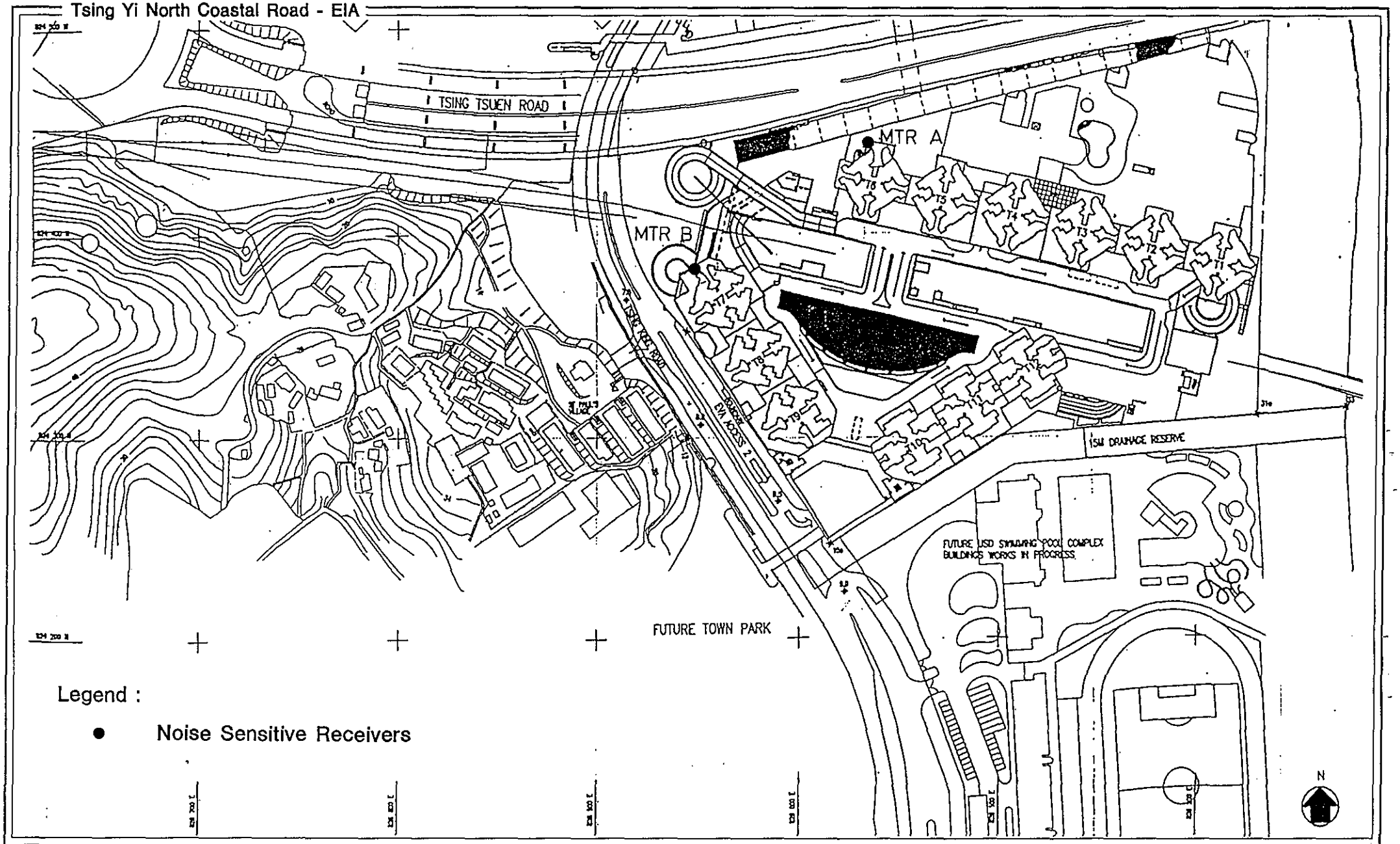
Figure No. 2a



Noise Sensitive Receivers Above the Proposed MTRC Station

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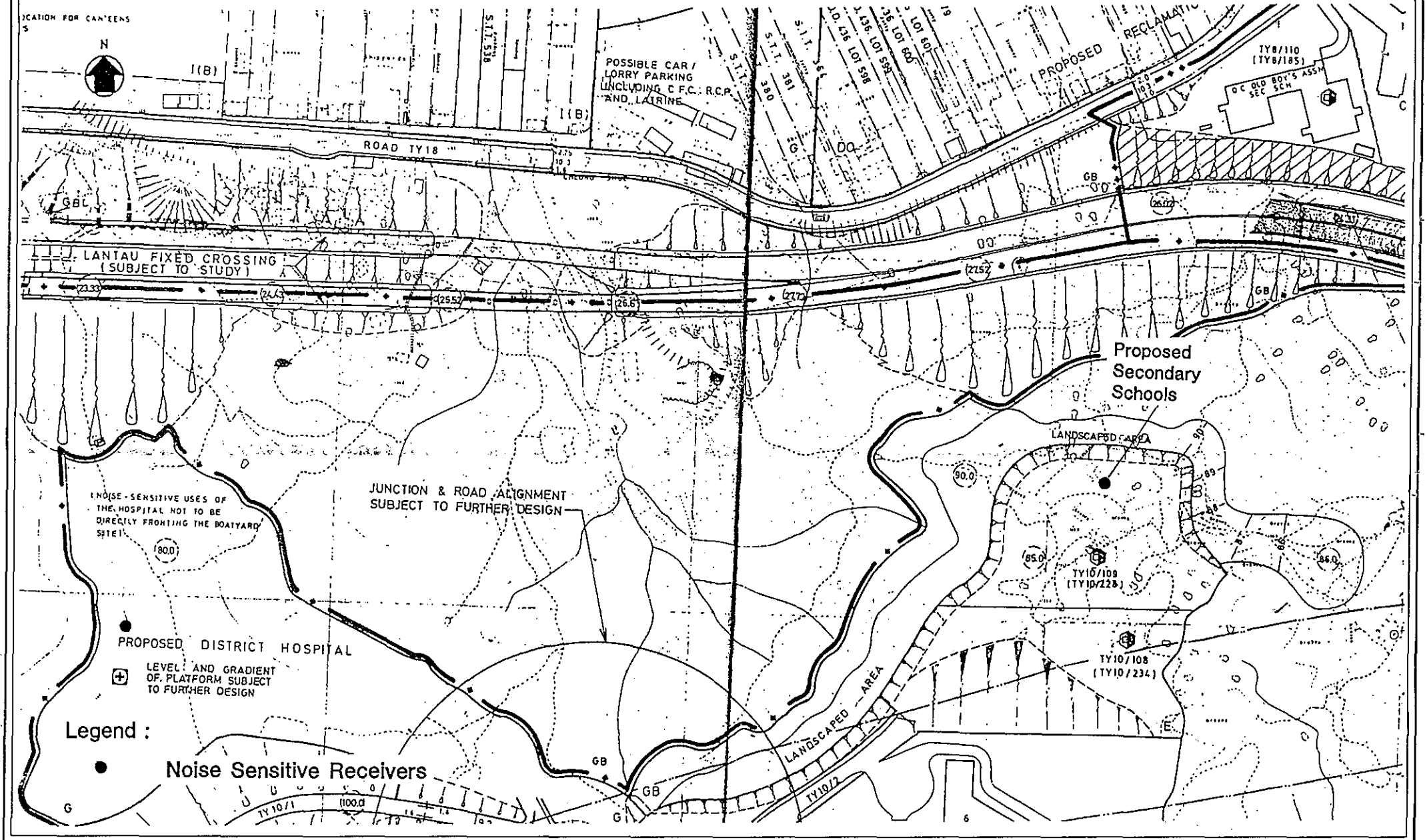
Drawing No. 2b



The Locations of the Proposed Secondary Schools and Proposed District Hospital

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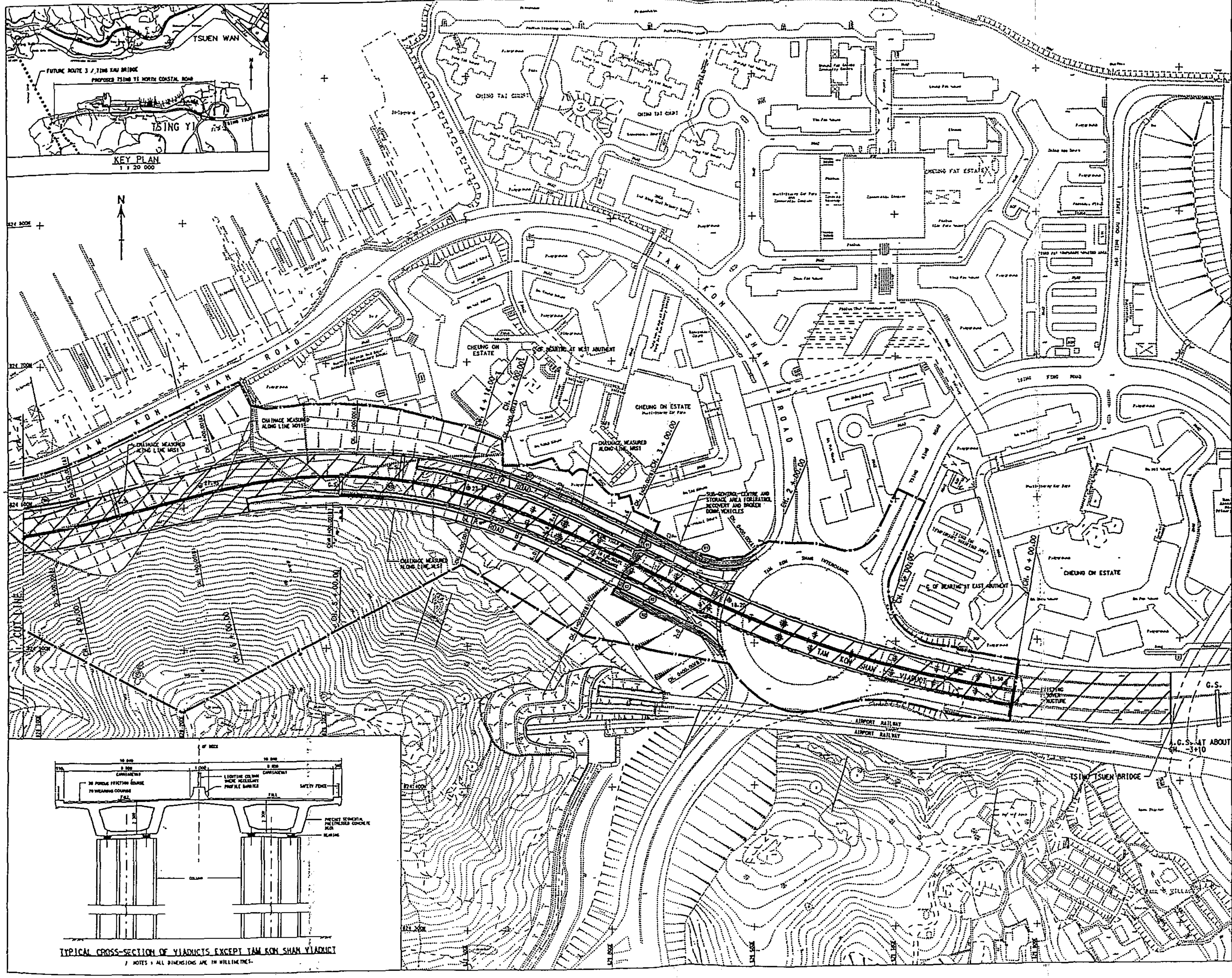
Drawing No. 2c



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LEGEND :

- WORKS SITE LIMIT
- PROPOSED COLUMN
- 15.50 PROPOSED LEVEL
- PROPOSED FOOTPATH
- PROPOSED SUBWAY WITH No. INDICATED
- PROPOSED 3m HIGH NOISE BARRIER
- PROPOSED NOISE SEMI-ENCLOSURE
- G.S. PROPOSED SIGN GANTRY
- PROPOSED DIRECTIONAL SIGN
- NRHS WILL BE ADDED

ABBREVIATION :-

G.S. - GANTRY SIGN
A.G.S. - ADVANCED GANTRY SIGN

no.	date	description	initial

REVISION

	name	date
surveyed		
designed	W. K. LUI	5/97
drawn	L. N. LAI	5/97
traced		
checked	K. C. POON	5/97
approved	F. L. YIU SENIOR ENGINEER / C.V.	

contract no.

file no. HNT 54/125

project no. 6580TH

contract

TSING YI
NORTH COASTAL ROAD

drawing title

SCHEME LAYOUT

(SHEET 1 OF 2)

Figure No. 3a

scale N.T.S.

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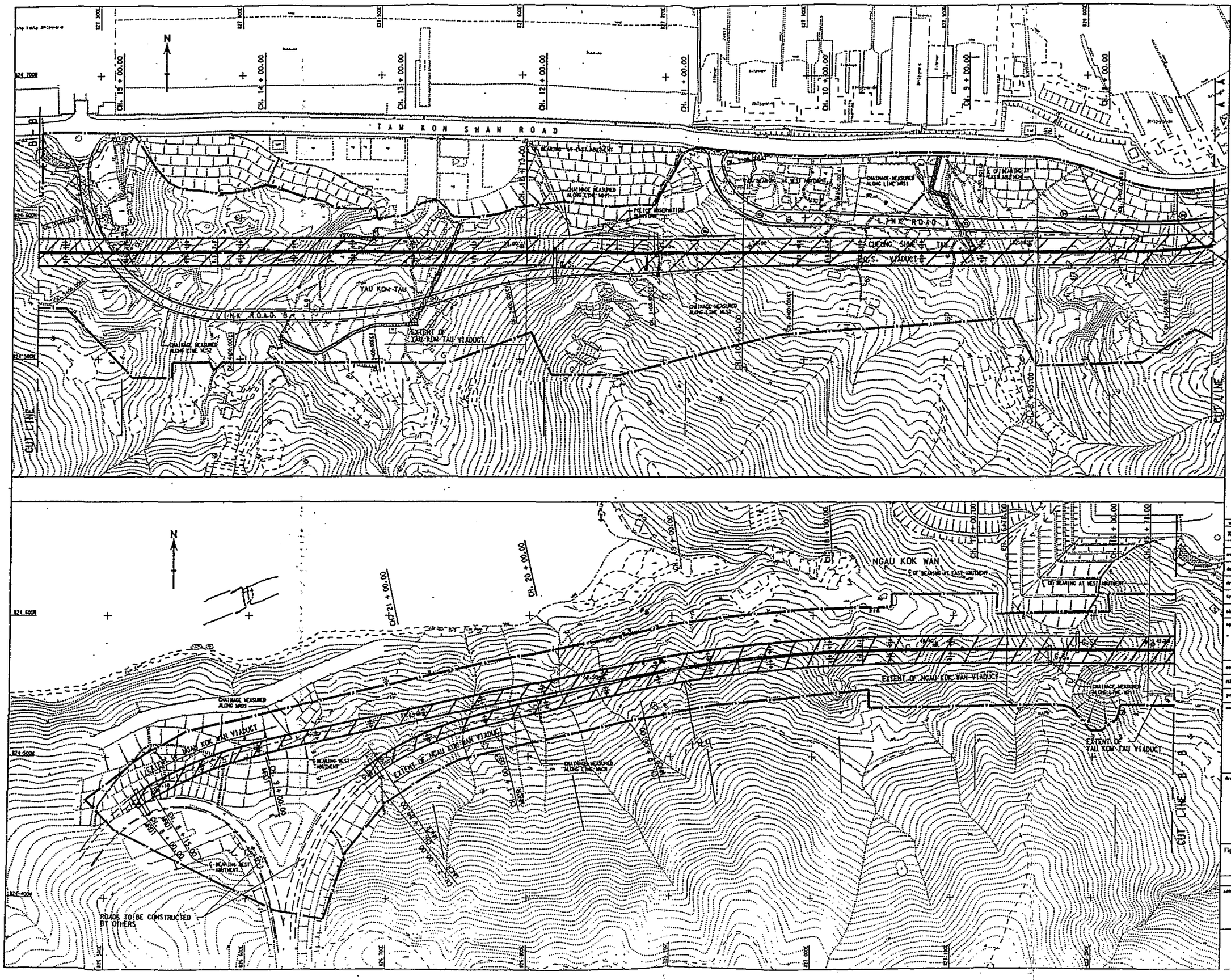

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- WORKS SITE LIMIT
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- PROPOSED FOOTPATH
- PROPOSED SUBWAY WITH No. INDICATED
- PROPOSED 7m HIGH NOISE BARRIER
- PROPOSED NOISE SEMI-ENCLOSURE
- G.S. PROPOSED SIGN GANTRY
- D.D. PROPOSED DIRECTIONAL SIGN
- NRHS WILL BE ADDED

ABBREVIATION :-

G.S. - GANTRY SIGN
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	name	date
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traced		
checked	K. C. POON	5/97
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contract no.

file no. HNT 54/125

project no. 6580TH

contract

TSING YI
NORTH COASTAL ROAD

drawing title

SCHEME LAYOUT

(SHEET 2 OF 2)

Figure No. 3b

scale N.T.S.

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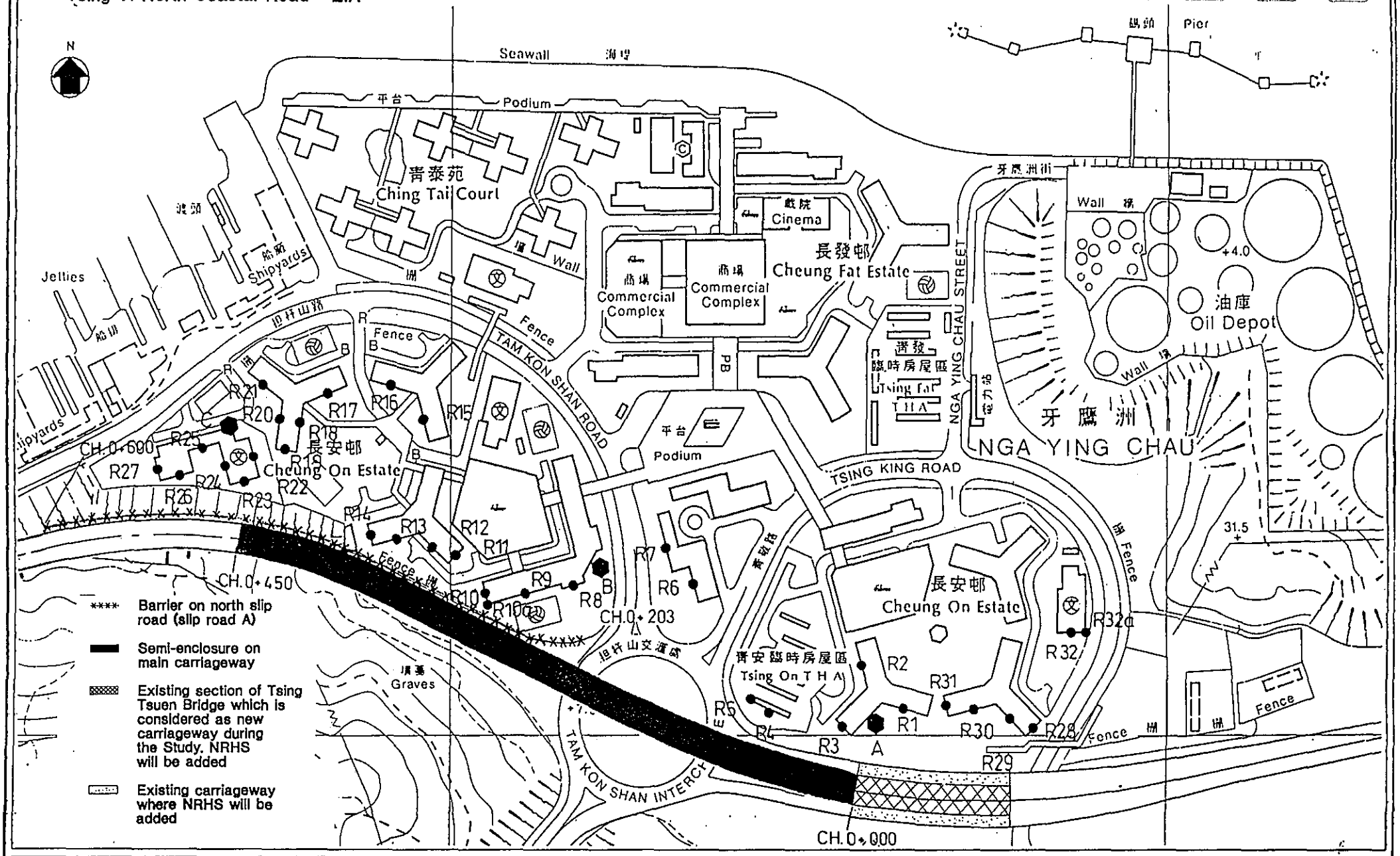
HIGHWAYS DEPARTMENT HONG KONG



Locations of the Noise Mitigation Measures

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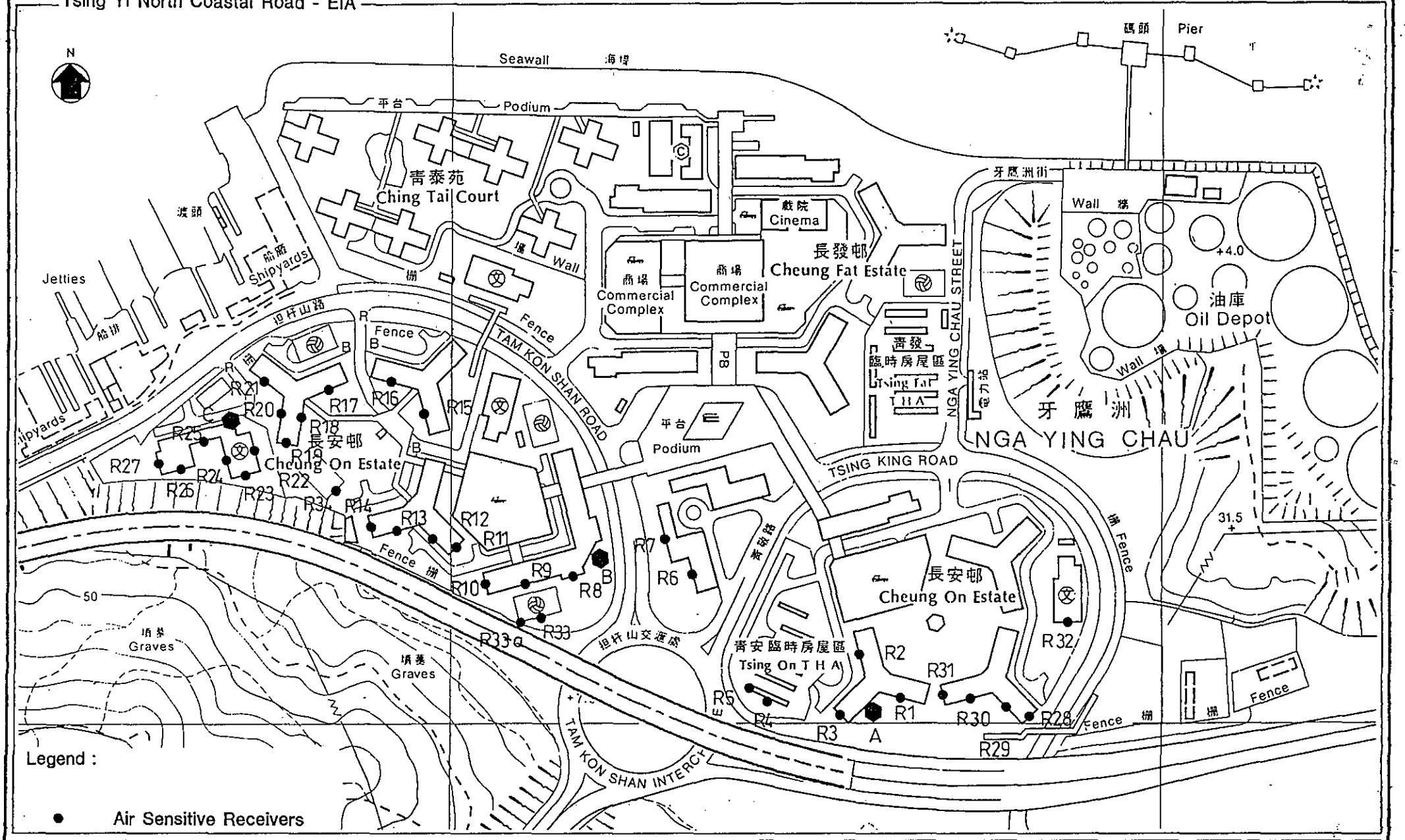
Figure No. 4



Locations of Air Sensitive Receivers

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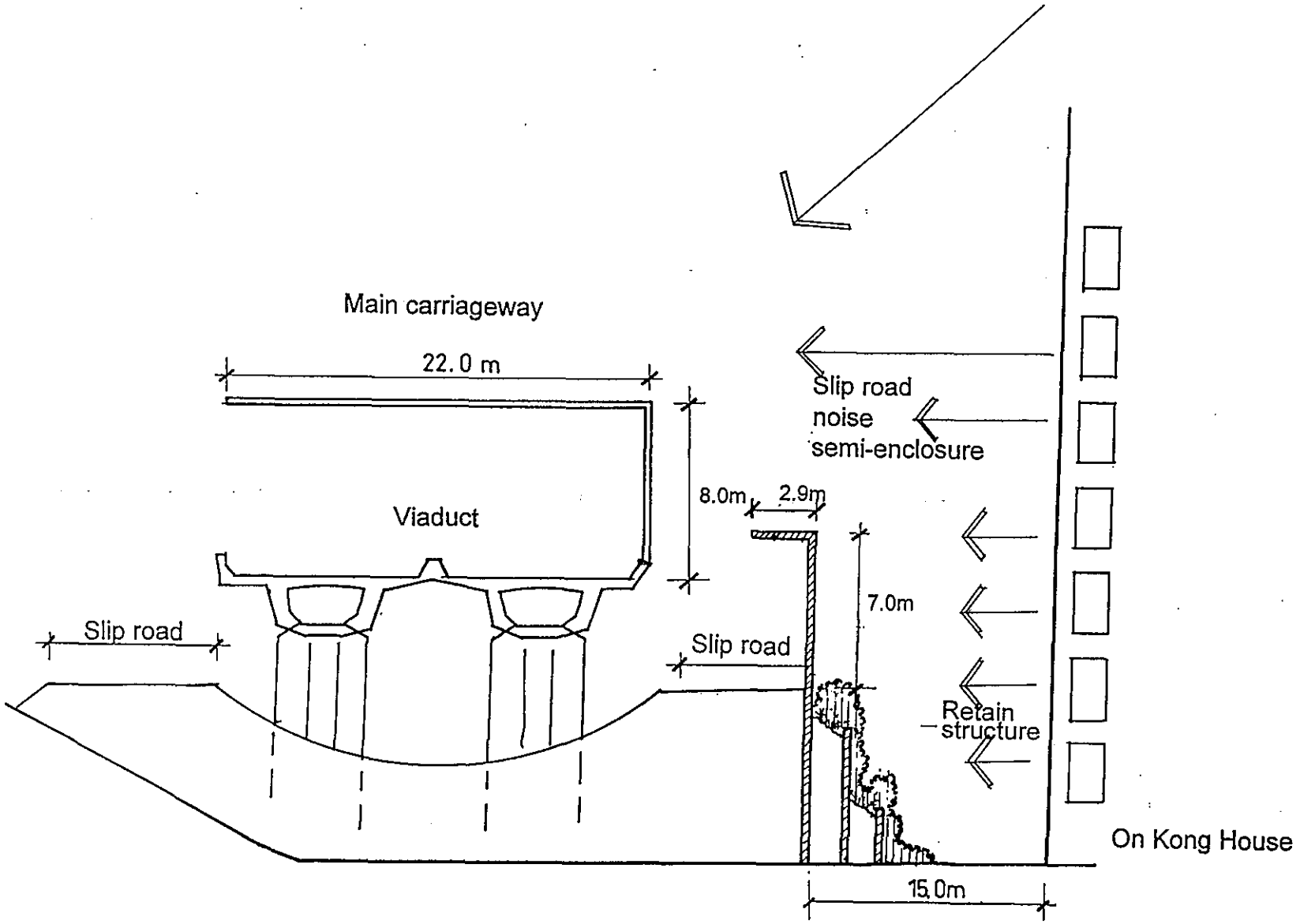
Figure No. 5



Typical Cross - section at On Kong House

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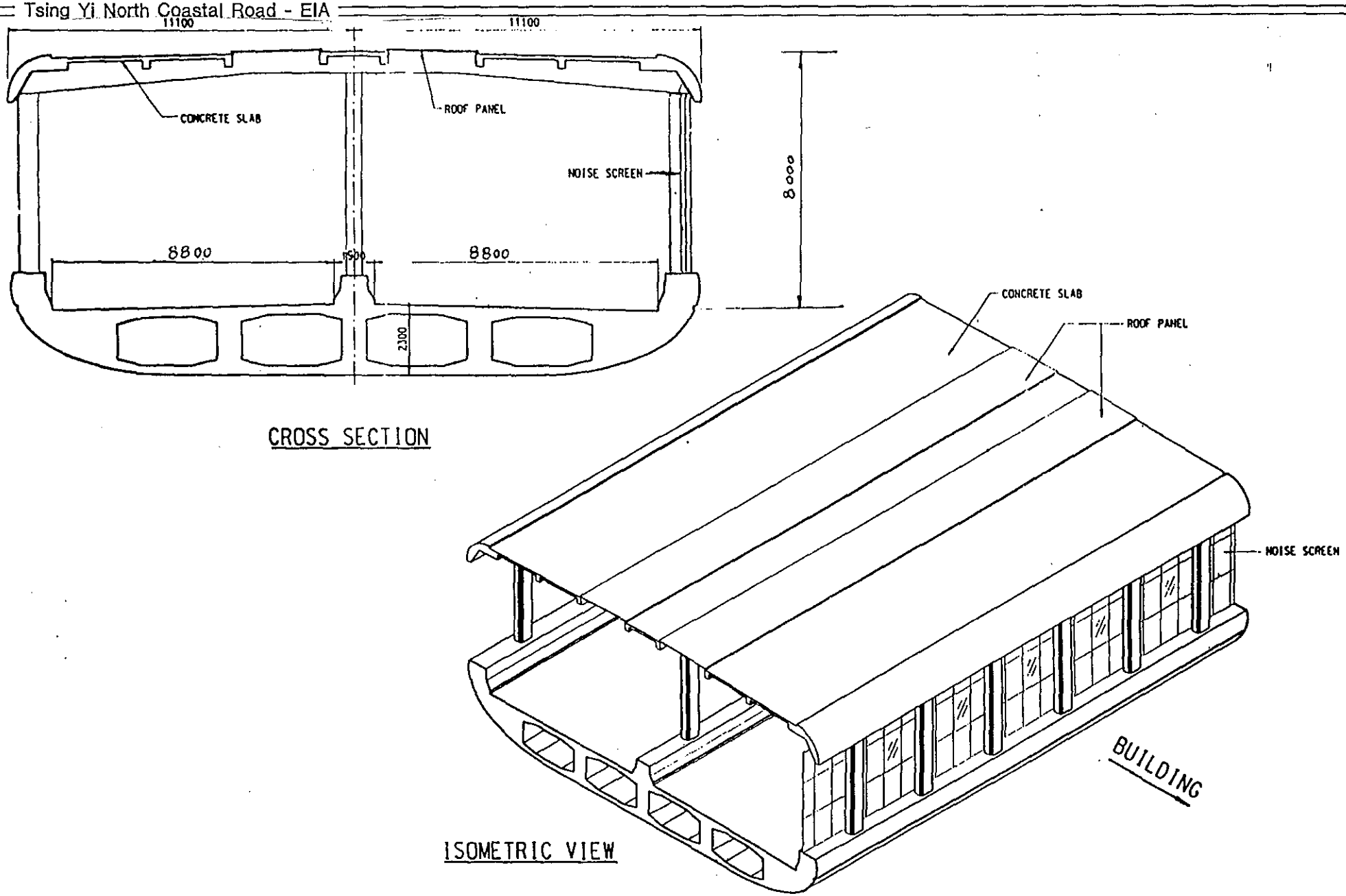
Drawing No. 6a



Typical Cross - section of the Noise Semi-enclosure

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Drawing No. 6b