Territory Development Department 新界發展署

NT EAST DEVELOPMENT OFFICE
新界東發展處

Tseung Kwan O Development

Improvements To Ying Yip Road And Silverstrand Beach Road At Junctions With Hang Hau Road And Clear Water Bay Road

Contract No. TK 40/94

Environmental Impact Assessment

Final Report

DECEMBER 1995

MAUNSELL CONSULTANTS ASIA LTD
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FOREWORD

This Report details the environmental impact assessment carried out in respect of Tseung Kwan O Development Contract TK 40/94. Part 1 describes the studies and conclusions relating to the impact of road traffic noise from the completed scheme and the impact of noise during construction. Mitigatory measures to limit the impact of noise at affected properties are also described. Part 2 details the impact on air quality and details measures to minimise the impact during construction. A separate Monitoring and Auditing Manual is issued as a self contained document setting out the recommended monitoring and auditing procedures for both the construction and operational phases of the proposed improvements.

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Environmental Impact Assessment

PART 1

NOISE IMPACT ASSESSMENT

ENVIRONMENTAL IMPACT ASSESSMENT - PART 1

1 INTRODUCTION TO NOISE ASSESSMENT

1.1 Background

1.1.1 Improvements to the junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads under Contract No. TK 40/94 are parts of a general scheme of improvements to the road network within Tseung Kwan O New Town. With increased traffic in the foreseeable future and the present high volumes of traffic, the above junctions would become a prime area of concern. The ultimate road improvement scheme involves the realignment of the road network, as well as, the introduction of a four prong roundabout. The works are anticipated to commence in late 1996 and be completed in early 1998. The proposed road layout is illustrated on Drawing No. 60293/T/1B.

1.1.2 The purpose of the assessment is to examine the possible noise impact of traffic on sensitive facades immediately adjacent to this new road and hence recommend appropriate mitigatory measures to be included in the above road contract.

1.1.3 The report examines the impact of road traffic noise arising from the final road layout at the proposed junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads.

1.2 Scope of Study

1.2.1 The main objective is to assess the likely impact of traffic noise on the existing and proposed developments immediately adjacent to the junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads. The study includes the investigation of the possible traffic noise mitigatory measures that should be adopted for the existing and proposed developments.

1.2.2 The likely noise impact arising from the construction activities will also be examined. Appropriate noise mitigatory measures and monitoring procedures will also be investigated.

2 ASSUMPTIONS AND NOISE ASSESSMENT CRITERIA

2.1 General

2.1.1 The traffic noise impact assessment adopts the method given in the Calculation of Road Traffic Noise, Department of Transport/UK 1988 Version and the guidelines included in the Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 9, Environment. Other assumptions are given below.

2.2 Traffic Projections

2.2.1 Traffic projections for noise assessments have been based on two transport studies in Tseung Kwan O (TKO). These studies are the Feasibility Study of Opportunities for Further Development in TKO, and the development study completed in mid 1993 for Area 137.

2.2.2 For the assessment of the existing road network system (1994), a morning peak-hour traffic survey has been conducted. For the long term situation, the projected 2011 traffic flows derived from the development study for Area 137 have been used. The relevant traffic flows in vehicles per hour with percentage of heavy vehicles are shown in the layout Drawing No. 60293/T/1B for the years 1994 and 2011 respectively.

2.3 Speed of Traffic

2.3.1 The relevant roads are all district distributor roads and therefore a 50 kph traffic speed was adopted. Other associated roads are considered as district or local distributors. A 50 kph traffic speed was also adopted for these roads.

2.4 Heavy Vehicles

2.4.1 For noise assessments those vehicles having an unladen weight in excess of 1,525 kg are classified as heavy vehicles. The percentages of heavy vehicles assumed for the assessments are shown on Drawing No. 60293/T/1B.

2.5 Assessment Criteria

2.5.1 The HKPSG recommends that noise levels at buildings should be limited to guideline values to ensure a satisfactory environment within the building. The guideline values for road traffic noise for various developments are summarised as follows:-

Schools and Institutes	65 dB(A) L_{10} (1-hour)
Clinics	55 dB(A) L_{10} (1-hour)
Residential dwellings and offices without noise insulation	70 dB(A) L_{10} (1-hour)

2.5.2 At locations where it is not feasible to mitigate the effects of noise to guideline values using direct measures then indirect measures of insulating properties may be considered. When noise insulation is considered as a measure to mitigate the anticipated noise levels, the following criteria for residential properties must be met:

(i) the combined expected maximum traffic noise level i.e. the relevant noise level from the new or altered highway together with other traffic in the vicinity must be above 70 dB(A) L_{10} (1-hour);

(ii) the relevant noise level must be at least 1.0 dB(A) L_{10} (1-hour) more than the total traffic noise level existing prior to the works to construct or improve the highway;

(iii) the contribution to the increase in the relevant noise level from the new or altered highway must be at least 1.0 dB(A) L_{10} (1-hour).

2.5.3 These are the conditions that have been adopted for the assessment of the noise impact on those existing buildings immediately adjacent to the junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads.

3 IDENTIFICATION OF NOISE SENSITIVE RECEIVERS

3.1 The identification of noise sensitive receivers (NSR's) has been made following the guidance set out in the HKPSG for road traffic noise assessment.

3.2 The affected NSR's have been identified from survey plans of the area and site observations. The affected locations may be broadly defined as those buildings facing Ying Yip Road, Hang Hau Road, Silverstrand Beach Road, Clear Water Bay Road and those buildings in the vicinity of the proposed roundabout on Clear Water Bay Road. None of the buildings contained within the Clear Water Bay Film Studio were considered to have noise sensitive facades which would be affected by road traffic noise.

4 NOISE IMPACT ASSESSMENT FOR THE SENSITIVE FACADES

4.1 Location of Sensitive Facades

4.1.1 Building facades will be affected by road traffic noise generated from the following existing or proposed roads :

(1) Ying Yip Road
(2) Hang Hau Road
(3) Silverstrand Beach Road
(4) Clear Water Bay Road
(5) Clear Water Bay Road in the vicinity of the proposed roundabout

4.1.2 The identified sensitive facades are shown on Drawing No. 60293/T/2D and the impact on the facades for each road are described in the following sections.

4.1.3 The predicted traffic noise levels at all facades examined for the years 1994 and 2011 are tabulated on Drawing No. 60293/T/2D. The predictions have been made using the assumption that all the roads are constructed with flexible pavements and are overlain with a dense bituminous wearing course.

4.2 Ying Yip Road (Facades F1, F2, F3, F5 and F14)

4.2.1 The majority of the buildings are located on the lower slopes of the valley and are not located close to the road. Noise levels at the buildings are reduced by the natural screening provided by the terrain and the parapet of the new roundabout. The anticipated growth of traffic on Ying Yip Road is 30% and does not give rise to significantly higher noise levels.

4.2.2 Predicted noise levels between the years of 1994 and 2011 are not predicted to change considerably. The maximum change is predicted to be in the order of 4 dB(A) L_{10} (1-hour) at Facade F14.

4.2.3 Noise levels at these sensitive facades are predicted to be below 70 dB(A) and varied between 56.8 dB(A) and 69.3 dB(A) in the year 2011. Facade F14 will be close to the realigned section of Ying Yip Road but traffic noise at the property is expected to be reduced due to the existing boundary wall surrounding the lot and the level difference between the lot and the new Ying Yip Road.

4.2.4 The re-alignment of Ying Yip Road also affects the existing film studio in Area 92. This is not currently considered as a sensitive development. Decision has been made by Town Planning Board on 13 May 1994 in its preliminary consideration of an objection (No.TPB/O/STKO/1-3) to the draft Tseung Kwan O Outline Zoning Plan S/TKO/1. The Board agreed to consider the proposed re-zoning the site from 'OU (film Studio)' and 'U' to 'CDA' with development restrictions.

4.2.5 The studio site to be re-zoned is highlighted in Drawing No. 60293/T/2D. Two typical locations (F27 and F28) were chosen for the preliminary assessment of the likely noise impact on the proposed re-zoning site. The predicted noise levels at these two locations are going to be over 77 dB(A)L_{10}1hr at a distance of approximate 10 metres from the near side kerb. Any noise barrier provision will be along the inside curve of Ying Yip Road which would also impose a sight line restriction on the main road. Therefore direct mitigatory measures such as noise barriers along the highway is not appropriate. Noise sensitive development should be set-back further to meet the criteria given in HKPSG. As such, a separate Environmental Assessment should be prepared by the developer to prove the appropriateness of the proposed development to meet the HKPSG from the environmental protection points of view.

4.3 Hang Hau Road (Facades F4 and F7)

4.3.1 Within this group, there are only two facades affected by road traffic noise from Hang Hau Road, Facades F4 and F7. As the affected buildings are located on sloping terrain the maximum calculated noise values at the sensitive facades in 1994 are approximately 57 dB(A).

4.3.2 It is predicted that in the year 2011 there will be a large increase of traffic using Hang Hau Road and hence the traffic noise levels are predicted to increase to levels varying between 57.7 dB(A) and 61.3 dB(A). However, once again the topography of the land will play a major role in screening most of the traffic noise.

4.4 Silverstrand Beach Road (Facades F16 to F23)

4.4.1 The realignment of Silverstrand Beach Road will not result in any significant changes of noise levels at sensitive facades by the year 2011. Whilst traffic noise will increase because of higher traffic volumes, some facades will experience a decrease of traffic noise due to the realignment of the road.

4.4.2 By 2011 all of the predicted traffic noise levels at the sensitive facades will remain within the guideline noise level of 70 dB(A) for residential dwellings. The noise levels at the sensitive facades are predicted to range between 50.6 dB(A) and 64.8 dB(A).

4.5 Clear Water Bay Road - Excluding Roundabout (Facades F11, F15, F24 and F25)

4.5.1 The large volumes of traffic currently using Clear Water Bay Road result in the noise levels at the sensitive facades exceeding 70 dB(A) for residential properties in 1994 with the exception of Facade F11. At Facade F11 the noise levels at the sensitive facade are substantially reduced due to the large difference in level between the building and the road.

4.5.2 By 2011 traffic noise will increase further and noise levels at the sensitive facades are predicted to vary from 62.6 dB(A) at Facade F11 to 76.6 dB(A) at Facade F24. Facade F24 is an extreme case as it is located very close to Clear Water Bay Road and directly faces the carriageway. This facade is predicted to experience a maximum increase of around 2.6 dB(A) between 1994 and 2011 with the provision of a 2 metre high barrier along Clearwater Bay Road.

4.6 Proposed Roundabout (Facades F6, F8, F9, F10, F12, F13 and F26)

4.6.1 As expected most of the calculated noise levels at the facades of buildings in the vicinity of the proposed roundabout either exceed, or are close to, 70 dB(A) for 1994. At Facade F6 the traffic noise levels are only around 63 dB(A) because of a difference in level of over 10 metres between the road and the residential building. This facade is also going to be protected by an one metre high profile barrier which forms part of the new roundabout.

4.6.2 At the facades facing the proposed roundabout the traffic noise levels in 2011 are predicted to range from 70.6 dB(A) at Facade F6 to a maximum of 81.8 dB(A) at Facade F9.

4.6.3 The noise level for the first floor at Facade F13 is predicted to be in the order of 80 dB(A) in 2011. A 2.0 metre wall adjacent to the roundabout has been assumed in the analysis which is similar to the existing boundary wall which already exists along Clear Water Bay Road.

5 PROPOSED NOISE MITIGATORY MEASURES

5.1 The facades most affected by road traffic noise from the proposed improvements are those in the vicinity of the proposed roundabout of Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and Clear Water Bay Road. Noise levels at several of the facades exceed 70 dB(A) and implementation of various noise mitigatory measures is considered necessary.

5.2 To reduce traffic noise levels to below 70 dB(A) different forms of noise barriers have been tested. These include barrier heights ranging from 1 to 8.5 metres with an offset of 1 metre from the edge of the carriageway as shown on Drawing No. 60293/T/3C. Such measures would generally protect the affected facades and reduce noise levels to acceptable levels. However, these noise barriers would significantly reduce visibility and affect driver behaviour at the roundabout except the normal profile barrier, aproximately 1 metre above ground, will be provided for road safety reasons.

5.3 Provision of noise barrier at the roundabout would hamper road safety. A canopy would also be effective in reducing traffic noise to acceptable levels but it would also have the same shortcoming. Noise barriers are therefore not considered to be practicable for this situation except that a 4 m high noise barrier along Clear Water Bay Road can be erected to protect the first floor windows at Facade 24 of PIME House.

5.4 Other direct mitigatory measures would be the application of open texture pavement on this roundabout which would reduce the noise levels at facades by approximately 2.5 to 3.0 dB(A). Such a reduction would not reduce noise levels to below 70 dB(A) L_{10} (1-hour) at the facades and additional mitigating measures would be required to achieve satisfactory noise levels. There will be a large number of stop-and-go actions on the affected road surfaces. Open texture pavement would easily be damaged and is not considered to be desirable from the maintenance point of view.

5.5 In view of the limited effectiveness of open texture surfacing, it is considered that the facades in the vicinity of the proposed roundabout would best be treated at location using indirect mitigation measures rather than seeking to mitigate the effects of noise at source. Insulation at the receivers should therefore be considered.

5.6 The analysis has identified those facades that would have noise levels higher than 70 dB(A) both in terms of the existing situation and in future and which would also experience a 1 dB(A) increase of traffic noise in the future. The contribution of noise from the roundabout and the improved roads at the affected facades will generally be greater than 1 dB(A) except at Facade 24 of PIME House and therefore, compensation to those affected properties should be considered.

5.7 As far as Facade No. 24 is concerned, noise contribution from the new roads which include the new roundabout, re-alignment of Silverstrand Beach Road and Ying Yip Road will not result in increasing the overall noise levels by more than 1 dB(A) at this facade. This condition does not satisfy the eligibility for indirect technical remedies at this location and the identified noise impact will need to be mitigated through direct remedies as highlighted in paragraph 5.3. A 4 metre high barrier should be considered for the case of PIME House. The noise contribution from the improvement scheme for the affected properties are shown on Drawing No. 60293/T/2D.

5.8 The number of dwellings exceeding the HKPSG criterion after the completion of the improvement works with and without any direct noise mitigatory measures and those eligible for indirect mitigatory measures are listed as follows:

Dwellings	Exceeding HKPSG without Direct Mitigatory measures	Exceeding HKPSG with Recommended direct mitigatory measures	Eligible for indirect mitigatory measures
Lot 351SA	x	x	x
Lot 360	x	x	x
PIME House	x	x	-
Villa Pine	x	-	-
Villa Placida	x	x	x
Clear View	x	x	x
Haven View	x	x	x
Lot 351 R.P.	x	x	x
Total	**8**	**7**	**6**

It should also be noted that PIME House is not eligible for indirect mitigatory measures but the predicted impact of traffic noise from Clear Water Bay Road can be mitigated to meet the 70 dB(A)L_{10}1hr level.

5.9 Particular attention should be drawn to the investigation of Facade 24. In the initial assessment, Facade 24 was considered as a noise sensitive receiver but it was unable to confirm because it was mainly masked by over-growing trees. Further site inspection identified that only the ground floor entrance hall where window openings were identified was considered as noise sensitive receiver. This was mentioned in the advance copy of the Final Report. The predicted impact at the entrance hall can be mitigated by a proposed 1 metre road side barrier.

5.10 A recent visit to the site just before the submission of the Final Report revealed that new windows were installed at first floor after an apparent renovation and hence, the proposed 4 metre barrier becomes necessary to the said facade of PIME House. The construction of a 4m barrier would have an impact on the existing trees and the surrounding landscape. Major tree felling would be involved. A 2 metre high barrier which would have less disruption to the existing environment is recommended for implementation. Although it would not entirely comply with the guidelines for residential development, it will reduce the impact close to the prevailing levels.

6 COST ESTIMATE FOR COMPENSATION

6.1 The dwellings /facades which comply with the criteria for compensation are listed as follows :

Lot 351SA	Facade F9
	Facade F10
Lot 351RP	-
Lot 360	Facade F8
	Facade F25
Villa Placida	Facade F13
	Facade F15
Clear View	Facade 12
Haven View	Facade F26

6.2 Detailed cost estimates have yet to be finalised. Preliminary cost estimates have been derived by assuming that openable well-gasketted 6 mm panel windows (Type I) and air-conditioners are provided at the facades to be insulated. For the case of Lot 351SA, the northbound facades would need double-glazed windows Type II detailed in Appendix 4.4 of HKPSG. External observations of the affected properties show that several of the facades are not typical and have multiple rooms or large glazed areas and allowances for specific facades have been included.

6.3 The preliminary cost estimates for insulating the affected facades are tabulated as follows:

Lot 351SA	$200,000
Lot 351RP	$150,000
Lot 360	$150,000
Villa Placida	$150,000
Haven View	$150,000
Clear View	$150,000
Total	$950,000

6.4 The preliminary costs have been derived from external observations of the properties made from the highway. Detailed plans and surveys of the properties will be required to assess the number of rooms affected and the full extent of the insulation works before a more detailed estimate of the cost can be derived. Only the capital costs of providing insulation have been assumed and no allowances for operating costs have been included.

7 NOISE IMPACT DURING CONSTRUCTION

7.1 General

7.1.1 The brief does not require a detailed assessment of construction noise to be carried out. A brief assessment of the impact of construction noise on the adjacent area has however been conducted to highlight any potential problems.

7.1.2 Works to be conducted under TKO Contract No. 40/94 require the formation of a new roundabout on Clear Water Bay Road and the construction of connections for 3 side roads in addition to the connections required for Clear Water Bay Road. All of the side roads approach the proposed roundabout on steep gradients and two of the roads, Ying Yip Road and Silverstrand Beach Road are to be realigned and improved on the sloping sections leading to the roundabout.

7.1.3 With the exception of the roundabout most dwellings are located away from the roads to be improved. Several dwellings will be close to the new roads in the vicinity of the roundabout.

7.2 Major Works

7.2.1 The major works involved in the Contract include:

- Construction of retaining walls and placing of fill material to form the roundabout on Clear Water Bay Road together with connections for approach arms.
- Construction of retaining walls, placing of fill and cutting of hillslopes to form the improved/realigned routes of Silverstrand Beach Road and Ying Yip Road.
- Laying of pavement materials for the new roads.

7.3 Assessment of Construction Noise

7.3.1 The assessment of noise levels from construction activities was undertaken in accordance with the methodology given in the "Technical Memorandum on Noise from Construction Work other than Percussive Piling". Reference has also been made to the publication "A Practical Guide for the Reduction of Noise from Construction Works", EPD, July 1991 and British Standard BS 5228 Part 1, 1984, "Noise Control on Construction and Open Sites".

7.3.2 The impact of construction noise on the identified noise sensitive receivers (NSR's) will result from a series of construction activities to be carried out within their vicinity. The noise levels will depend on the number of plants and/or lorries to be used for one particular or more activities. The major activities that will affect the NSR's are those described in Section 7.2 - Major Works.

7.3.3 A number of assumptions have to be made in the assessment to estimate the noise impacts from the construction work at each of the construction stages. These include:

- sound power levels of plants adopted in the assessment are those contained in the "Technical Memorandum on Noise from Construction Work other than Percussive Piling",
- one paver/roller is adopted for the periods of earthworks,
- lorries are assumed to be used for handling excavated and filling materials.

7.3.4 The impacts of construction noise at those identified NSR's assumed that construction activities are continuously carried out within the defined areas in Drawing No. 60293/T/4A. The likely problem areas are works being carried out in construction stages 5, 6 and 7. These works involve the construction of new carriageways for Silverstrand Beach Road, Ying Yip Road and the associated roadworks at the junction of Clear Water Bay Road/Hang Hau Road/Ying Yip Road/Silverstrand Beach Road. Noise levels are expected to be exceeding 75 dB(A) and reaching 88 dB(A) at Facades F9, F10, F13 and F14 under conditions of continuous plant operation.

7.3.5 Other NSR's are anticipated to be subject to construction noise levels in the order of 64-75 dB(A) during the daytime. This is considered to be acceptable on a normal construction site.

7.3.6 EPD currently require day time noise levels from construction sites to be limited to 75 dB(A) L_{eq} (30 min) at facades of sensitive buildings. In the light of potential high noise levels arising from the associated roadworks in Contract No. TK 40/94, the Contractor will be required to programme the works and select equipment and working practices which meet this requirement. Typical measures include the use of quiet equipment with sound proof insulation, programming of construction activity to minimise simultaneous activity close to the affected properties and the use of barriers and enclosures. Permits will be required for working between 1900 and 0700 hours and any time on a general holiday including Sunday.

7.3.7 It is recommended that a clause limiting day time noise levels to a maximum of 75 dB(A) L_{eq} (30 min) should be included in the Contract together with other relevant environmental control requirements.

7.3.8 The properties and facades which are likely to be subject to high construction noise levels qualify for noise insulation, with the exception of Facade F14. It is recommended therefore that insulation of these properties is undertaken prior to construction works commencing. This will minimise the adverse impact of construction noise at these properties.

8 NOISE MONITORING AND AUDITING

8.1 General

8.1.1 Monitoring and auditing procedures are required as a check during the construction and operation of a development to ensure that the specified control criteria and standards are being complied with. The pre- construction and operational analysis will highlight potential problems and can be used to minimise or eliminate adverse impacts prior to their occurrence. Analysis requires various assumptions to be made which may differ to those actually employed or arising on site and therefore monitoring is required to confirm that the required standards and objectives are being met.

8.1.2 Auditing defines methods and procedures for ensuring that the monitoring is effectively carried out and that the monitoring will identify adverse impacts. Auditing also covers procedures to be followed in the event that the assumed criteria or standards are exceeded.

8.2 Road Traffic Noise

8.2.1 Traffic noise can be monitored following the opening of a new road but measures to limit the adverse impacts of higher traffic noise levels are limited. In most instances it is not possible to control traffic noise as it is directly related to the volume of traffic using the road.

8.2.2 It is not therefore recommended that any specific monitoring measures are undertaken. It is anticipated that there will be queries from occupiers seeking compensation for the insulation of properties. Any notable differences of predicted noise levels will be identified in responding to these queries.

8.3 Construction Noise

8.3.1 The impact of construction noise will be minimised if insulation of the facades and properties which are eligible for compensation are carried out prior to the commencement of construction works. The Contractor will still be required to meet EPD's criterion of 75 dB(A) L_{eq} (30 min) at sensitive facades of buildings.

8.3.2 The control of noise arising from construction works outside normal working hours is covered by the Noise Control Ordinance and a Construction Noise Permit will be required. The Contractor will, if necessary, be required to satisfy the criteria for working outside the normal working day. Details of construction noise control are subject to the requirements and procedures given in the Environmental Monitoring and Audit Manual for this Contract.

8.4 Monitoring of Construction Noise

8.4.1 Noise monitoring should be undertaken to ensure compliance with the guidelines for construction noise and any construction noise permits. The area is currently dominated by existing road traffic noise and many of the facades are already experiencing noise levels in excess of 70 dB(A) under peak traffic flow conditions. In the vicinity of the roundabout the contractor will need to adopt quiet working procedures to avoid noise levels exceeding 75 dB(A) L_{eq} (30 min).

8.4.2 It is recommended that monitoring is undertaken during the first week of new construction activities in the vicinity of properties to ensure that noise levels at the facades of properties do not exceed 75 dB(A) L_{eq} (30 min). The contractor should propose plant and working methods to meet these requirements. Monitoring during the first week of new operations should be used to verify equipment which can be used for a particular operation in a particular area.

8.4.3 During the progress of the Contract and following the initial monitoring of construction activities it is recommended that noise monitoring is undertaken in response to changes of working procedures, complaints or at the initiative of site staff if it is considered that noise levels are higher than recorded during the initial monitoring period. Regular monitoring of construction noise will be performed at selected noise sensitive locations immediately adjacent to the works site.

8.5 Auditing Procedures During Construction

8.5.1 The procedures and recommendations stated above should be included in the contract documentation for the project. Noise recordings should be made by personnel with appropriate training in the use of the equipment which should be calibrated before and after readings. Records should be maintained of all readings undertaken. The records relating to the operation of equipment on site should contain specific details identifying the particular items of plant being monitored ie registration or serial numbers.

8.5.2 A record of all noise monitoring activity should be kept and this should be made available to Environmental Protection Department if required. A record of complaints received should similarly be maintained together with the action taken and the results of any noise monitoring undertaken as a result of complaints.

8.5.3 Where noise levels are at, or approaching, the permitted level the Contractor should be informed to avoid exceeding the recommended noise levels. Any readings in excess of 5 dB(A) L_{eq} (30 min) of the guideline value should require the contractor to stop work and submit proposals for an amended method of working which is capable of meeting the criteria. Where measured noise levels exceed the 75 dB(A) criterion by less than 5 dB(A) the measurements should be repeated. If the second measurement similarly exceeds the criterion the contractor should stop work and submit proposals for a method of working which will meet the criterion.

9 CONCLUSIONS AND RECOMMENDATIONS FOR NOISE ASSESSMENTS

9.1 The impact analysis reveals that most of the sensitive facades adjacent to the improved roads leading to the new roundabout are within the HKPSG traffic noise level standard of 70 dB(A) L_{10} (1-hour) for residential developments. Facades adjacent to the new roundabout are expected to have noise levels exceeding 70 dB(A) L_{10} (1-hour). The properties involved are Villa Placida (Facades F13 and F15), Clear View (Facade F12), dwellings at Lot 351 at the corner of Clear Water Bay Road/Hang Hau Road junction (Facades F9 and F10), Haven View (Facade 26) and the property at Lot 360 (Facades 8 and 25). The westerly facing facade of P.I.M.E. House (Facade 24) overlooks Clear Water Bay Road and Ying Yip Road and this would also be subject to road traffic noise exceeding 70 dB(A) L_{10} (1-hour).

9.2 The options of different forms of noise barrier were examined but, with the exception of the 4 m high noise barrier along Clear Water Bay Road, these options were found not practicable in this case because they obstruct visibility at the roundabout. The provision of such barriers, up to 9 metres above the carriageway, are capable of mitigating the effects of noise but, would impose a road safety hazard at this roundabout and therefore are not recommended at this location. A normal profile barrier approximately 1 metre high will be included along the edge of Hang Hau Road/Ying Yip Road for safety reason. Such barrier provides the necessary noise mitigation to Villa Pine (Facade 6).

9.3 The barriers would also be visually intrusive in the area. However, it is suggested to build the 4 m high noise barrier along Clear Water Bay Road where possible to reduce noise level at Facade F24 to the acceptable level. After considering the site constraints, a 2 metre high concrete barrier is recommended for the protection of PIME House (Facade 24).

9.4 The affected facades in the vicinity of the roundabout generally comply with the three criteria to be eligible for insulation. It is recommended therefore that the properties should be insulated with openable well-gasketted windows with 6 mm pane together with the installation of air conditioning. In the case of Lot 351SA, the northern facades of the house would need double glazed windows.

9.5 The preliminary cost estimates for each of the houses involved are in the order of $150,000 to $200,000. The total capital cost of insulation is estimated to be in order of $950,000. Recurrent operating costs have not been considered.

9.6 The assessment of noise insulation for the affected properties is based on the best information available and observations outside the lot boundaries. Details of the proposed indirect mitigatory measures for the qualified properties would need to be confirmed in a survey to be considered within the affected properties and would be subject to the approval of Exco.

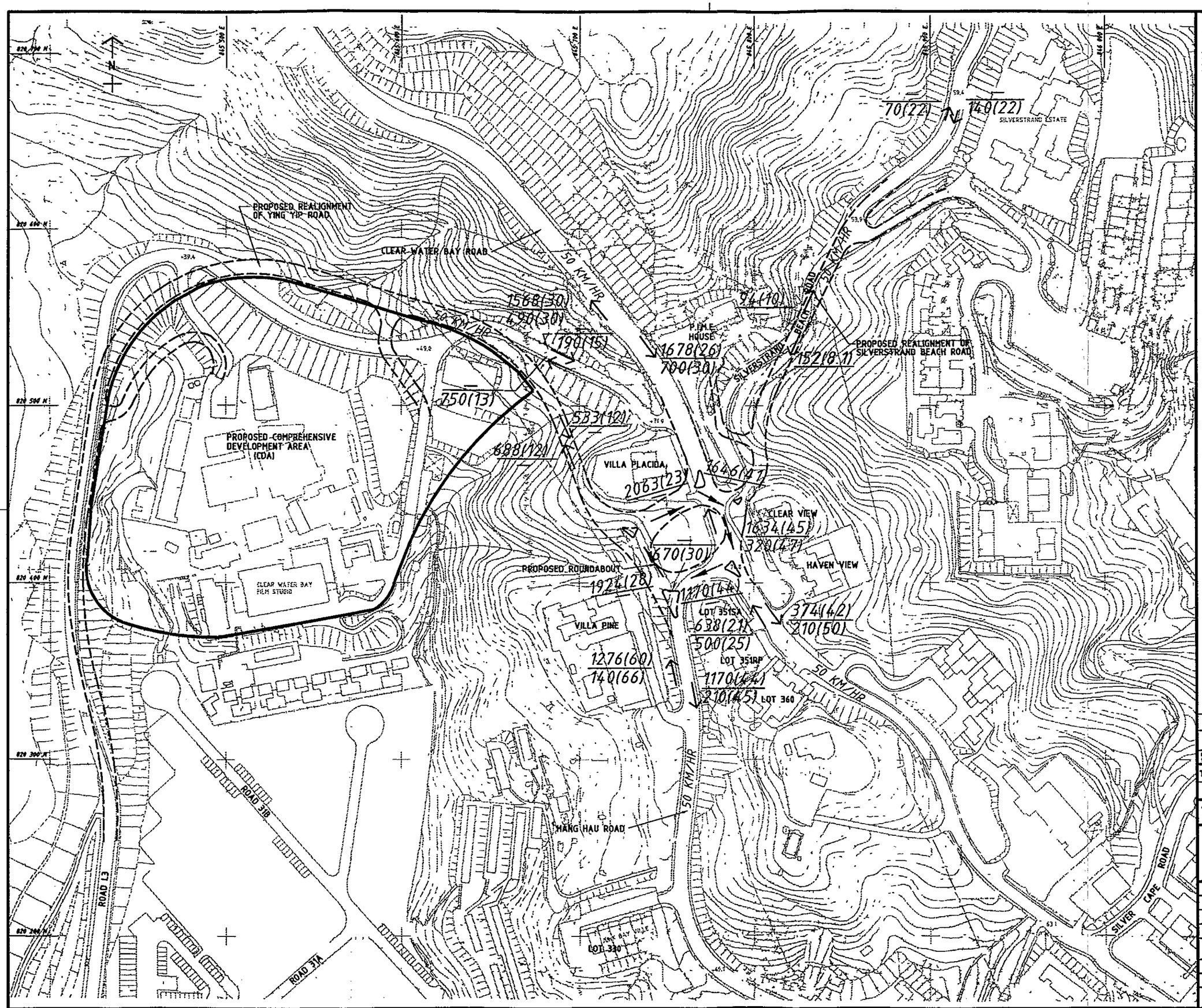
9.7 The existing Clear Water Bay Studio is going to be re-zoned to a comprehensive development. Preliminary noise impact assessment reveals that locations near the edge of Ying Yip Road will expose to traffic noise levels exceeding 70 db(A)L_{10}1hr. The developer should carry out a separate assessment to show the proposed master layout plan would meet the guidelines for road traffic noise as well as other noise impacts.

9.8 Properties in the close vicinity of the roundabout are likely to experience high noise levels arising from construction. Equipment with sound proof insulation combined with quiet methods of working will be required to minimise the impact on adjacent properties. Most of the properties adversely affected by construction noise are eligible for insulation and it is recommended that the properties should be insulated prior to the commencement of construction.

9.9 EPD currently require construction noise levels to be limited to 75 dB(A) L_{eq} (30 min) during the normal working day and the contractor should be required to conduct the works within these limits. Recommendations for monitoring construction noise to ensure that guideline values are adhered to have been described.

DRAWINGS - PART 1

NOISE IMPACT ASSESSMENT



LEGEND:

1276(60) 2011 ← ASSESSMENT YEAR
140(66) 1994 ← PERCENTAGE OF HEAVY VEHICLES
← TRAFFIC FLOW IN VECHICLES PER HOUR

← DIRECTION OF FLOW

B	GENERAL REVISIONS	10/95	
A	ALIGNMENT OF YING YIP ROAD AND ROUNDABOUT REVISED.	6/95	

Territory Development Department 新界東新界發展

TSEUNG KWAN O DEVELOPMENT

TKO DEVELOPMENT CONTRACT No 40/94
NOISE IMPACT ASSESSMENT

PROPOSED ROAD LAYOUT AND TRAFFIC FLOW ASSUMPTIONS

MAUNSELL CONSULTANTS ASIA LTD

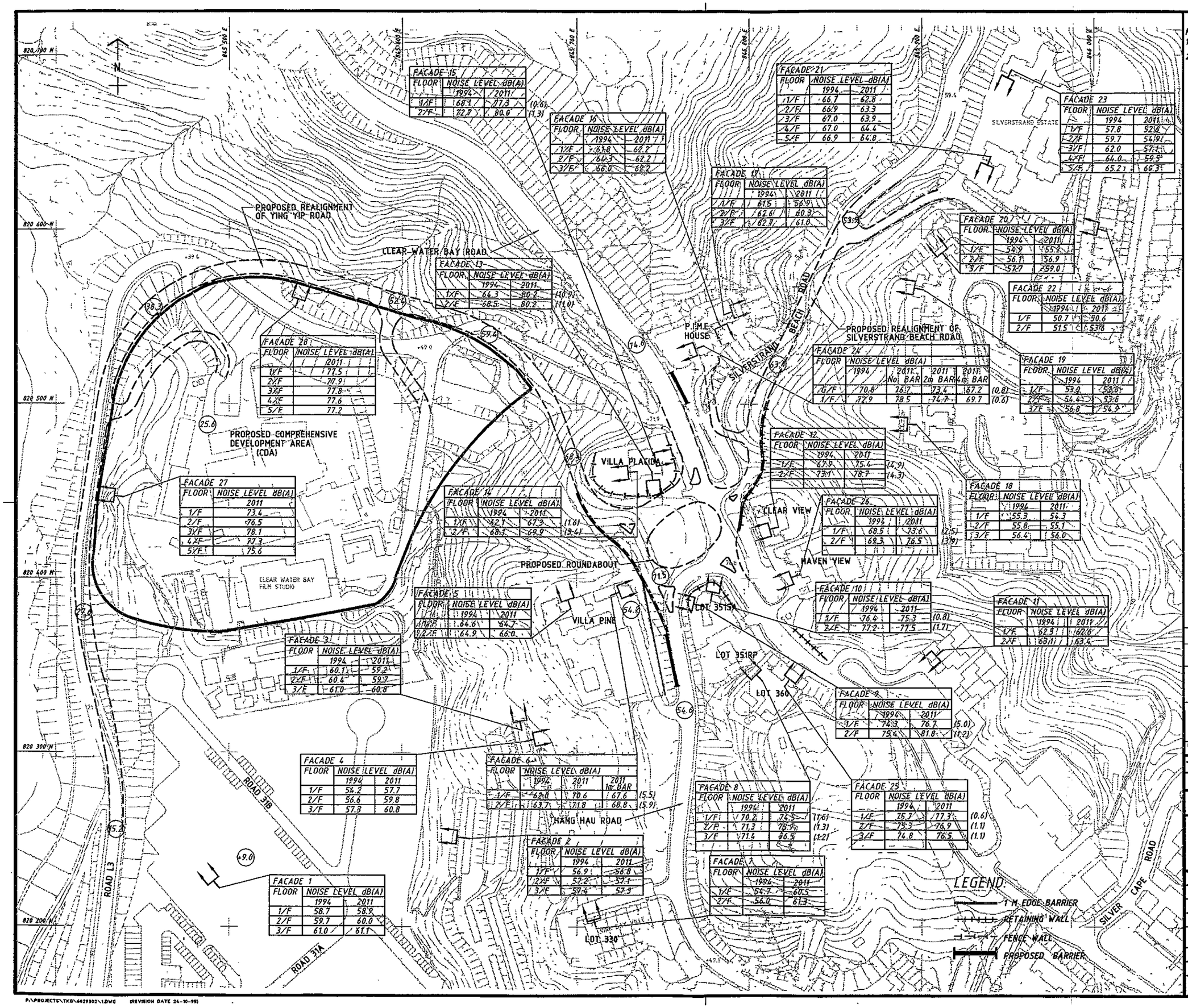
DRG.NO. 60293/T/1 B

DATE 10 - 94

SCALE 1 : 2 000

DIMENSIONS ARE IN MILLIMETRES

P:\PROJECTS\TKO\60293\T\1.DWG (REVISION DATE 6-10-94)



FACADE 15

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	68.1	77.3	(9.6)
2/F	72.7	80.0	(11.3)

FACADE 16

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	63.8	62.2
2/F	60.3	62.2
3/F	66.0	68.2

FACADE 21

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	66.7	62.8
2/F	66.9	63.3
3/F	67.0	63.9
4/F	67.0	64.4
5/F	66.9	64.8

FACADE 23

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	57.8	52.6
2/F	59.7	54.9
3/F	62.0	57.1
4/F	64.0	59.5
5/F	65.2	60.3

FACADE 17

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	61.5	56.9
2/F	62.6	60.3
3/F	62.9	61.8

FACADE 20

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	54.9	55.8
2/F	56.1	56.9
3/F	57.7	59.0

FACADE 13

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	64.3	80.2	(10.9)
2/F	68.5	80.2	(11.0)

FACADE 22

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	50.7	50.6
2/F	51.5	52.6

FACADE 28

FLOOR	NOISE LEVEL dB(A) 2011
1/F	77.5
2/F	70.9
3/F	77.8
4/F	77.6
5/F	77.2

FACADE 24

FLOOR	NOISE LEVEL dB(A) 1994	2011 No BAR	2011 2m BAR	2011 4m BAR	
G/F	70.8	76.7	73.4	67.2	(0.8)
1/F	77.9	78.5	74.7	69.7	(0.8)

FACADE 19

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	53.0	53.0
2/F	54.4	53.6
3/F	56.8	54.9

FACADE 12

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	67.9	75.4	(4.9)
2/F	73.1	78.7	(4.3)

FACADE 18

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	55.3	54.3
2/F	55.8	55.1
3/F	56.4	56.0

FACADE 26

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	68.5	73.6	(2.5)
2/F	69.3	76.5	(3.9)

FACADE 14

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	62.7	67.3	(1.8)
2/F	68.1	68.9	(3.4)

FACADE 10

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	76.6	75.3	(0.8)
2/F	77.2	77.5	(1.7)

FACADE 11

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	62.9	62.6
2/F	63.1	63.4

FACADE 5

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	64.6	64.7
2/F	64.9	66.0

FACADE 3

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	60.1	59.2
2/F	60.4	59.7
3/F	61.0	60.8

FACADE 9

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	74.9	76.7	(5.0)
2/F	75.4	81.8	(1.2)

FACADE 4

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	54.2	57.7
2/F	56.6	59.8
3/F	57.3	60.8

FACADE 6

FLOOR	NOISE LEVEL dB(A) 1994	2011	2011 1m BAR	
1/F	62.0	70.6	67.6	(5.5)
2/F	63.7	71.8	68.8	(5.9)

FACADE 8

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	70.2	74.5	(1.6)
2/F	71.3	76.9	(1.3)
3/F	71.4	76.5	(1.2)

FACADE 25

FLOOR	NOISE LEVEL dB(A) 1994	2011	
1/F	75.7	77.3	(0.6)
2/F	75.3	76.9	(1.1)
3/F	74.8	76.5	(1.1)

FACADE 27

FLOOR	NOISE LEVEL dB(A) 2011
1/F	73.4
2/F	76.5
3/F	78.1
4/F	77.3
5/F	75.6

FACADE 2

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	56.9	56.8
2/F	57.2	57.1
3/F	57.4	57.3

FACADE 7

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	56.7	60.5
2/F	56.0	61.3

FACADE 1

FLOOR	NOISE LEVEL dB(A) 1994	2011
1/F	58.7	58.9
2/F	59.7	60.0
3/F	61.0	61.1

NOTES:
1. ALL NOISE VALUES ARE IN dB(A) L_{10} (1 HOUR).
2. NOISE CONTRIBUTION FROM THE IMPROVEMENT SCHEME SHOWN IN BRACKETS.

REV.	DESCRIPTION	DATE	CHECKED
D	GENERAL REVISION	10/95	
C	NOISE LEVELS AT FACADE 24 AMENDED.	8/95	
B	ALIGNMENT OF YING YIP ROAD AND ROUNDABOUT REVISED. NOISE LEVELS AT FACADE 14 REVISED.	6/95	
A	NOISE INCREASES DUE TO IMPROVEMENT SCHEME ADDED AT SELECTED FACADES AND MINOR CHANGES TO 2011 NOISE LEVELS AT ROUNDABOUT	1/95	

Territory Development Department 拓展署
NT EAST DEVELOPMENT OFFICE 新界東拓展處

TSEUNG KWAN O DEVELOPMENT

TKO DEVELOPMENT CONTRACT No 40/94
NOISE IMPACT ASSESSMENT

PREDICTED NOISE LEVELS

DESIGNED 設計 | CHECKED 核對 | DRAWN 繪圖 | CHECKED 核對 | APPROVED FOR ISSUE 批准發出

MAUNSELL CONSULTANTS ASIA LTD. 英倫(亞洲)工程顧問有限公司

DRG.NO. 圖號編號 60293/T/2 D

CONTRACT NO. 合約編號 | DATE OF ISSUE 發出日期

DATE 日期 11 - 94

SCALE 比例 1 : 2 000

DIMENSIONS ARE IN 尺寸單位 MILLIMETRES

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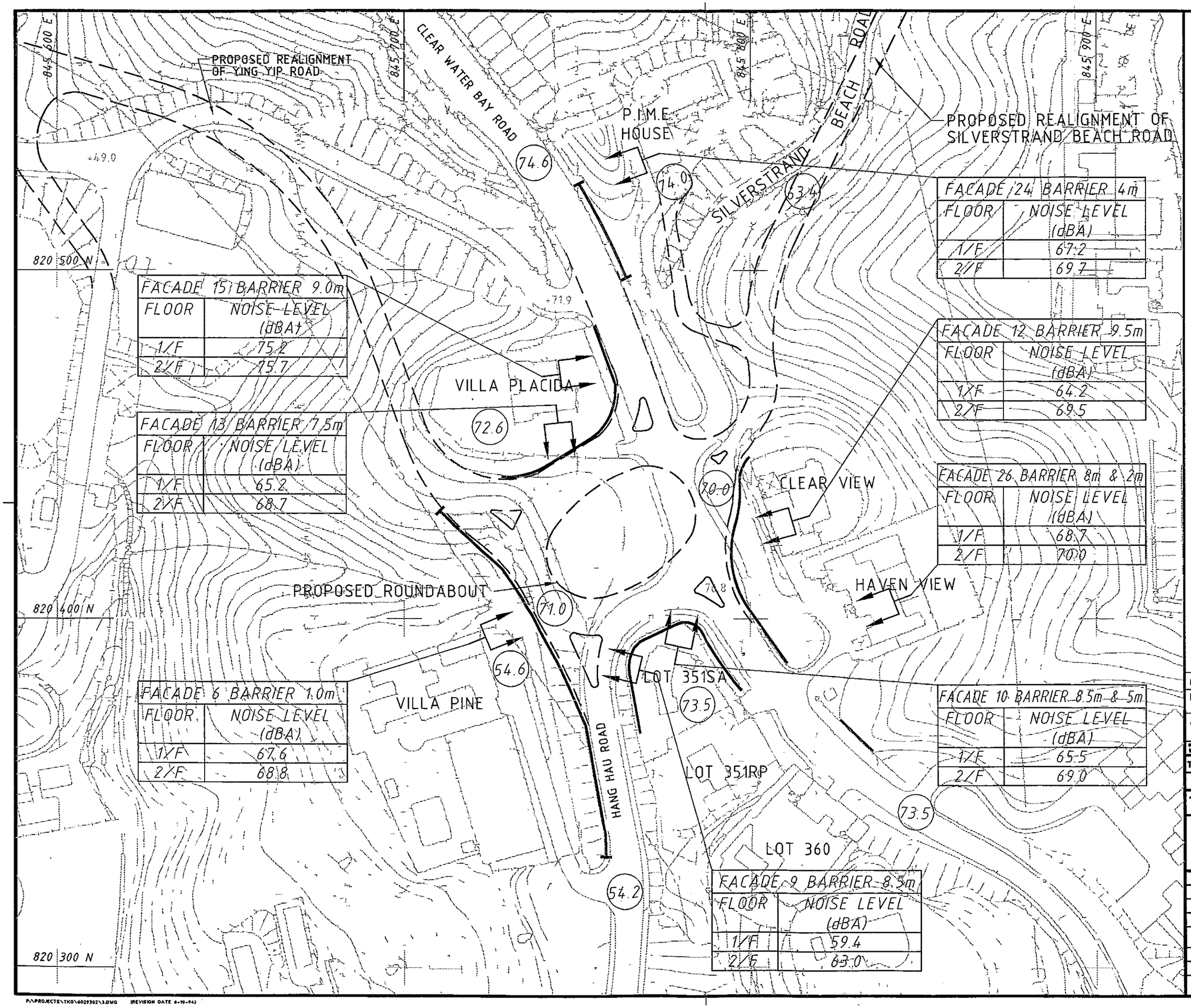

FACADE 15 BARRIER 9.0m	
FLOOR	NOISE LEVEL (dBA)
1/F	75.2
2/F	75.7

FACADE 13 BARRIER 7.5m	
FLOOR	NOISE LEVEL (dBA)
1/F	65.2
2/F	68.7

FACADE 6 BARRIER 1.0m	
FLOOR	NOISE LEVEL (dBA)
1/F	67.6
2/F	68.8

FACADE 24 BARRIER 4m	
FLOOR	NOISE LEVEL (dBA)
1/F	67.2
2/F	69.7

FACADE 12 BARRIER 9.5m	
FLOOR	NOISE LEVEL (dBA)
1/F	64.2
2/F	69.5

FACADE 26 BARRIER 8m & 2m	
FLOOR	NOISE LEVEL (dBA)
1/F	68.7
2/F	70.0

FACADE 10 BARRIER 8.5m & 5m	
FLOOR	NOISE LEVEL (dBA)
1/F	65.5
2/F	69.0

FACADE 9 BARRIER 8.5m	
FLOOR	NOISE LEVEL (dBA)
1/F	59.4
2/F	63.0

LEGEND:

NOISE BARRIER (HEIGHT SHOWN FROM GROUND LEVEL)

ALL NOISE VALUES ARE IN dB(A) L_{10} 1 HOUR.

REV.	DESCRIPTION	DATE	CHECKED
C	GENERAL REVISIONS	10/95	
B	NOISE LEVELS AT FACADE 24 AMENDED.	8/95	
A	ALIGNMENT OF YING YIP ROAD AND ROUNDABOUT REVISED.	6/95	

Territory Development Department 拓展署
KT EAST DEVELOPMENT OFFICE 新界東拓展處

TSEUNG KWAN O DEVELOPMENT

TKO DEVELOPMENT CONTRACT No 40/94
NOISE IMPACT ASSESSMENT

MITIGATION OF TRAFFIC NOISE USING BARRIERS

MAUNSELL CONSULTANTS ASIA LTD

DRG.NO. 60293/T/3C

DATE 11 - 94
SCALE 1 : 1 000
METRES

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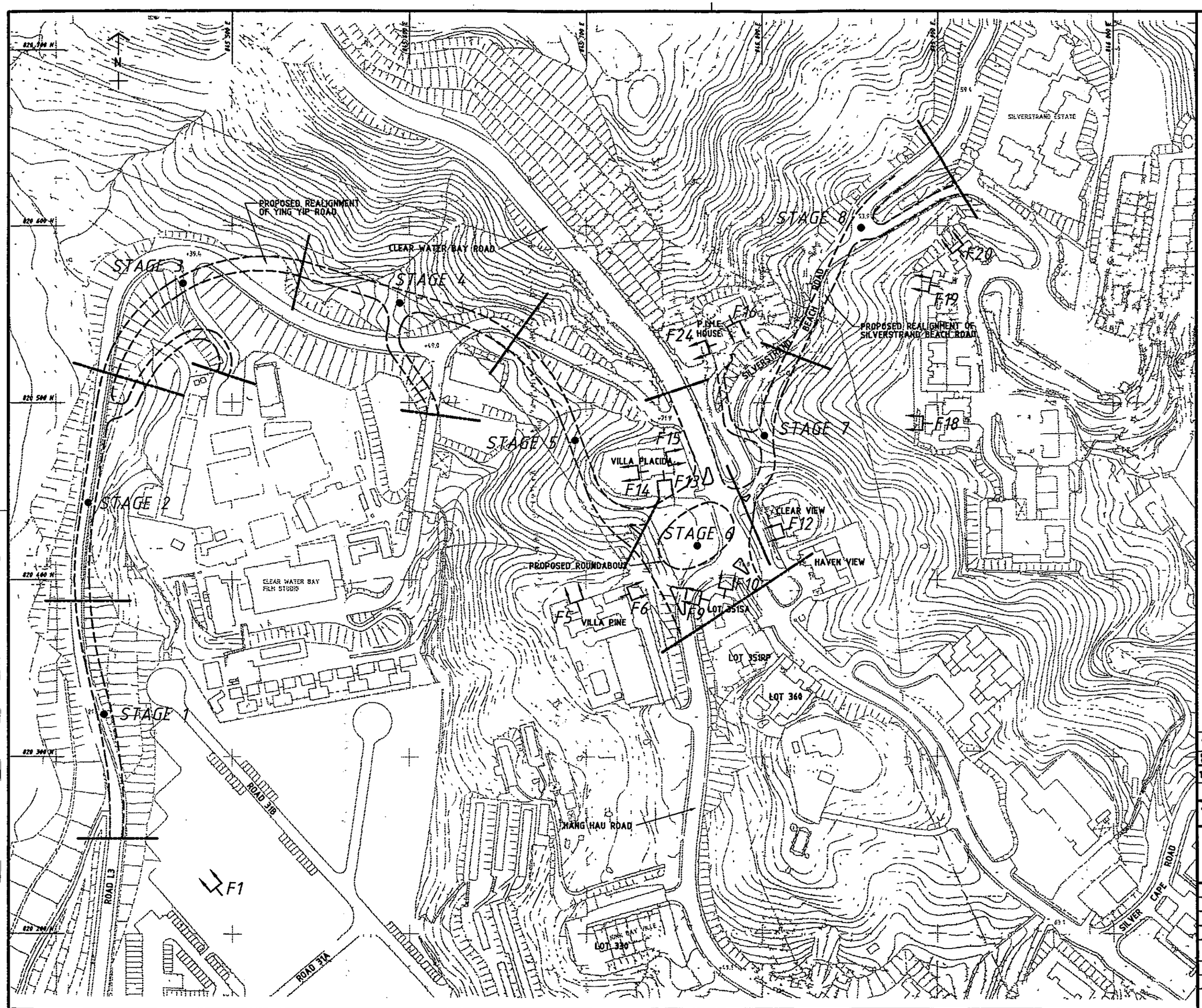

LEGEND:

- CONSTRUCTION STAGES

A	ALIGNMENT OF YING YIP ROAD AND ROUNDABOUT REVISED.	6/95	
DWG. NO.	DESCRIPTION REMARKS	DATE 日期	CHECKED 核准

Territory Development Department 新界發展署
NT EAST DEVELOPMENT OFFICE 新界東發展處

TSEUNG KWAN O DEVELOPMENT

TKO DEVELOPMENT CONTRACT No 40/94
NOISE IMPACT ASSESSMENT

CONSTRUCTION STAGES

DESIGNED 設計
CHKD 核對
DRAWN 繪圖
CHECKED 審核
APPROVED FOR ISSUE 批准

MAUNSELL CONSULTANTS ASIA LTD.

DRG.NO. 圖表編號 60293/T/4 A

CONTRACT NO. 合約編號
DATE OF ISSUE 發出日期

DATE 日期 10 - 94
SCALE 比例 1 : 2 000
DIMENSIONS ARE IN 尺寸單位 METRES

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Tseung Kwan O Development

Improvements to Ying Yip Road and Silverstrand Beach Road at Junctions with Hang Hau Road and Clear Water Bay Road

Contract No. TK 40/94

Environmental Impact Assessment

PART 2

AIR QUALITY IMPACT ASSESSMENT

ENVIRONMENTAL IMPACT ASSESSMENT - PART 2

10 INTRODUCTION TO AIR QUALITY ASSESSMENT

10.1 Background

10.1.1 Improvements to the junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads under Contract No. TK 40/94 are parts of a general scheme of improvements to the road network within Tseung Kwan O New Town. With increased traffic in the foreseeable future and the present high volumes of traffic, the above junctions would become a prime area of concern. The ultimate road improvement scheme involves the realignment of the road network, as well as, the introduction of a four prong roundabout. The works are anticipated to commence in late 1996 and be completed in early 1998. The proposed road layout is illustrated on Drawing No. 60293/A/1A.

10.1.2 The purpose of the assessment is to examine the potential impact of traffic on the air quality in the vicinity of the new roads and identify any adverse impacts on the adjacent properties.

10.1.3 The report investigates the air quality impacts arising from the final road layout at the proposed junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads.

10.2 Scope of Study

10.2.1 The main objective of the study is to assess the future air quality following the proposed improvements to the junctions of Clear Water Bay Road, Hang Hau Road, Ying Yip Road, Silverstrand Beach Road and associated roads. Future levels of pollutants will be checked to ensure that acceptable standards defined in the Hong Kong Air Quality Objectives (HKAQO) will not be exceeded at properties in the area.

10.2.2 The likely impact on air quality arising from construction activities is also examined.

11 AIR QUALITY ASSUMPTIONS AND ASSESSMENT CRITERIA

11.1 General

The assessment of air quality has been undertaken for the future year of 2011 to assess the worst possible impact on air quality. The potential impact of vehicle exhaust emissions has been predicted using the CALINE4 line source dispersion model.

11.2 Traffic Projections

11.2.1 Traffic projections for the air quality assessments have been based on two transport studies in Tseung Kwan O (TKO). These studies are the Feasibility Study of Opportunities for Further Development in TKO, and the development study completed in mid 1993 for Area 137. Predicted flows for the am peak period in 2011 have been used to assess the worst impact and the flows used for the study are shown in Drawing No. 60293/A/1A.

11.3 Vehicle Composition

11.3.1 Forecasts of vehicle proportions for each of the roads were not available for 2011. Existing traffic records have been examined to assess the likely vehicle composition in the future. The vehicle proportions shown in Table 1 were considered to be representative of the area and have been assumed to apply for all road links.

TABLE 1 VEHICLE COMPOSITION FOR AIR QUALITY ASSESSMENTS

Vehicle Category	Proportion (%)
Car	40%
Taxi	20%
Goods vehicle	20%
Bus	20%

11.4 Assessment Criteria

11.4.1 The Air Pollution Control Ordinance provides powers for controlling air pollutants from a variety of sources to protect the community against excessive levels of pollution. Acceptable levels of various pollutants are defined in the Hong Kong Air Quality Objectives (HKAQO). The major pollutants arising from road traffic are carbon monoxide (CO), nitrogen dioxide (NO_2) and respirable suspended particulates (RSP) and the HKAQO's acceptable maximum concentration in respect of these pollutants are listed in Table 2.

TABLE 2 HONG KONG AIR QUALITY OBJECTIVES

Parameter	Average Concentration $\mu g/m^3$			
	1-hour[1]	8-hour[2]	24-hour[2]	Annual
CO	30,000	10,000		
NO_2	300		150	80
RSP			180	55

Notes [1] Not to be exceeded more than three times per year
[2] Not to be exceeded more than once per year

11.4.2 The impact on air quality has been assessed for the peak hour using the criteria stated in Table 2. A significant impact is taken to be where the predicted pollutants exceed the criteria in Table 2.

11.5 Existing Air Quality

11.5.1 The overall levels of pollutants at any location will be a combination of the ambient levels experienced in the area and the locally generated pollutants from road traffic. Existing concentrations of pollutants have been derived from data recorded at the air quality monitoring station in Junk Bay. The station ceased monitoring in 1993 and therefore the last 12 months data collected at the station has been used to determine existing annual average concentrations of pollutants in the Tseung Kwan O area generally.

11.5.2 Pollutant levels may be expected to change in the future as the area is developed. Existing concentrations of nitrous oxides recorded at the Junk Bay monitoring station are low and are not necessarily considered to be representative of conditions in the future. Ambient levels for NO and NO_2 were therefore derived from data recorded at the Tai Po monitoring station which is considered to be more representative of a developed area. The ambient levels of pollutants adopted for the study are shown in Table 3.

TABLE 3 AMBIENT POLLUTANT LEVELS USED IN ASSESSMENTS

Pollutant	Concentration $\mu g/m^3$
Carbon Monoxide (CO)	2090
Nitrogen Dioxide (NO_2)	60
Respirable Suspended Particulates (RSP)	42

11.5.3 The ambient levels of the various pollutants within the Tseung Kwan O area are below the HKAQO values.

11.6 Air Quality Modelling/Assessment Methodology

11.6.1 The impact of vehicle emissions on the adjacent properties was undertaken using the line source dispersion model CALINE4. Pollutants CO, NO_2 and RSP were modelled for the peak hour. For the assessments a worst case scenario of meteorological conditions was assumed as specific data for the Tseung Kwan O area was not available. The procedure estimated the worst possible impact for each receiver coincident with the most unfavourable meteorological conditions. In practice these conditions will only occur infrequently and are not representative of average daily conditions over a long term. The parameters adopted for the modelling are given in Table 4.

TABLE 4 ASSUMED METEOROLOGICAL CONDITIONS FOR WORST CASE SCENARIO

Parameter	Assumption
Wind speed	1 ms^{-1}
Wind direction	Worst case leading to maximum pollutant concentrations at the receiver
Stability Class	D
Mixing height	500 metres

11.6.2 NO_2 concentrations have been assessed by assuming a 20% conversion of NO_x emissions to NO_2.

11.7 Vehicle Emissions

11.7.1 Emission rates for various vehicle types have been taken from data supplied by Environmental Protection Department (EPD). In general, vehicle emissions are predicted to decline in the future due to improved technology and legislation. Full development of Tseung Kwan O is not likely to occur significantly before 2011 and therefore an assessment based on forecast flows for 2011 will provide a realistic base to estimate pollutant levels in the future. The emission factors adopted for the assessments are average values for a range of speeds and are given in Table 5.

TABLE 5 VEHICLE EMISSION FACTORS

Vehicle category	Emission rate (gm/veh/km)		
	CO	NO_x	RSP
Car	13.508	1.321	0.041
Taxi	0.910	0.779	0.238
Goods	8.410	7.061	0.566
Public transport	9.017	8.578	0.894

11.7.2 It has been assumed that all cars are petrol driven and taxis, goods vehicles and public transport vehicles are diesel operated.

12 IDENTIFICATION OF SENSITIVE RECEIVERS

12.1 Receivers which may be affected by pollutants emitted by road traffic have been identified from survey plans of the area and site observations. The affected locations may be broadly defined as those buildings facing Ying Yip Road, Hang Hau Road, Silverstrand Beach Road, Clear Water Bay Road and those buildings in the vicinity of the proposed roundabout on Clear Water Bay Road. The greatest impact will occur on those properties closest to the most heavily trafficked roads, i.e. Clear Water Bay Road and therefore the assessment has been limited to the properties on Clear Water Bay Road in the vicinity of the roundabout.

12.2 In general, receivers have been assumed for buildings at the point closest to the road. This will identify the highest pollutant levels at the property and concentrations at windows will be lower.

13 AIR QUALITY IMPACT ASSESSMENT

13.1 Location of Sensitive Facades

13.1.1 Pollutant levels were modelled at the buildings in the vicinity of the roundabout. The receptors were located in positions which will be representative of the highest levels of road traffic generated pollutants in the area of the proposed improvements.

13.1.2 Pollutant levels were calculated for six receptors at the locations shown on Drawing No. 60293/A/2B, for the following properties:

Lot 351
Villa Pine
Villa Placida
Clear View
Haven View

13.1.3 In general pollutant levels are highest closest to the ground. Pollutant levels have therefore been calculated for the ground storey of buildings as the critical location.

13.2 Impact on Air Quality at Facades

13.2.1 Predicted hourly concentrations of CO, NO_2 and RSP at each of the receptor points are shown on Drawing No. 60293/A/2B. The concentrations include both the pollutants generated from the adjacent highways and the background ambient levels stated in Table 3 and are therefore indicative of absolute levels at the receptors in the future.

13.2.2 The predicted peak hour concentrations of CO and NO_2, at the premises, are less than the maximum 1 hour concentrations defined in the HKAQO. The HKAQO do not stipulate a maximum hourly concentration of RSP but the predicted hourly values are less than the 24 hour criterion.

13.2.3 It is concluded therefore that future traffic flows on the proposed and improved roads forming the TK 40/94 Contract will not have a significant impact on air quality. No measures to mitigate the effects of pollutants from road traffic are therefore required.

13.2.4 The most affected properties will be Villa Placida and the premises closest to the roundabout in Lot 351. Levels of CO will however be significantly below the values stated in the HKAQO. Peak hour concentrations of RSP are also within the HKAQO 24-hour value.

13.2.5 For the peak hour under the assumed worst meteorological scenario a maximum concentration of 185 $\mu g/m^3$ of NO_2 will be attributable to local traffic and this will be less outside the peak hour. Average levels over a 24 hour period will be lower due to the greater dispersion arising from changes in wind direction and will be within the HKAQO specified values.

13.2.6 HKAQO annual average limiting values for NO_2 and RSP are 80 $\mu g/m^3$ and 55 $\mu g/m^3$ respectively. The annual concentration values at the receptors will be noticeably lower than the peak 1-hour concentrations calculated for the worst meteorological conditions. Variations of wind speed, wind direction and traffic flows will result in significantly lower levels of pollutants at the receptors over a period of time. Pollutant levels from road traffic, calculated on an annual basis, will not therefore exceed HKAQO.

13.2.7 Overall the impact of road traffic at the receptors will be low and the resulting concentrations of pollutants are not considered to be a problem. It is concluded therefore that the impact on air quality at the buildings in the vicinity of the proposed improvement works will not be significant.

13.3 Air Quality adjacent to Improvement Scheme

13.3.1 The pollutant concentrations at buildings, shown on Drawing No. 60293/A/2B, are located around the roundabout and illustrate the concentrations which may be expected in the vicinity of the roundabout. The receptors vary between 8 metres at Lot 351 and 20 metres at Haven View, from the edge of the carriageway and all values comply with HKAQO standards.

13.3.2 Pollutant levels are not predicted to be significantly higher at locations closer to the carriageway. At a distance of 3 metres from the edge of the carriageway hourly concentrations are predicted to increase to a maximum of 280 $\mu g/m^3$ for NO_2 and 160 $\mu g/m^3$ for RSP under the worst case assessment scenario. Average concentrations for a 24 hour period will be lower and will not exceed HKAQO.

13.3.3 A short section of noise barrier with height of 2 metres could be included along Clear Water Bay Road at a distance approximately 25 metres in front of PIME House. The total length is in the order of 25 metres. The preliminary assessment indicated that it will not have an adverse effect on the air quality objectives at the sensitive receptors within the vicinity.

13.3.4 It is concluded that pollutant concentrations in the vicinity of the roundabout and improvement scheme will not deteriorate to a level which would affect the use of the adjacent land.

14 AIR QUALITY DURING CONSTRUCTION

14.1 General

14.1.1 Works to be conducted under TKO Contract No. TK 40/94 require the formation of a new roundabout on Clear Water Bay Road and the construction of connections for 3 side roads in addition to the connections required for Clear Water Bay Road. All of the side roads approach the proposed roundabout on gradients and two of the roads, Ying Yip Road and Silverstrand Beach Road are to be realigned and improved on the sloping sections leading to the roundabout.

14.1.2 Most dwellings are located away from the roads to be improved. Several dwellings will however be close to the new roads in the vicinity of the roundabout.

14.2 Major Works

14.2.1 The major works involved in the Contract include:

- Construction of retaining walls and placing of fill material to form the roundabout on Clear Water Bay Road together with connections for approach arms.
- Construction of retaining walls, placing of fill and cutting of hillslopes to form the improved/realigned routes of Silverstrand Beach Road and Ying Yip Road.
- Laying of pavement materials for the new roads.

14.3 Assessment of Air Quality During Construction

14.3.1 The major air quality impacts from road construction projects usually result from dust emissions. Vehicle and plant exhaust emissions do not normally add significant levels of pollutants to the air because the number of emitters are low. Contract TK 40/94 is not large and would not warrant the use of a large on-site batching plant or other facilities which are likely to generate large quantities of dust. The main source of dust will therefore arise from the construction activities on site.

14.3.2 Construction of the new roads under Contract No. TK 40/94 will not require activities which are likely to generate significant volumes of dust. There are no major cutting or fill operations required and the constraints of the site will limit the nature of the earthworks operations. The major source of dust will mainly arise from moving vehicles. Unlike most construction sites all vehicles will need to use the existing roads and the only travel on unpaved roads will be in the immediate area of construction works. Dust from construction vehicles will not therefore be a significant problem.

14.3.3 An assessment of the dust emissions from construction activities was undertaken using the Fugitive Dust Model (FDM). Dust emission factors were calculated for various activities using USEPA Compilation of Air Pollutant Emission Factors (AP-42) for a 30 micron particle size. The parameters adopted for the modelling are as follows:

silt content	= 7% - 25%
mean wind speed	= 2m/s
vehicle weight	= 20 tonnes

A worst case assessment methodology was adopted and the maximum level of total suspended particulates (TSP) predicted at the sensitive receivers was 450$\mu g/m^3$ at Villa Placida. Lower levels were calculated at other locations. Detailed assumptions and sample calculation for the FDM analysis are included in Appendix 4.

14.3.4 The predicted levels of TSP are below the EPD hourly criterion of 500 $\mu g/m^3$. With good working practices on site dust emissions will be lower than those predicted by the analysis. Typical measures to reduce dust emissions include the sheeting of all loose loads being transported to and from the works areas, avoidance of material being deposited on the road and regular sweeping of the adjacent roads. Where dust is noticed to arise from within the works area damping of the material using water sprays will minimise any impact.

14.3.5 It is recommended that clauses defining the transport of materials to and from the site, sweeping of roads, and control of dust emissions from operations are included in the Contract. The Contractor should also have equipment for damping of construction areas and stockpiles should this be required.

15 AIR QUALITY MONITORING AND AUDITING

15.1 General

15.1.1 Monitoring and auditing procedures are required as a check during the construction and operation of a development that the specified control criteria and standards are being complied with. The pre-construction and operation analysis will highlight potential problems and can be used to minimise or eliminate adverse impacts prior to their occurrence. Analysis requires various assumptions to be made which may differ from those actually employed or arising on site and therefore monitoring may be required to confirm that the required standards and objectives are being met.

15.1.2 Auditing defines methods and procedures for ensuring that the monitoring is effectively carried out and that the monitoring will identify adverse impacts. Auditing also covers procedures to be followed in the event that the assumed criteria or standards are exceeded.

15.2 Air Quality Monitoring of Road Traffic Pollutants

15.2.1 It is possible to monitor pollutant levels at the properties adjacent to the proposed improvements following the opening of the scheme and at regular intervals thereafter to confirm that the Hong Kong Air Quality Objectives are not being exceeded. It has already been described in Section 4 that the impact on air quality in the future will not be significant.

15.2.2 The likelihood of HKAQO values being exceeded will be small. It is not therefore recommended that any post opening monitoring should be undertaken.

15.2.3 Properties most likely to be affected by pollutants generated from road traffic will be those in close proximity to the highest traffic flows. The major flows will be those along the section of Clear Water Bay Road north of the proposed roundabout. A check that both the traffic volume and composition are within the forecasts will be a reliable indicator that HKAQO values will not be exceeded.

15.3 Air Quality Monitoring during Construction

15.3.1 Measures which should be regarded as good working practice have already been described to avoid dust nuisance during construction. These include covering of loads, sweeping of roads and the use of water to damp stockpiles and areas of construction work which are noticed to generate dust. The implementation of such measures will avoid HKAQO from being exceeded. Details of requirements and procedures are given in the Environmental Monitoring and Audit Manual.

15.3.2 The construction works for Contract No. TK40/94 are not of a nature to create an impact over a wide area nor are there large groups of dwellings or sensitive receivers which will be susceptible to an impact during construction. However, in view of sensitive receivers are located at only 10-25 metres away from the construction site, there should be regular air quality monitoring during the construction period.

15.3.3 Dust monitoring equipment should be used to monitor the dust levels regularly to ensure the TSP HKAQO Limits and 1-hour TSP guideline level can be met.

15.4 Construction Phase Auditing

15.4.1 In view of the limited impact that construction works will have on air quality it is not considered necessary to make any special provisions. Good working practice and regular site supervision will minimise any impact during construction to negligible levels.

15.4.2 It will be the responsibility of the Contractor to control dust levels to avoid causing a nuisance on adjacent properties. Site supervision staff should initially bring to the attention of the Contractor any operations which cause a visible plume of dust to be emitted from the site. This will allow the Contractor to take action to control emission of dust.

15.4.3 A copy of complaints should be maintained and this should be made available to EPD. For each complaint a report stating the validity of the complaint, the cause and action undertaken to prevent further occurrence should be compiled.

16 CONCLUSIONS AND RECOMMENDATIONS FOR AIR QUALITY ASSESSMENTS

16.1 Future levels of pollutants generated by road traffic have been examined in the vicinity of the proposed road improvements to be constructed under Contract No. TK 40/94. The analysis indicates that pollutant levels in the future will be within the requirements stated in the Hong Kong Air Quality Objectives and it is concluded that the impact upon air quality will not be significant.

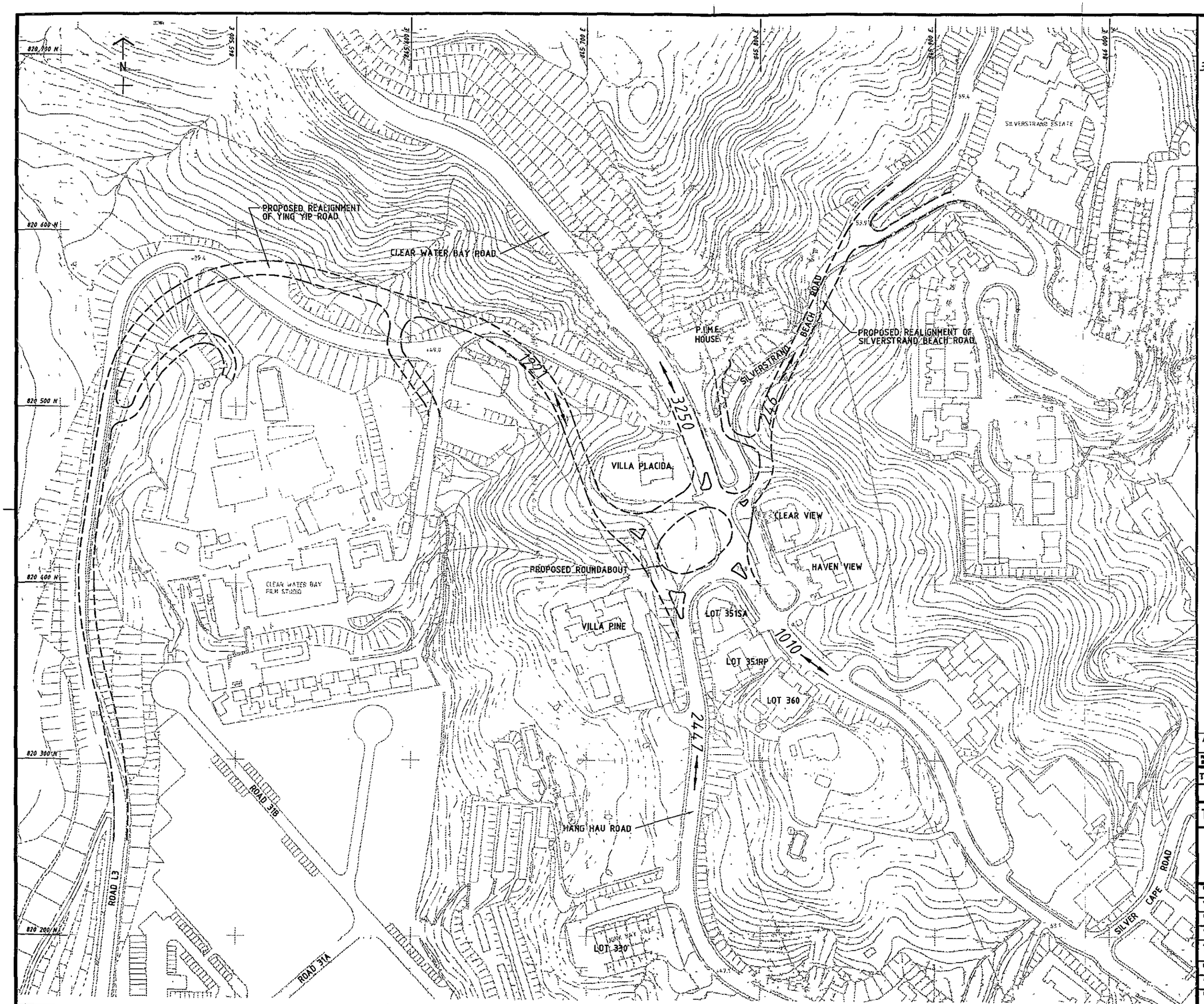
16.2 The assessment has been made assuming that worst case meteorological conditions coincide with peak hour traffic flows. The actual levels of pollutants at the affected properties will in practice be noticeably lower for most of the time.

16.3 Dust is the usual cause for a deterioration of air quality during construction. The nature of the site and associated construction activities will not lead to significant volumes of dust being generated from construction activities. An assessment of the dust emissions from construction activities has shown that TSP levels at the adjacent properties will not exceed the recommended criteria. Good working practices combined with adequate site supervision will be able to further reduce the impact of dust emissions at the adjacent properties. However, in view of sensitive receivers are located at 10-25 metres away from the construction site, regular air quality monitoring should be performed during the construction period.

16.4 It is concluded therefore that the impact upon air quality due to the construction and post operation of the improvement works included in Contract No. TK 40/94 will not be significant. Dust monitoring equipment should be used to monitor the dust impact on a regular basis to prevent any exceedance of the TSP, HKAQO Limits and the 1-hour TSP guideline level.

DRAWINGS - PART 2

AIR QUALITY ASSESSMENT



LEGEND:

3250 → PREDICTED 2-WAY AM PEAK HOUR TRAFFIC FLOW IN 2011 (VEHICLES PER HOUR)

REV.	DESCRIPTION	DATE	CHECKED
A	ALIGNMENT OF YING YIP ROAD AND ROUNDABOUT REVISED.	6/95	

Territory Development Department 拓展署
NT EAST DEVELOPMENT OFFICE 新界東拓展處

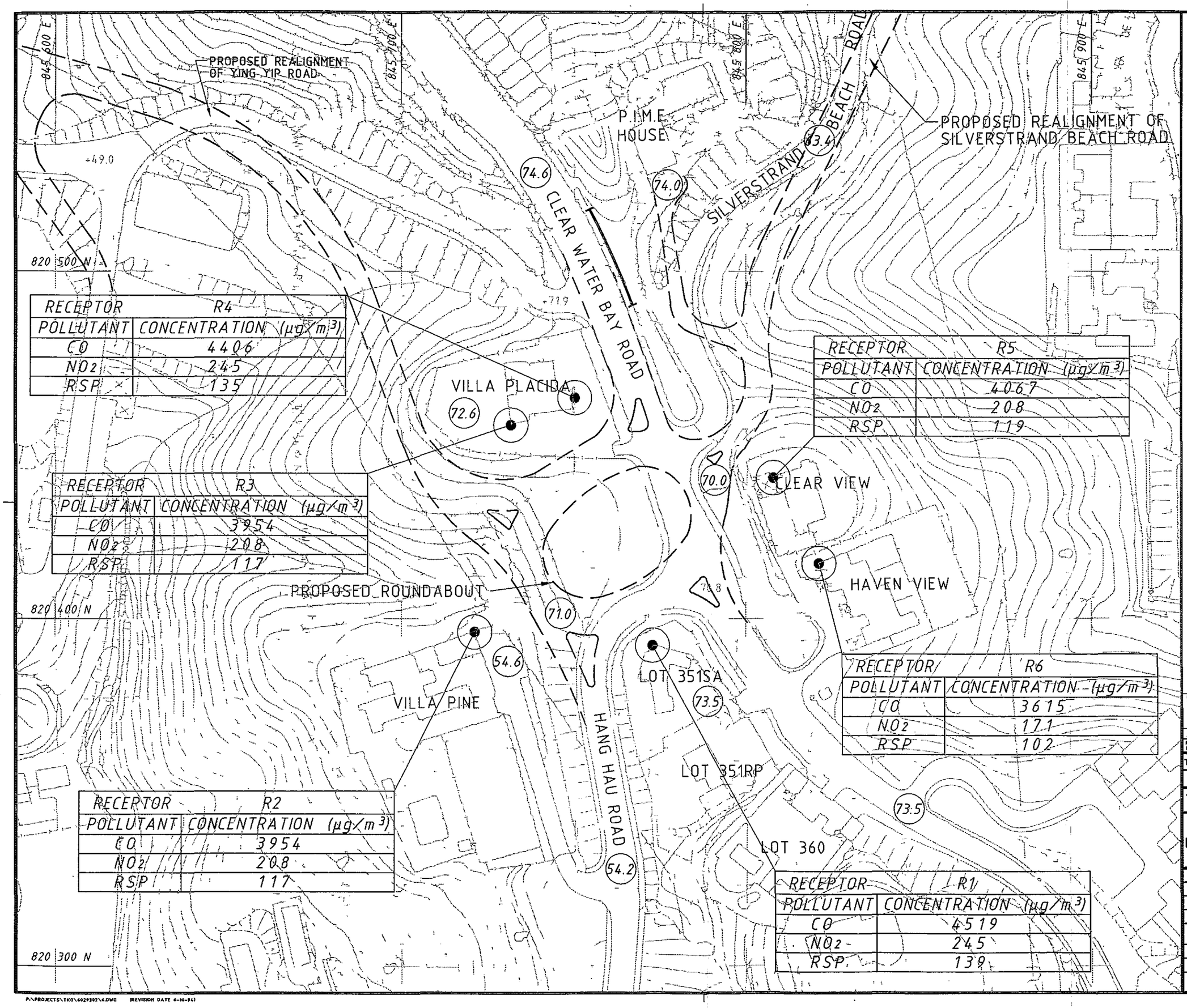
TSEUNG KWAN O DEVELOPMENT

TKO DEVELOPMENT CONTRACT No 40/94
AIR IMPACT ASSESSMENT

PROPOSED ROAD LAYOUT AND TRAFFIC FLOW ASSUMPTIONS

DESIGNED 設計	MAUNSELL CONSULTANTS ASIA LTD.
CHECKED 核對	
DRAWN 繪圖	DRG.NO. 圖則編號 60293/A/1 A
CHECKED 核對	
APPROVED FOR ISSUE 批准以供發出	CONTRACT NO. 合約編號 / DATE OF ISSUE 發出日期
DATE 日期 11 - 94	
SCALE 比例 1 : 2 000	
DIMENSIONS ARE IN 尺寸單位 METRES	© COPYRIGHT RESERVED 版權所有

P:\PROJECTS\TKO\60293\02\S.DWG (REVISION DATE 6-10-94)



RECEPTOR	R4
POLLUTANT	CONCENTRATION ($\mu g/m^3$)
CO	4406
NO_2	245
RSP	135

RECEPTOR	R5
POLLUTANT	CONCENTRATION ($\mu g/m^3$)
CO	4067
NO_2	208
RSP	119

RECEPTOR	R3
POLLUTANT	CONCENTRATION ($\mu g/m^3$)
CO	3954
NO_2	208
RSP	117

RECEPTOR	R6
POLLUTANT	CONCENTRATION ($\mu g/m^3$)
CO	3615
NO_2	171
RSP	102

RECEPTOR	R2
POLLUTANT	CONCENTRATION ($\mu g/m^3$)
CO	3954
NO_2	208
RSP	117

RECEPTOR	R1
POLLUTANT	CONCENTRATION ($\mu g/m^3$)
CO	4519
NO_2	245
RSP	139

NOTES :

CONCENTRATIONS SHOWN ARE FOR AVERAGE HOUR WORST CASE METEOROLOGICAL CONDITIONS COINCIDING WITH PEAK HOUR TRAFFIC FLOWS.

REV.	DESCRIPTION	DATE	CHECKED
B	ALIGNMENT OF YING YIP ROAD AND ROUNDABOUT REVISED. POLLUTANT CONCENTRATIONS UPDATED.	6/95	
A	TSP REPLACED BY RSP	2/95	

Territory Development Department 拓展署

NT EAST DEVELOPMENT OFFICE 新界東拓展處

TSEUNG KWAN O DEVELOPMENT

TKO DEVELOPMENT CONTRACT No 40/94
AIR IMPACT ASSESSMENT

PREDICTED AIR POLLUTION LEVELS FROM ROAD TRAFFIC

DESIGNED 設計
CHECKED 核對
DRAWN 繪圖
CHECKED 核對
APPROVED FOR ISSUE 批准人

MAUNSELL CONSULTANTS ASIA LTD. 茂盛(亞洲)工程顧問有限公司

DRG.NO. 圖紙編號 60293/A/2 B

CONTRACT NO. 合約編號
DATE OF ISSUE 圖紙日期

DATE 日期 11 - 94
SCALE 比例 1 : 1 000
DIMENSIONS ARE IN 尺寸單位 METRES

P:\PROJECTS\TKO\60293\2\6.DWG (REVISION DATE 6-10-94)

APPENDIX 1

Typical CALINE4 Data Input And Output Files For CO

Typical CALINE4 data input file for CO

```
PEAK-V3\CO.DAT
1   CO
      100.000000       28.000000    0.000000E+00    0.000000E+00           1
          18        1.000000           1           1
R1,G/F
      774.000000      393.000000        1.800000
A1
A2
A3
B1
B2
B3
C1
C2
D1
D2
E1
E2
F1
F2
F3
F4
F5
F6
           1      600.000000      557.000000      675.000000      532.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      675.000000      532.000000      709.000000      441.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      709.000000      441.000000      734.000000      423.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      654.000000      632.000000      734.000000      539.000000
    0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
           1      734.000000      539.000000      763.000000      480.000000
    0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
           1      763.000000      480.000000      768.000000      451.000000
    0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
           1      850.000000      594.000000      804.000000      476.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      804.000000      476.000000      788.000000      442.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      890.000000      317.000000      832.000000      354.000000
    0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
           1      832.000000      354.000000      784.000000      415.000000
    0.000000E+00       15.000000    0.000000E+00    0.000000E+00           0
           1      757.000000      246.000000      766.000000      320.000000
    0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
           1      766.000000      320.000000      750.000000      400.000000
    0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
           1      734.000000      423.000000      750.000000      400.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      750.000000      400.000000      784.000000      415.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      784.000000      415.000000      788.000000      442.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      788.000000      442.000000      768.000000      451.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      768.000000      451.000000      748.000000      440.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      748.000000      440.000000      734.000000      423.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
31111CO 1M/S
     1221.000000     1221.000000     1221.000000     3250.000000
     3250.000000     3250.000000      246.000000      246.000000
     1010.000000     1010.000000     2447.000000     2447.000000
     2280.000000     2290.000000     2070.000000     2020.000000
     2060.000000     2060.000000
       14.513000       14.513000       14.513000       14.513000
       14.513000       14.513000       14.513000       14.513000
       14.513000       14.513000       14.513000       14.513000
       14.513000       14.513000       14.513000       14.513000
       14.513000       14.513000
       90.000000        1.000000             4      500.000000       20.000000
        1.850000       25.000000
```

Typical output file from CALINE4 for CO

```
        CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                 JULY 1985 VERSION
                 PAGE   1

             JOB: PEAK-V3\CO.DAT
             RUN: CO 1M/S          (WORST CASE ANGLE)
      POLLUTANT:    CO
```

I. SITE VARIABLES

```
     U=   1.0  M/S            Z0= 100. CM
   BRG= WORST CASE            VD=   .0 CM/S
  CLAS=     4  (D)            VS=   .0 CM/S
  MIXH=  500.  M             AMB=  1.9 PPM
 SIGTH=   20.  DEGREES      TEMP= 25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (M) X1	Y1	X2	Y2	* TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. A1	*	600	557	675	532	* AG	1221	14.5	.0	14.0
B. A2	*	675	532	709	441	* AG	1221	14.5	.0	14.0
C. A3	*	709	441	734	423	* AG	1221	14.5	.0	14.0
D. B1	*	654	632	734	539	* AG	3250	14.5	.0	17.0
E. B2	*	734	539	763	480	* AG	3250	14.5	.0	17.0
F. B3	*	763	480	768	451	* AG	3250	14.5	.0	17.0
G. C1	*	850	594	804	476	* AG	246	14.5	.0	14.0
H. C2	*	804	476	788	442	* AG	246	14.5	.0	14.0
I. D1	*	890	317	832	354	* AG	1010	14.5	.0	13.0
J. D2	*	832	354	784	415	* AG	1010	14.5	.0	15.0
K. E1	*	757	246	766	320	* AG	2447	14.5	.0	13.0
L. E2	*	766	320	750	400	* AG	2447	14.5	.0	13.0
M. F1	*	734	423	750	400	* AG	2280	14.5	.0	16.0
N. F2	*	750	400	784	415	* AG	2290	14.5	.0	16.0
O. F3	*	784	415	788	442	* AG	2070	14.5	.0	16.0
P. F4	*	788	442	768	451	* AG	2020	14.5	.0	16.0
Q. F5	*	768	451	748	440	* AG	2060	14.5	.0	16.0
R. F6	*	748	440	734	423	* AG	2060	14.5	.0	16.0

III. RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (M) X	Y	Z
1. R1,G/F	*	774	393	1.8

JOB: PEAK-V3\CO.DAT
RUN: CO 1M/S (WORST CASE ANGLE)
POLLUTANT: CO

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1,G/F	350.	4.0	.0	.0	.0	.2	.3	.3	.0	.0

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R
1. R1,G/F	.0	.0	.0	.0	.0	.9	.1	.1	.2	.0

APPENDIX 2

Typical CALINE4 Data Input And Output Files For NO_2

Typical CALINE4 data input file for NO_2

```
PEAK-V3\NO2I.DAT
3   NO2  INERT GAS
      100.000000       46.000000    0.000000E+00    0.000000E+00           1
          18        1.000000           1           1
R1,G/F
      774.000000      393.000000        1.800000
A1
A2
A3
B1
B2
B3
C1
C2
D1
D2
E1
E2
F1
F2
F3
F4
F5
F6
           1      600.000000      557.000000      675.000000      532.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      675.000000      532.000000      709.000000      441.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      709.000000      441.000000      734.000000      423.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      654.000000      632.000000      734.000000      539.000000
    0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
           1      734.000000      539.000000      763.000000      480.000000
    0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
           1      763.000000      480.000000      768.000000      451.000000
    0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
           1      850.000000      594.000000      804.000000      476.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      804.000000      476.000000      788.000000      442.000000
    0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
           1      890.000000      317.000000      832.000000      354.000000
    0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
           1      832.000000      354.000000      784.000000      415.000000
    0.000000E+00       15.000000    0.000000E+00    0.000000E+00           0
           1      757.000000      246.000000      766.000000      320.000000
    0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
           1      766.000000      320.000000      750.000000      400.000000
    0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
           1      734.000000      423.000000      750.000000      400.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      750.000000      400.000000      784.000000      415.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      784.000000      415.000000      788.000000      442.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      788.000000      442.000000      768.000000      451.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      768.000000      451.000000      748.000000      440.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
           1      748.000000      440.000000      734.000000      423.000000
    0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
31111NO2 1M/S
     1221.000000     1221.000000     1221.000000     3250.000000
     3250.000000     3250.000000      246.000000      246.000000
     1010.000000     1010.000000     2447.000000     2447.000000
     2280.000000     2290.000000     2070.000000     2020.000000
     2060.000000     2060.000000
        6.099000        6.099000        6.099000        6.099000
        6.099000        6.099000        6.099000        6.099000
        6.099000        6.099000        6.099000        6.099000
        6.099000        6.099000        6.099000        6.099000
        6.099000        6.099000
       90.000000        1.000000               4      500.000000       20.000000
    0.000000E+00       25.000000
```

Typical output file from CALINE4 for NO_2

```
        CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                 JULY 1985 VERSION
                 PAGE   1

             JOB: PEAK-V3\NO2I.DAT
             RUN: NO2 1M/S          (WORST CASE ANGLE)
      POLLUTANT:    NO2  INERT GAS
```

I. SITE VARIABLES

```
     U=   1.0  M/S            Z0= 100. CM
   BRG= WORST CASE            VD=   .0 CM/S
  CLAS=     4  (D)            VS=   .0 CM/S
  MIXH=  500.  M              AMB=   .0 PPM
 SIGTH=   20.  DEGREES       TEMP= 25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (M) X1	Y1	X2	Y2	* TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. A1	*	600	557	675	532	* AG	1221	6.1	.0	14.0
B. A2	*	675	532	709	441	* AG	1221	6.1	.0	14.0
C. A3	*	709	441	734	423	* AG	1221	6.1	.0	14.0
D. B1	*	654	632	734	539	* AG	3250	6.1	.0	17.0
E. B2	*	734	539	763	480	* AG	3250	6.1	.0	17.0
F. B3	*	763	480	768	451	* AG	3250	6.1	.0	17.0
G. C1	*	850	594	804	476	* AG	246	6.1	.0	14.0
H. C2	*	804	476	788	442	* AG	246	6.1	.0	14.0
I. D1	*	890	317	832	354	* AG	1010	6.1	.0	13.0
J. D2	*	832	354	784	415	* AG	1010	6.1	.0	15.0
K. E1	*	757	246	766	320	* AG	2447	6.1	.0	13.0
L. E2	*	766	320	750	400	* AG	2447	6.1	.0	13.0
M. F1	*	734	423	750	400	* AG	2280	6.1	.0	16.0
N. F2	*	750	400	784	415	* AG	2290	6.1	.0	16.0
O. F3	*	784	415	788	442	* AG	2070	6.1	.0	16.0
P. F4	*	788	442	768	451	* AG	2020	6.1	.0	16.0
Q. F5	*	768	451	748	440	* AG	2060	6.1	.0	16.0
R. F6	*	748	440	734	423	* AG	2060	6.1	.0	16.0

III. RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (M) X	Y	Z
1. R1,G/F	*	774	393	1.8

JOB: PEAK-V3\NO2I.DAT
RUN: NO2 1M/S (WORST CASE ANGLE)
POLLUTANT: NO2 INERT GAS

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1,G/F	350.	.5	.0	.0	.0	.0	.1	.1	.0	.0

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R
1. R1,G/F	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0

APPENDIX 3

Typical CALINE4 Data Input And Output Files for RSP

Typical CALINE4 data input file for RSP

```
PEAK-V3\RSP.DAT
4   RSP
      100.000000    61957.000000    0.000000E+00    0.000000E+00          1
          18        1.000000           1            1
R1,G/F
      774.000000      393.000000       1.800000
A1
A2
A3
B1
B2
B3
C1
C2
D1
D2
E1
E2
F1
F2
F3
F4
F5
F6
          1       600.000000      557.000000      675.000000      532.000000
   0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
          1       675.000000      532.000000      709.000000      441.000000
   0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
          1       709.000000      441.000000      734.000000      423.000000
   0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
          1       654.000000      632.000000      734.000000      539.000000
   0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
          1       734.000000      539.000000      763.000000      480.000000
   0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
          1       763.000000      480.000000      768.000000      451.000000
   0.000000E+00       17.000000    0.000000E+00    0.000000E+00           0
          1       850.000000      594.000000      804.000000      476.000000
   0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
          1       804.000000      476.000000      788.000000      442.000000
   0.000000E+00       14.000000    0.000000E+00    0.000000E+00           0
          1       890.000000      317.000000      832.000000      354.000000
   0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
          1       832.000000      354.000000      784.000000      415.000000
   0.000000E+00       15.000000    0.000000E+00    0.000000E+00           0
          1       757.000000      246.000000      766.000000      320.000000
   0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
          1       766.000000      320.000000      750.000000      400.000000
   0.000000E+00       13.000000    0.000000E+00    0.000000E+00           0
          1       734.000000      423.000000      750.000000      400.000000
   0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
          1       750.000000      400.000000      784.000000      415.000000
   0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
          1       784.000000      415.000000      788.000000      442.000000
   0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
          1       788.000000      442.000000      768.000000      451.000000
   0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
          1       768.000000      451.000000      748.000000      440.000000
   0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
          1       748.000000      440.000000      734.000000      423.000000
   0.000000E+00       16.000000    0.000000E+00    0.000000E+00           0
31111RSP 1M/S
     1221.000000     1221.000000     1221.000000     3250.000000
     3250.000000     3250.000000      246.000000      246.000000
     1010.000000     1010.000000     2447.000000     2447.000000
     2280.000000     2290.000000     2070.000000     2020.000000
     2060.000000     2060.000000
    5.696000E-01    5.696000E-01    5.696000E-01    5.696000E-01
    5.696000E-01    5.696000E-01    5.696000E-01    5.696000E-01
    5.696000E-01    5.696000E-01    5.696000E-01    5.696000E-01
    5.696000E-01    5.696000E-01    5.696000E-01    5.696000E-01
    5.696000E-01    5.696000E-01
       90.000000       1.000000           4       500.000000       20.000000
    0.000000E+00      25.000000
```

Typical output file from CALINE4 for RSP

```
        CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                 JULY 1985 VERSION
                 PAGE   1

             JOB: PEAK-V3\RSP.DAT
             RUN: RSP 1M/S          (WORST CASE ANGLE)
      POLLUTANT:    RSP
      (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

  I.  SITE VARIABLES

       U=   1.0  M/S            ZO= 100. CM
     BRG= WORST CASE            VD=   .0 CM/S
    CLAS=     4  (D)            VS=   .0 CM/S
    MIXH=  500.  M              AMB=   .0 PPM
   SIGTH=   20.  DEGREES       TEMP= 25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (M) X1	Y1	X2	Y2	* TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. A1	*	600	557	675	532	* AG	1221	.6	.0	14.0
B. A2	*	675	532	709	441	* AG	1221	.6	.0	14.0
C. A3	*	709	441	734	423	* AG	1221	.6	.0	14.0
D. B1	*	654	632	734	539	* AG	3250	.6	.0	17.0
E. B2	*	734	539	763	480	* AG	3250	.6	.0	17.0
F. B3	*	763	480	768	451	* AG	3250	.6	.0	17.0
G. C1	*	850	594	804	476	* AG	246	.6	.0	14.0
H. C2	*	804	476	788	442	* AG	246	.6	.0	14.0
I. D1	*	890	317	832	354	* AG	1010	.6	.0	13.0
J. D2	*	832	354	784	415	* AG	1010	.6	.0	15.0
K. E1	*	757	246	766	320	* AG	2447	.6	.0	13.0
L. E2	*	766	320	750	400	* AG	2447	.6	.0	13.0
M. F1	*	734	423	750	400	* AG	2280	.6	.0	16.0
N. F2	*	750	400	784	415	* AG	2290	.6	.0	16.0
O. F3	*	784	415	788	442	* AG	2070	.6	.0	16.0
P. F4	*	788	442	768	451	* AG	2020	.6	.0	16.0
Q. F5	*	768	451	748	440	* AG	2060	.6	.0	16.0
R. F6	*	748	440	734	423	* AG	2060	.6	.0	16.0

III. RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (M) X	Y	Z
1. R1,G/F	*	774	393	1.8

JOB: PEAK-V3\RSP.DAT
RUN: RSP 1M/S (WORST CASE ANGLE)
POLLUTANT: RSP
(NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1,G/F	350.	96.4	.1	.3	.0	7.2	13.1	12.5	.1	.3

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R
1. R1,G/F	.0	.3	.0	.0	.0	39.6	6.0	6.5	8.5	1.9

APPENDIX 4

Details of FDM Dust Analysis

APPENDIX 4

FUGITIVE DUST MODEL FOR IMPROVEMENTS TO YING YIP ROAD AND SILVERSTRAND BEACH ROAD AT JUNCTION WITH HANG HAU ROAD AND CLEAR WATER BAY ROAD

Assumptions

- A worst case scenario was used to model the maximum possible dust emissions during construction.
- TSP concentrations were assessed for dwellings at Villa Pine, Villa Placida, Clear View, PIME House and LOT 351.
- Trucks delivering materials to the site are assumed to use the existing paved highways.
- The areas of fill are considered as sources which emit dust through the deposition and handling of fill material and from an exposed site surface. The embankment areas are separated into areas of roughly $1000m^2$ each. It is assumed that trucks deposit 13 tonnes of fill material on each area every 10 minutes. The dumping of the fill is considered as a point source in the centre of each embankment area.
- A moisture content of 10% is assumed for fill materials to achieve satisfactory compaction.
- Areas of cut are considered as sources which emit dust through soft excavation and from an exposed site durface. It is assumed that 13 tonnes are excavated every 10 minutes.
- The emission rates for TSP below 30μm are taken from "Compilation of Air Pollutant Emission Factors" (AP-42)(USEPA, 4th edn 1986). Particles of larger sizes tend to settle out within short distances of plant and are therefore not considered. It is assumed that background dust is negligible.
- One hour average concentrations in $\mu g/m^3$ are calculated by FDM for 16 different wind directions for a wind velocity of $2ms^{-1}$ to assess the worst impact.

Results

- The highest TSP concentration for the worst wind direction is $448\mu g/m^3$ at Villa Placida. Lower levels are calculated at the other receptor locations.
- One hour TSP concentrations at each of the receivers are tabulated as follows:

Dwelling	TSP Concentration ($\mu g/m^3$) (1-hour average)
Villa Pine	211
Villa Placida	448
Clear View	126
PIME House	376
LOT 351	267

- The TSP concentrations calculated fall below the EPD hourly standard of $500\mu g/m^3$. With good working practices on site these levels can be further reduced.

CALCULATION OF DUST EMISSION FACTORS

(using rates taken from "Compilation of Air Pollutant Emission Factors" (AP-42)(USEPA, 4th edn. 1986)

Industrial Paved Roads (11.2.6)

For Access Roads carrying 20t trucks

Surface material silt content(S) = 7%

Surface dust loading (L) = 4000kg/km

$TSP \leq 30\mu m$ 1.7 (kg/veh-km)

TSP Emission $= \frac{1.7 \times (veh/hr)}{3600}$ g/m-sec

Handling Material (11.2.3)

For a truck depositing fill once every 10 mins. (13t each trip)

Weight of fill dumped in 1 sec $= \frac{13}{10 \times 60} = 21.67 \times 10^{-3}$ t/s

Assume dumping to occur at point source in centre of area involved

For moisture content of 10% and silt content of 25%

$TSP \leq 30\mu m$ = 0.0004kg/t

TSP Emission $= 21.67 \times 10^{-3} \times 0.0004 \times 10^{3}$

$= 8.667 \times 10^{-3}$ g/s

Filling Area - Exposed Site Surface (Table 8.19. 1-1)

$TSP \leq 30\mu m$ Emission = 3.9kg/hectare/day

= 0.39g/m^2/day

$= \frac{0.39}{24x60x60}$ g/m^2/s $= 4.514 \times 10^{-6}$ g/m^2/s

Soft Excavation (11.2.3)

$TSP \leq 30\mu m$ Emission = 0.0004kg/tonne

Assuming 13 tonnes taken every 10 mins

TSP Emission $= \frac{0.0004 \times 13 \times 10^{3}}{10 \times 60}$ g/s

$= 8.67 \times 10^{-3}$ g/s

Dividing by area involved

$TSP \leq 30\mu m$ Emission $= \frac{8.67 \times 10^{-3}}{A}$ g/m^2 - sec

FDM data input file for assessment of dust during construction

```
 YING YIP RD AND SILVERSTRAND BEACH RD / HANGHAU RD AND CLEAR WATER BAY RD
 1 1 1 2 1 1 4 1 1 1 1
   28   5    1   16
 60.      1.        1.        2.5
30.
1.
845723.0  820392.0
845732.0  820456.0
845812.0  820427.0
845781.0  820531.0
845771.0  820391.0
 30.451400E-05        845845.0  820500.0      20.0      50.0          -26.
 30.451400E-05        845828.0  820509.0      20.0      50.0          -26.
 30.451400E-05        845820.0  820528.0      10.0     100.0          -26
 30.451400E-05        845787.0  820466.0      20.0      50.0          21.
 30.451400E-05        845777.0  820447.0      10.0     100.0          21.
 30.451400E-05        845769.0  820425.0      20.0      50.0          21.
 30.451400E-05        845751.0  820417.0      20.0      50.0          21.
 30.451400E-05        845722.0  820411.0      20.0      50.0          21.
 30.451400E-05        845694.0  820478.0      10.0     100.0          21.
 30.451400E-05        845689.0  820445.0      20.0      50.0          21.
 30.451400E-05        845667.0  820460.0      10.0     100.0          21.
 30.451400E-05        845670.0  820492.0      20.0      50.0          21.
 30.451400E-05        845629.0  820545.0      10.0     100.0          68.
 30.451400E-05        845531.0  820572.0      10.0     100.0          79.
 30.451400E-05        845449.0  820539.0      10.0     100.0          48.
 30.451400E-05        845420.0  820447.0      10.0     100.0          82
 30.451400E-05        845422.0  820348.0      10.0     100.0          -80
 30.867000E-05        845872.0  820598.0      50.0      20.0          -71
 20.0118000           845675.0  820526.0  845583.0  820564.0          6.
 20.0118000           845582.0  820563.0  845483.0  820579.0          6.
 20.0118000           845481.0  820574.0  845417.0  820503.0          6.
 20.0118000           845427.0  820498.0  845414.0  820400.0          6.
 20.0118000           845414.0  820398.0  845432.0  820301.0          6.
 10.866700E-02        845820.0  820527.0
 10.866700E-02        845770.0  820425.0
 10.866700E-02        845751.0  820418.0
 10.866700E-02        845694.0  820474.0
 10.866700E-02        845630.0  820545.0
      2.00     0.       4        500.        297.0
      2.00     22.5     4        500.        297.0
      2.00     45.      4        500.        297.0
      2.00     67.5     4        500.        297.0
      2.00     90.      4        500.        297.0
      2.00     112.5    4        500.        297.0
      2.00     135.     4        500.        297.0
      2.00     157.5    4        500.        297.0
      2.00     180.     4        500.        297.0
      2.00     202.5    4        500.        297.0
      2.00     225.     4        500.        297.0
      2.00     247.5    4        500.        297.0
      2.00     270.     4        500.        297.0
      2.00     292.5    4        500.        297.0
      2.00     315.     4        500.        297.0
      2.00     337.5    4        500.        297.0
```

Output file from FDM for assessment of dust during construction

1

FUGITIVE DUST MODEL (FDM)
VERSION 90121
MAY, 1990

RUN TITLE:
YING YIP RD AND SILVERSTRAND BEACH RD / HANGHAU RD AND CLEAR WATER BAY RD

INPUT FILE NAME: yingyip.IN
OUTPUT FILE NAME: yingyip.OUT

CONVERGENCE OPTION 1=OFF, 2=ON	1
MET OPTION SWITCH, 1=CARDS, 2=PREPROCESSED	1
PLOT FILE OUTPUT, 1=NO, 2=YES	1
MET DATA PRINT SWITCH, 1=NO, 2=YES	2
POST-PROCESSOR OUTPUT, 1=NO, 2=YES	1
DEP. VEL./GRAV. SETL. VEL., 1=DEFAULT, 2=USER	1
PRINT 1-HOUR AVERAGE CONCEN, 1=NO, 2=YES	4
PRINT 3-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT 8-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT 24-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT LONG-TERM AVERAGE CONCEN, 1=NO, 2=YES	1
NUMBER OF SOURCES PROCESSED	28
NUMBER OF RECEPTORS PROCESSED	5
NUMBER OF PARTICLE SIZE CLASSES	1
NUMBER OF HOURS OF MET DATA PROCESSED	16
LENGTH IN MINUTES OF 1-HOUR OF MET DATA	60.
ROUGHNESS LENGTH IN CM	1.00
SCALING FACTOR FOR SOURCE AND RECPTORS	1.0000
PARTICLE DENSITY IN G/CM**3	2.50

GENERAL PARTICLE SIZE CLASS INFORMATION

PARTICLE SIZE CLASS	CHAR. DIA. (UM)	GRAV. SETTLING VELOCITY (M/SEC)	DEPOSITION VELOCITY (M/SEC)	FRACTION IN EACH SIZE CLASS
1	30.0000000	**	**	1.0000

** COMPUTED BY FDM

1

RECEPTOR COORDINATES (X,Y,Z)

(845723., 820392., 0.) (845732., 820456., 0.) (845812., 820427., 0.)
(845781., 820531., 0.) (845771., 820391., 0.) (

1

SOURCE INFORMATION

TYPE	ENTERED EMIS. RATE (G/SEC, G/SEC/M OR G/SEC/M**2)	TOTAL EMISSION RATE (G/SEC)	WIND SPEED FAC.	X1 (M)	Y1 (M)	X2 (M)	Y2 (M)	HEIGHT (M)	WIDTH (M)
3	0.000004514	0.00451	0.000	845845.	820500.	20.	50.	0.50	-26.00
3	0.000004514	0.00451	0.000	845828.	820509.	20.	50.	0.50	-26.00
3	0.000004514	0.00451	0.000	845820.	820528.	10.	100.	0.50	-26.00
3	0.000004514	0.00451	0.000	845787.	820466.	20.	50.	0.50	21.00
3	0.000004514	0.00451	0.000	845777.	820447.	10.	100.	0.50	21.00
3	0.000004514	0.00451	0.000	845769.	820425.	20.	50.	0.50	21.00
3	0.000004514	0.00451	0.000	845751.	820417.	20.	50.	0.50	21.00
3	0.000004514	0.00451	0.000	845722.	820411.	20.	50.	0.50	21.00
3	0.000004514	0.00451	0.000	845694.	820478.	10.	100.	0.50	21.00
3	0.000004514	0.00451	0.000	845689.	820445.	20.	50.	0.50	21.00
3	0.000004514	0.00451	0.000	845667.	820460.	10.	100.	0.50	21.00
3	0.000004514	0.00451	0.000	845670.	820492.	20.	50.	0.50	21.00
3	0.000004514	0.00451	0.000	845629.	820545.	10.	100.	0.50	68.00
3	0.000004514	0.00451	0.000	845531.	820572.	10.	100.	0.50	79.00
3	0.000004514	0.00451	0.000	845449.	820539.	10.	100.	0.50	48.00
3	0.000004514	0.00451	0.000	845420.	820447.	10.	100.	0.50	82.00
3	0.000004514	0.00451	0.000	845422.	820348.	10.	100.	0.50	-80.00
3	0.000008670	0.00867	0.000	845872.	820598.	50.	20.	0.50	-71.00
2	0.011800000	1.17456	0.000	845675.	820526.	845583.	820564.	0.50	6.00
2	0.011800000	1.18336	0.000	845582.	820563.	845483.	820579.	0.50	6.00
2	0.011800000	1.12793	0.000	845481.	820574.	845417.	820503.	0.50	6.00
2	0.011800000	1.16653	0.000	845427.	820498.	845414.	820400.	0.50	6.00
2	0.011800000	1.16414	0.000	845414.	820398.	845432.	820301.	0.50	6.00
1	0.008667000	0.00867	0.000	845820.	820527.	0.	0.	0.50	0.00
1	0.008667000	0.00867	0.000	845770.	820425.	0.	0.	0.50	0.00
1	0.008667000	0.00867	0.000	845751.	820418.	0.	0.	0.50	0.00
1	0.008667000	0.00867	0.000	845694.	820474.	0.	0.	0.50	0.00
1	0.008667000	0.00867	0.000	845630.	820545.	0.	0.	0.50	0.00
		5.94527							

TOTAL EMISSIONS

1

1 HOUR AVERAGE FOR HOUR ENDING 1
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 56.305) (845732., 820456., 0.000) (845812., 820427., 10.605)
(845781., 820531., 0.000) (845771., 820391., 159.594) (

1

1 HOUR AVERAGE FOR HOUR ENDING 1
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 3.895) (845732., 820456., 0.000) (845812., 820427., 0.734)
(845781., 820531., 0.000) (845771., 820391., 11.040) (

1

1 HOUR AVERAGE FOR HOUR ENDING 2
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 56.108) (845732., 820456., 0.145) (845812., 820427., 8.857)
(845781., 820531., 0.000) (845771., 820391., 47.349) (

1

1 HOUR AVERAGE FOR HOUR ENDING 2
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 3.881) (845732., 820456., 0.010) (845812., 820427., 0.613)
(845781., 820531., 0.000) (845771., 820391., 3.275) (

1

1 HOUR AVERAGE FOR HOUR ENDING 3
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 150.668) (845732., 820456., 9.560) (845812., 820427., 0.055)
(845781., 820531., 2.403) (845771., 820391., 15.886) (

1

1 HOUR AVERAGE FOR HOUR ENDING 3
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 10.423) (845732., 820456., 0.661) (845812., 820427., 0.004)
(845781., 820531., 0.166) (845771., 820391., 1.099) (

1

1 HOUR AVERAGE FOR HOUR ENDING 4
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 51.970) (845732., 820456., 14.568) (845812., 820427., 0.000)
(845781., 820531., 4.997) (845771., 820391., 4.736) (
1

1 HOUR AVERAGE FOR HOUR ENDING 4
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 3.595) (845732., 820456., 1.008) (845812., 820427., 0.000)
(845781., 820531., 0.346) (845771., 820391., 0.328) (
1

1 HOUR AVERAGE FOR HOUR ENDING 5
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 44.322) (845732., 820456., 9.732) (845812., 820427., 0.000)
(845781., 820531., 57.529) (845771., 820391., 0.001) (
1

1 HOUR AVERAGE FOR HOUR ENDING 5
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 3.066) (845732., 820456., 0.673) (845812., 820427., 0.000)
(845781., 820531., 3.980) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 6
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 3.720) (845732., 820456., 15.624) (845812., 820427., 0.000)
(845781., 820531., 15.524) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 6
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 0.257) (845732., 820456., 1.081) (845812., 820427., 0.000)
(845781., 820531., 1.074) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 7
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 24.424) (845732., 820456., 49.886) (845812., 820427., 0.000)
(845781., 820531., 10.079) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 7
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 1.690) (845732., 820456., 3.451) (845812., 820427., 0.000)
(845781., 820531., 0.697) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 8
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 0.646) (845732., 820456., 74.736) (845812., 820427., 0.000)
(845781., 820531., 4.281) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 8
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 0.045) (845732., 820456., 5.170) (845812., 820427., 0.000)
(845781., 820531., 0.296) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 9
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 2.292) (845732., 820456., 6.926) (845812., 820427., 0.000)
(845781., 820531., 17.068) (845771., 820391., 0.000) (
1

1 HOUR AVERAGE FOR HOUR ENDING 9
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 0.159) (845732., 820456., 0.479) (845812., 820427., 0.000)
(845781., 820531., 1.181) (845771., 820391., 0.000) (

1

1 HOUR AVERAGE FOR HOUR ENDING 10
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 4.682) (845732., 820456., 15.241) (845812., 820427., 1.493)
(845781., 820531., 9.539) (845771., 820391., 0.000) (

1

1 HOUR AVERAGE FOR HOUR ENDING 10
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 0.324) (845732., 820456., 1.054) (845812., 820427., 0.103)
(845781., 820531., 0.660) (845771., 820391., 0.000) (

1

1 HOUR AVERAGE FOR HOUR ENDING 11
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 2.190) (845732., 820456., 13.952) (845812., 820427., 7.115)
(845781., 820531., 3.797) (845771., 820391., 0.000) (

1

1 HOUR AVERAGE FOR HOUR ENDING 11
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 0.152) (845732., 820456., 0.965) (845812., 820427., 0.492)
(845781., 820531., 0.263) (845771., 820391., 0.000) (

1

1 HOUR AVERAGE FOR HOUR ENDING 12
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 7.566) (845732., 820456., 53.754) (845812., 820427., 30.057)
(845781., 820531., 38.383) (845771., 820391., 2.332) (

1

1 HOUR AVERAGE FOR HOUR ENDING 12
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 0.523) (845732., 820456., 3.719) (845812., 820427., 2.079)
(845781., 820531., 2.655) (845771., 820391., 0.161) (

1

1 HOUR AVERAGE FOR HOUR ENDING 13
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 47.218) (845732., 820456., 61.410) (845812., 820427., 125.619)
(845781., 820531., 375.691) (845771., 820391., 51.027) (

1

1 HOUR AVERAGE FOR HOUR ENDING 13
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 3.266) (845732., 820456., 4.248) (845812., 820427., 8.690)
(845781., 820531., 25.989) (845771., 820391., 3.530) (

1

1 HOUR AVERAGE FOR HOUR ENDING 14
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 50.768) (845732., 820456., 161.971) (845812., 820427., 102.243)
(845781., 820531., 6.227) (845771., 820391., 74.374) (

1

1 HOUR AVERAGE FOR HOUR ENDING 14
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 3.512) (845732., 820456., 11.205) (845812., 820427., 7.073)
(845781., 820531., 0.431) (845771., 820391., 5.145) (

1

1 HOUR AVERAGE FOR HOUR ENDING 15
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 132.633) (845732., 820456., 447.711) (845812., 820427., 38.506)
(845781., 820531., 0.000) (845771., 820391., 267.139) (

1

1 HOUR AVERAGE FOR HOUR ENDING 15
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 9.175) (845732., 820456., 30.971) (845812., 820427., 2.664)
(845781., 820531., 0.000) (845771., 820391., 18.480) (

1

1 HOUR AVERAGE FOR HOUR ENDING 16
CONCENTRATIONS IN MICROGRAMS/M**3

(845723., 820392., 211.086) (845732., 820456., 1.417) (845812., 820427., 14.472)
(845781., 820531., 0.000) (845771., 820391., 57.840) (

1

1 HOUR AVERAGE FOR HOUR ENDING 16
DEPOSITION RATE IN MICROGRAMS/M**2/SEC

(845723., 820392., 14.602) (845732., 820456., 0.098) (845812., 820427., 1.001)
(845781., 820531., 0.000) (845771., 820391., 4.001) (

1

METEOROLOGICAL DATA FOR DAY 1. (HOURS -7 TO 16)

WIND SPEED (M/SEC)	WIND DIRECTION (DEGREES)	STABILITY CLASS (TURNER)	MIXING HEIGHT (M)	AMBIENT TEMP. (DEG. K)
2.00	0.	4	500.	297.0
2.00	23.	4	500.	297.0
2.00	45.	4	500.	297.0
2.00	68.	4	500.	297.0
2.00	90.	4	500.	297.0
2.00	113.	4	500.	297.0
2.00	135.	4	500.	297.0
2.00	158.	4	500.	297.0
2.00	180.	4	500.	297.0
2.00	203.	4	500.	297.0
2.00	225.	4	500.	297.0
2.00	248.	4	500.	297.0
2.00	270.	4	500.	297.0
2.00	293.	4	500.	297.0
2.00	315.	4	500.	297.0
2.00	338.	4	500.	297.0

1

TOP 50 TABLE FOR 1 HOUR AVERAGES

RANK	RECEPTOR	X-COORDINATE	Y-COORDINATE	ENDING HOUR	CONCENTRATION	DEPOSITION
1	2	845732.0	820456.0	15	447.7105	30.9711
2	4	845781.0	820531.0	13	375.6905	25.9890
3	5	845771.0	820391.0	15	267.1389	18.4798
4	1	845723.0	820392.0	16	211.0858	14.6022
5	2	845732.0	820456.0	14	161.9705	11.2046
6	5	845771.0	820391.0	1	159.5942	11.0402
7	1	845723.0	820392.0	3	150.6675	10.4227
8	1	845723.0	820392.0	15	132.6326	9.1751
9	3	845812.0	820427.0	13	125.6187	8.6899
10	3	845812.0	820427.0	14	102.2430	7.0728
11	2	845732.0	820456.0	8	74.7364	5.1700
12	5	845771.0	820391.0	14	74.3741	5.1450
13	2	845732.0	820456.0	13	61.4105	4.2482
14	5	845771.0	820391.0	16	57.8402	4.0012
15	4	845781.0	820531.0	5	57.5293	3.9797
16	1	845723.0	820392.0	1	56.3050	3.8950
17	1	845723.0	820392.0	2	56.1082	3.8814
18	2	845732.0	820456.0	12	53.7537	3.7185
19	1	845723.0	820392.0	4	51.9695	3.5951
20	5	845771.0	820391.0	13	51.0265	3.5298
21	1	845723.0	820392.0	14	50.7684	3.5120
22	2	845732.0	820456.0	7	49.8860	3.4509
23	5	845771.0	820391.0	2	47.3486	3.2754
24	1	845723.0	820392.0	13	47.2178	3.2664
25	1	845723.0	820392.0	5	44.3218	3.0660
26	3	845812.0	820427.0	15	38.5061	2.6637
27	4	845781.0	820531.0	12	38.3825	2.6552
28	3	845812.0	820427.0	12	30.0573	2.0793
29	1	845723.0	820392.0	7	24.4240	1.6896
30	4	845781.0	820531.0	9	17.0683	1.1807
31	5	845771.0	820391.0	3	15.8865	1.0990
32	2	845732.0	820456.0	6	15.6238	1.0808
33	4	845781.0	820531.0	6	15.5241	1.0739
34	2	845732.0	820456.0	10	15.2410	1.0543
35	2	845732.0	820456.0	4	14.5682	1.0078
36	3	845812.0	820427.0	16	14.4721	1.0011
37	2	845732.0	820456.0	11	13.9516	0.9651
38	3	845812.0	820427.0	1	10.6050	0.7336
39	4	845781.0	820531.0	7	10.0791	0.6972
40	2	845732.0	820456.0	5	9.7321	0.6732
41	2	845732.0	820456.0	3	9.5604	0.6614
42	4	845781.0	820531.0	10	9.5387	0.6599
43	3	845812.0	820427.0	2	8.8571	0.6127
44	1	845723.0	820392.0	12	7.5663	0.5234
45	3	845812.0	820427.0	11	7.1149	0.4922
46	2	845732.0	820456.0	9	6.9260	0.4791
47	4	845781.0	820531.0	14	6.2266	0.4307
48	4	845781.0	820531.0	4	4.9971	0.3457
49	5	845771.0	820391.0	4	4.7358	0.3276
50	1	845723.0	820392.0	10	4.6819	0.3239

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HIGHEST AND SECOND HIGHEST VALUES FOR 1 HOUR AVERAGES

RECEPTOR	X-COORDINATE	Y-COORDINATE	HIGHEST VALUE	ENDING HOUR	DEPOSITION	SECOND HIGH	ENDING HOUR	DEPOSTION
1	845723.0	820392.0	211.0858	16	14.6022	150.6675	3	10.4227
2	845732.0	820456.0	447.7105	15	30.9711	161.9705	14	11.2046
3	845812.0	820427.0	125.6187	13	8.6899	102.2430	14	7.0728
4	845781.0	820531.0	375.6905	13	25.9890	57.5293	5	3.9797
5	845771.0	820391.0	267.1389	15	18.4798	159.5942	1	11.0402

APPENDIX 5

Comments on EIA Draft Final Report And Responses

APPENDIX 5

COMMENTS ON EIA DRAFT FINAL REPORT AND RESPONSES

1. PLANNING DEPARTMENT

	COMMENT	RESPONSE
1.1	**PD's letter (21) in SKT 2/01/1 III dated 4/7/95**	
1.1.1	An objection (No.TPB/O/S/TKO/1-3) to the draft Tseung Kwan O Outline Zoning Plan S/TKO/1 was met by the Town Planning Board with an amendment of rezoning the site in Tseung Kwan O Area 92 from 'OU (film studio)' and 'U' to 'CDA' with development restrictions of a maximum GFA of 15,700m^2 and maximum building height of 6 storeys over carport. The objector had accepted in principle the Board's proposed amendment, but not the development restrictions. The objector will therefore be invited to a TPB hearing to be arranged. The possible 'CDA' site needs to be studied as a noise sensitive receiver and be included into the draft report.	We note the decision of Town Planning Board. As it is a private development, the objector should propose a satisfactory Master Layout Plan for the 'CDA' to prove that the arrangements within the site in question would meet the requirements given in the HKPSG "Chapter 9, Environment". In view of the above decision, this report would only recommend that a detailed EIA should be conducted by the objector to satisfy EPD. No further assessment will be carried out in this report. [Remarks] Subsequent assessment was carried out for the 'CDA' and concluded that direct noise mitigatory measures along the re-aligned Ying Yip Road are not practical to reduce the predicted noise levels down to the recommended noise levels. A careful arranged Master Layout need to be developed to satisfy the HKPSG on environmental issues.

2. HIGHWAYS DEPARTMENT

	COMMENT	RESPONSE
2.1	**HyD's letter ( ) in HNT 707/SK/103 dated 28/6/95**	
2.1.1	Para. 5.2	
	It is agreed that neither noise barrier nor noise canopy provided at the proposed roundabout are suitable.	Noted.
	Nevertheless, HyD have reservation on the proposed 4m high barrier, as it would affect a large number of well established trees and would introduce adverse visual impact on the existing natural setting. Apparently, the narrow footway may not be able to accommodate the barrier without realigning the carriageway and utility diversion works. If insulation to most NSRs is adopted, locals may ask why Facade 24 cannot be treated in the same way. Perhaps, their preference of insulation to a barrier may need to be taken into consideration. Moreover, compared with the proposed noise barrier, insulation to the small house at Facade 24 would involve less construction nuisance and less costs in terms of both capital expenditure and maintenance liability.	Further surveys were conducted on site and it was revealed that Facade 24 of P.I.M.E. House is a wall without windows except at the ground entrance. It was unable to identified in the early stage because the building was mainly masked by over growing trees. The building has recently been renovated for sale. If the entrance hall way is considered as a noise sensitive receiver, a 1m high noise barrier would be required instead of a 4m barrier as previously proposed. [Remarks] A site visit just before the submission of the Final Report, revealed that new windows were installed at the first floor and hence, the proposed 4 metre barrier becomes necessary to the said building. Further consideration was given to the overall environment and landscape of the site, the proposed 4m barrier has been reduced to 2 metres.
2.1.2	Para. 5.3	
	It is agreed that open texture surfacing as noise mitigatory measure is not suitable for the subject road scheme.	Noted.

3. ENVIRONMENTAL PROTECTION DEPARTMENT

COMMENT	RESPONSE
3.1 EPD's letters ( ) in EP1/N8/581 dated 29/6/95 and 30/6/95	
3.1.1 Noise Policy Group	
The predicted noise levels at Lot 351 for 2011 are expected to exceed the HKPSG by more than 10dB. Double glazed window Type II should be recommended.	Noted.
A detailed survey should be conducted to fully identify all noise sensitive receivers and window facades that would qualify for indirect technical remedies under the eligibility criteria and the extent of the indirect technical remedial work required.	Noted.
For completeness, the following statistics should be stated in the report:	
(i) No. of dwellings exceeding the HKPSG criterion after completion of the improvement works without any direct noise mitigation measures.	These statistics are included in the final report.
(ii) No. of dwellings exceeding the HKPSG criterion after completion of the improvement works with the recommended direct noise mitigation measures.	
(iii) No. of dwellings meeting the "eligibility criteria" for indirect technical remedies.	

	COMMENT	RESPONSE
3.1.2	Regional Assessment Group	
	Noise Issue	
	It is suggested to include some sections/elevations in the report in order to illustrate the barrier (e.g. boundary wall of the NSRs) effect between the NSRs and the road alignment.	Upon review, the proposed noise barrier can be lowered from 4m to 1m high or can be deleted, depending on the actual conditions within the building PIME House.
	Air Quality Issue	
(a)	As it is proposed to use noise barrier for some sections of the road, the effect of noise barrier should be included into the air quality impact assessment and details of assessment should be provided.	The only location that a noise barrier would be proposed is the one adjacent to the building PIME House. The barrier is going to be 1 metre high [Remarks: See para. 2.1.1 response to commment, 2m high barrier has been adopted] and it is located 20 metres away from the affected building. The air quality impact due to the proposed barrier would be insignificant. Furthermore, this barrier may not be necessary if detailed inspection within the building can prove that the affected facade is not sensitive.
(b)	For the construction phase assessmvent, emission rate of TSP for soft excavation is 0.0867g/s instead of 8.67×10^{-3}g/s. Therefore, re-assessment should be carried out by the FDM model and the revised files and data should be submitted for comments. In addition, further details on the derivation of emission factors are required. The parameters adopted in the assessment such as silt content, mean wind speed, vehicle weight, etc. should be specified. Also, the text in Section 14 should be amended accordingly.	There is a typing error in the formula given in the calculation of the soft excavation emission rate for TSP. The actual modelling is corrected. The parameters adopted for the modelling are as follows: silt content = 7% ~25% mean wind speed = 2m/s vehicle weight = 20 tonnes These parameters are highlighted in the calculations and Section 14.
(c)	Please amend the typo error "μgm/m^3 in Table 2, p.33.	Noted.

4. FIRE SERVICES DEPARTMENT

	COMMENT	RESPONSE
4.1	**FSD's letter (8) in FSD 43/7596/93 dated 16th June 1995**	
4.1.1	It is envisaged that some fire hydrants may be affected by the proposed barriers. Under no circumstance, should the existing fire hydrants or the ground valves in-situ be encapsulated. Should relocation of fire hydrant be required, prior consent from FSD has to be sought.	Comment noted. It has now become apparent that the only suggested noise barrier can be reduced to 1m high or can be deleted, depending upon the circumstances. [Remarks] The adopted barrier proposals is a 2 metre high concrete barrier instead of the proposed options previously considered. Subsequent site visit did not identify any existing fire hydrants at the proposed barrier location.
4.1.2	As different material used for construction of noise barrier has a direct bearing on the safety of the public and fire fighters when subject barrier is on fire, relevant information of the material should be provided for FSD to comment.	Comment noted. See response to 4.1.1 above.

5. TRANSPORT DEPARTMENT

	COMMENT	RESPONSE
5.1	**TD's letter ( ) in NR 183/161/PWP-327TH dated 16th June 1995**	
5.1.1	No comment from traffic engineering point of view.	Noted.

6. DRAINAGE SERVICES DEPARTMENT

	COMMENT	RESPONSE
6.1	**DSD's letter (4) in MS 8/10/8-28 dated 26th June 1995**	
6.1.1	No comment on the subject report as it contains no material on drainage aspect and apparently has no drainage implication.	Noted.

7. ARCHITECTURAL SERVICES DEPARTMENT

	COMMENT	RESPONSE
7.1	**ASD's letter ASD 10/91053/ENV/ EIA/1 IV dated 6th July 1995**	
7.1.1	No comment from architectural point of view.	Noted.

8. DISTRICT LANDS OFFICER, SAI KUNG

	COMMENT	RESPONSE
8.1	**DLO/SK's memo (9) inDLO/SK448/SRN/59 dated 30th June 1995**	
8.1.1	No comment from land point of view.	Noted.

9. SAI KUNG DISTRICT OFFICE

	COMMENT	RESPONSE
9.1	**DO/SK's letter (84) in SK140/11/13 dated 14th June 1995**	
9.1.1	No comment on the report.	Noted.