8 AIR QUALITY

8.1 INTRODUCTION

This section presents an assessment of the potential air quality impacts arising from the construction and operation of Eastern MDC (73CD). Dust impacts during construction phase and maintenance dredging during operational phase are the main issue during the construction phase and appropriate mitigation measures are recommended, where necessary.

8.2 ENVIRONMENTAL LEGISLATION AND STATUTORY REQUIREMENTS

The principal legislation for the management of air quality in HKSAR is the *Air Pollution Control Ordinance* (APCO) (Cap 311). The statutory limits of specific air pollutants and the maximum allowable number of exceedances over specific time periods are stipulated by APCO. These limits and conditions on ambient air quality are referred to as the *Hong Kong Air Quality Objectives* (AQOs). The AQOs are shown below in *Table 8.2a*.

Table 8.2a ***Hong Kong Air Quality Objectives ($\mu g\ m^{-3}$)[i]***

Pollutant	Averaging Time			
	1 Hour[ii]	8 Hours[iii]	24 Hours[iii]	1 Year[iv]
Total Suspended Particulate (TSP)	-	-	260	80
Respirable Suspended Particulate (v) (RSP)	-	-	180	55
Sulphur Dioxide (SO_2)	800	-	350	80
Nitrogen Dioxide (NO_2)	300	-	150	80
Carbon monoxide (CO)	30,000	10,000	-	-

Note:
(i) Measured at 298K (25°C) and 101.325 kPa (one atmosphere).
(ii) Not to be exceeded more than three times per year.
(iii) Not to be exceeded more than once per year.
(iv) Arithmetic means.
(v) Respirable suspended particulate means suspended particles in air with a nominal aerodynamic diameter of 10 micrometres and smaller.

In addition to the above established statutory limits, the *Technical Memorandum of Environmental Impact Assessment* (TM) states that an hourly average TSP concentration of 500 $\mu g\ m^{-3}$ should not be exceeded for construction dust impact assessment. Also, the odour emission should meet the criteria of 5 odour units (5 seconds average) for odour prediction assessment.

Dust control measures for construction site are stipulated in the *Air Pollution Control (Construction Dust) Regulation.*

8.3 BASELINE CONDITIONS AND SENSITIVE RECEIVERS

8.3.1 Baseline Conditions

The Study Area is rural in nature, comprising ponds and villages. Vehicle exhaust emissions of Lok Ma Chau Road, New Territories Circular Road (NTCR) and Castle Peak Road are the major pollutant sources. Industrial emission from Shenzhen and Shekou may also affect the air quality of the site.

The site is located within the Deep Bay Airshed and the nearest fixed air monitoring station, operated by EPD is located at Yuen Long. The background air quality monitored at the station for the year 1996 were employed as the background air quality for the site and are shown in *Table 8.3a* below. The records indicate that the annual average value of TSP has breached the Hong Kong Air Quality Objectives.

Table 8.3a ***Air Quality of Yuen Long for 1996 ($\mu g\ m^{-3}$)***

Pollutant	Annual Average
NO_2	52
SO_2	18
TSP	114

8.3.2 Air Sensitive Receivers (ASRs)

Representative Air Sensitive Receivers (ASRs) have been identified according to the criteria set out in the TM and through site inspections and review of landuse plans of the study area. Domestic premises, school and recreation areas are classified as ASRs.

The identified ASRs and their horizontal separation between the eastern channels associated with the Eastern MDC are given in *Table 8.3b* below and the locations are shown in *Figure 8.3a*.

Table 8.3b ***Identified ASRs and Separations to the Channels***

ASRs	Location	Distance to Eastern MDC (73 CD) (m)
1	Lok Ma Chau Control Point	80
2	Ha Wan Tsuen	280
3	Ki Lun Tsuen	500
4	Yan Shau Wai	320
5	Tung Chan Wai	270
6	Wing Ping Tsuen	370

8.4 CONSTRUCTION PHASE

8.4.1 Introduction

The major pollutant sources associated with the Eastern MDC construction are dredging, excavating, and truck movements on unpaved haul road. Dust will be generated from these activities and would disperse into the local environment.

8.4.2 Potential Sources of Impact

Construction details are not available at this stage. The likely activities associated with the Eastern MDC construction are dredging and handling of excavated materials. The construction period for the Eastern MDC is about 30 months. The volume of excavated spoils generated is expected to be 115,000 m^3 from the Eastern MDC. The excavated materials will be transported offsite by trucks, and number of trips generated would be limited and is not expected to be over 30 per day as estimated by the Engineer.

Fugitive emissions would be generated through handling of spoils and movement of trucks over unpaved haul roads and worksites.

Odours may also be released when dredged and excavated mud or organic materials are lifted from ponds and agricultural fields.

8.4.3 Evaluation of Impacts

Assessment Methodology

The USEPA approved air dispersion model, *Fugitive Dust Model* (FDM), was used for predicting the likely dust impacts at the ASRs. The potential dust impacts from materials handling and truck movements on unpaved road were modelled. Emission factors and their particle size distributions have been estimated in accordance with *US EPA - Compilation of Air Pollutant Emission Factors, AP-42, 5th Edition, 1995 (AP-42).* The emission rates are shown in *Table 8.4a.*

The construction works will be carried out in daytime for 10 hours a day and 26 days a month. Meteorological data for year 1997 from Hong Kong Observatory's Lau Fau Shan Weather Station was employed. Surface roughness of the site is assumed to be 60 cm.

Table 8.4a *Emission Factors*

Construction Activities	Emission Factors[(i)]	Emission Rate	Remarks[(i)]
Materials handling	$k\,(0.0016)\,\frac{(\frac{u}{2.2})^{1.3}}{(\frac{M}{2})^{1.4}}$ kg/Mg	$7.06 \times 10^{-4}\ u^{1.3}$ g/s	• k = 0.74 • moisture content of 4.8% • annual handling: 38,333 m^3 • density of spoil: 1.94 Mg/m^3
Trucks movements on unpaved haul road	$E\,k\,(1.7)\,(\frac{s}{12})\,(\frac{S}{48})\,(\frac{W}{2.7})^{0.7}\,(\frac{w}{4})^{0.5}\,(\frac{365-p}{365})$ kg/VKT	0.00292 g/m/s	• k = 0.8 • silt content s of 10% • vehicle speed S of 30 kph • average vehicle W weight: 12.5 tonnes • p = 100 days • no. of wheel w: 10 • assume length of the road is 200 m • 30 trips per day (ie 30 vehicles per day)

Note:
(i) Reference to AP-42, 5th edition.

Assessment Results

Construction dust impacts attributed to material handling and truck haulage have been modelled. Isopleths of dust levels nearest to receivers are presented in *Figures 8.4 a-c*. It can be seen from the isopleths that the dust levels at the ASRs will all be within the dust criteria, even under the worst case scenario.

However, according to the requirement stated in the *Air Pollution (Construction Dust) Regulation*, mitigation measures should be required to ensure the compliance of the relevant criteria.

Cumulative Impacts with other concurrent projects

Construction dust emissions from other concurrent Projects as described in *Section 2.5*, including, *Expansion of Kiosks and Other Facilities at Lok Ma Chau Boundary Crossing, East Rail - Sheung Shui to Lok Ma Chau Spur Line* and *Shenzhen River Regulation Project*, may also affect the air quality of the area.

The construction period of the *Expansion of Kiosks and Other Facilities at Lok Ma Chau Boundary Crossing* is between mid 2001 and end 2002 (after completion of its site formation work) which overlaps with the San Tin Eastern MDC construction and may have cumulative dust impact. The *Final Environmental Study of the Expansion of Kiosks and Other Facilities at Lok Ma Chau Boundary Crossing (Binnie 1999)*, indicated that the construction dust impact is negligible given the small scale of works, high moisture content of excavated materials and limited number of construction plants. No adverse cumulative air quality impact from San Tin Eastern MDC with the expansion work of the Kiosk is expected.

Based on the Project Profile for the *Sheung Shui to Lok Ma Chau Spur Line* submitted under the EIA Ordinances, the construction work is expected between January 2001 and March 2004. The construction of the Spur Line will affect San

Tin and cumulative dust impact at some ASRs may be high. Details of the Spur Line works are not available, however, it is understood from the Project Profile that there will be a 30 month overlap between the San Tin Eastern MDC and Lok Ma Chau Spur Line Projects. It is expected that the Spur Line construction will result in a higher dust impacts to ASRs given the larger the scale of the works. It is recommended that the EIA of the Spur Link should include findings of the San Tin Eastern MDC Study to address the potential cumulative dust impact and identify appropriate mitigation measures.

For the nearby *Shenzhen River Regulation Project (SRRP)* Stage 2 (at Lok Ma Chau), the works will be completed in 2000 before the San Tin Eastern MDC work commences. The construction programme of the SRRP Stage 3 for Lo Wu upstream will overlap with the Eastern MDC work but any potential cumulative impact would be minimal given the over 4.5 km separation distance.

Odour

The main source of odour from construction activities will be from decomposing organic material trapped within river/stream sediments to be dredged or pond sediments. The rural ponds, though potentially eutrophic, are not a main dumping ground for agricultural wastes, it is not considered that the material within the ponds should be particularly malodorous. However, if the material is allowed to dry and decompose, especially under very hot weather conditions, odours may emanate from the breakdown of organic materials. As a result, caution and expedience should be used when dealing with dredged, excavated or any permitted stockpiled materials to minimise odours.

8.4.4 Mitigation Measures

Construction Dust

8.4.4.1 Dust control measures for construction sites have been specified in the *APCO (Construction Dust) Regulation*, which should be enforced in the site. Regulations are stated below.

- Vehicle washing facilities should be provided at the exit point of the site;
- any debris or materials should be covered entirely by impervious sheeting or stored in a debris collection area sheltered on the top and the 3 sides;
- water spray should be provided during material handling, excavation.; and
- the load on the vehicle should be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle.

Odour

8.4.4.2 To minimise odour nuisance at nearby ASRs, it is recommended that:

- any odorous dredged material should be placed remote from air sensitive receivers;
- any odorous permitted stockpiled material should be removed within two days of work to reduce the amount of time available for decomposition; and

- any odorous permitted stockpiled material should be covered with plastic tarpaulin sheets in the stockpile area.

8.4.4.3 Environmental Monitoring & Audit (EM&A) is required to ensure the air quality is within the criteria. The details of the EM&A requirement will be presented in the separate EM&A manual.

8.5 OPERATIONAL PHASE

8.5.1 There will be no pollutant sources during the operation of Eastern MDC. Potential air quality impacts may arise during maintenance dredging. It is anticipated that the impacts from the infrequent maintenance dredging will be similar to the dredging during the construction phase but to a much smaller scale, as less dredged material will be handled for the maintenance dredging, and for a short period of time.

8.5.2 Mitigation measures recommended for the construction phase should in *Section 8.4.4.2* apply to maintenance dredging.

8.6 CONCLUSION

This assessment has indicated that the dust criteria would be complied at all the ASRs during construction of the Eastern MDC . Mitigation measures as good construction practice should follow the *Air Pollution (Construction Dust) Regulation* to ensure the dust level is within the criteria. Potential cumulative impacts are expected to be small and within the dust criteria. For odour impact, it is not expected for the construction and operation of the Eastern MDC, as the sensitive receivers are located more than 80 m away from the site. Mitigation measures and EM&A requirements have been recommended to minimise potential nuisance from the work.

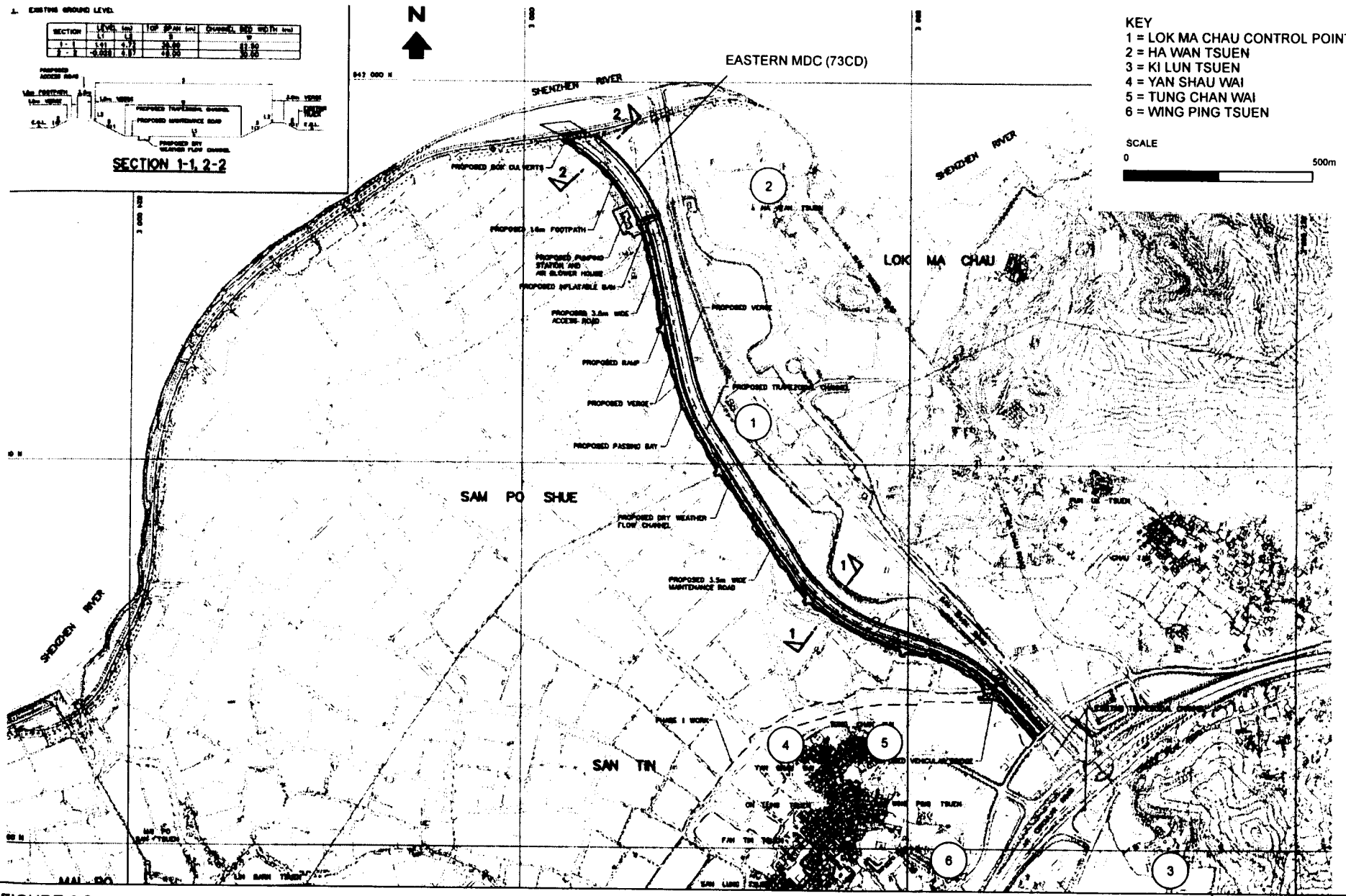


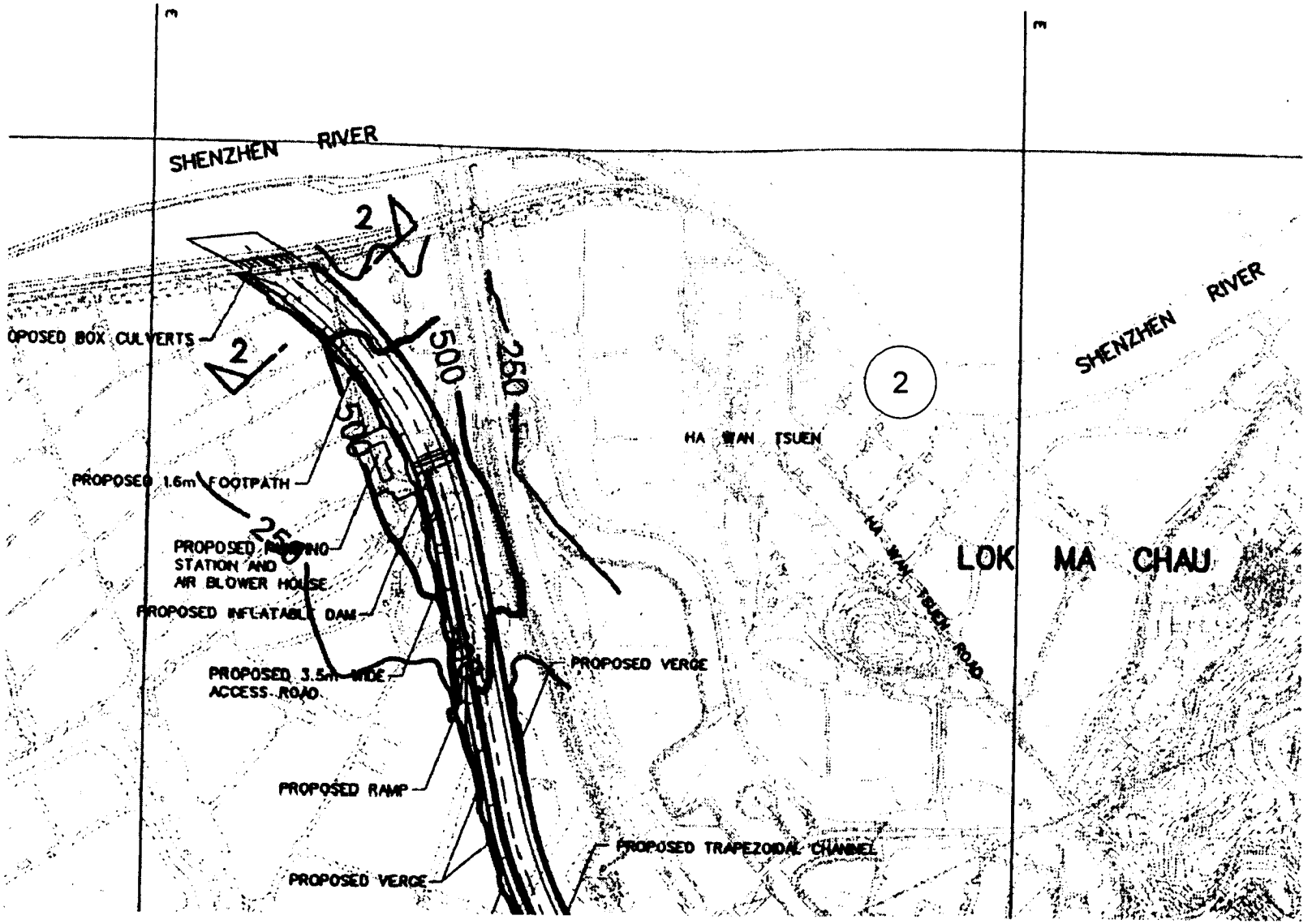
FIGURE 8.3a

LOCATION OF REPRESENTATIVE ASRs

FILE: C1618z82
DATE: 02/03/99

Environmental Resources Management

ERM



KEY

2 = HA WAN TSUEN

DUST CRITERIA (HOURLY) = 500μgm $^{-3}$

TSP LEVEL IN μgm $^{-3}$

SCALE

0 500m

FIGURE 8.4a

ISOPLETHS OF HOURLY TSP LEVEL

FILE: C1618_1

DATE: 29/03/99

Environmental Resources Management

ERM

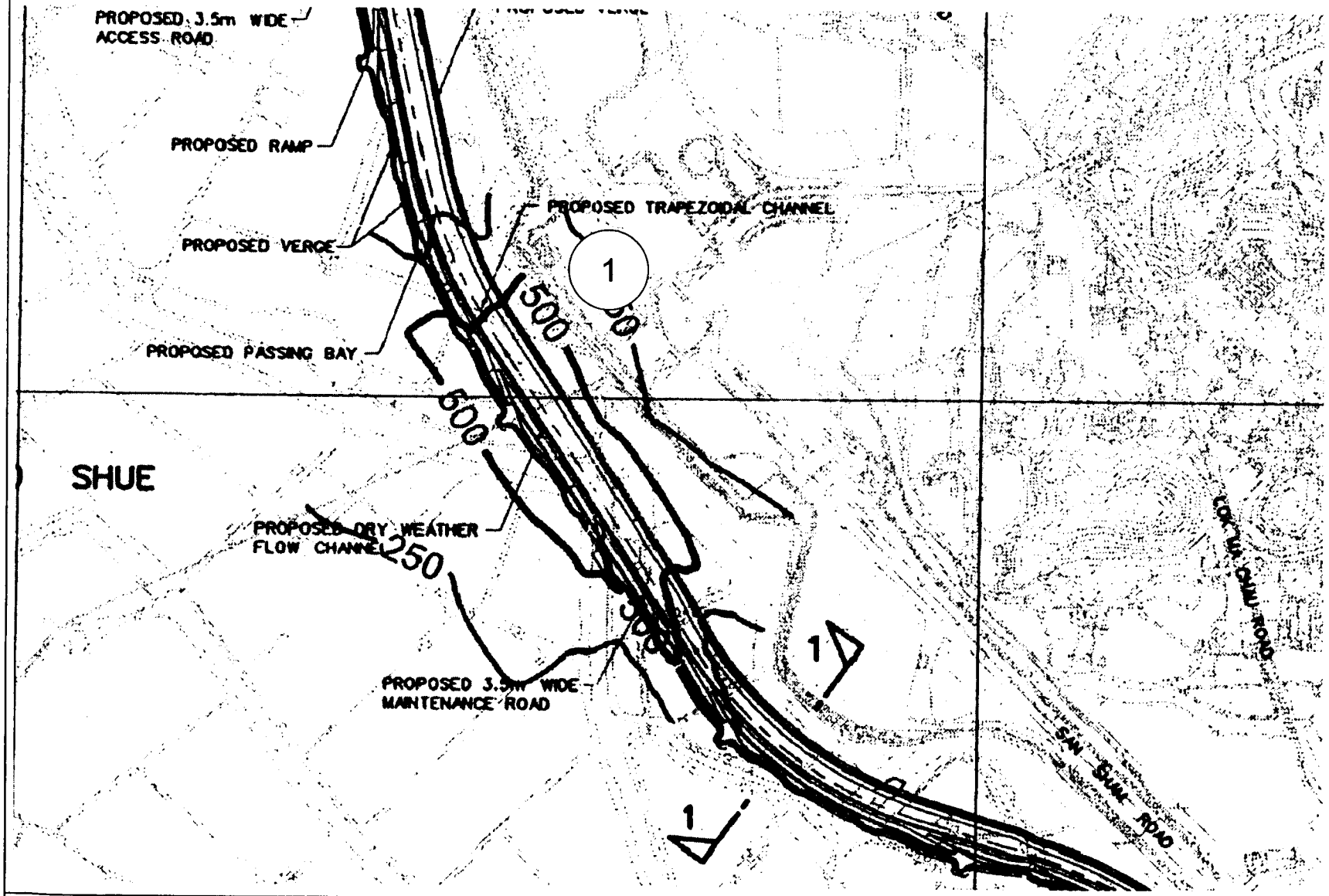


FIGURE 8.4b

ISOPLETHS OF HOURLY TSP LEVEL

FILE: C1618_2
DATE: 26/03/99

Environmental Resources Management

ERM

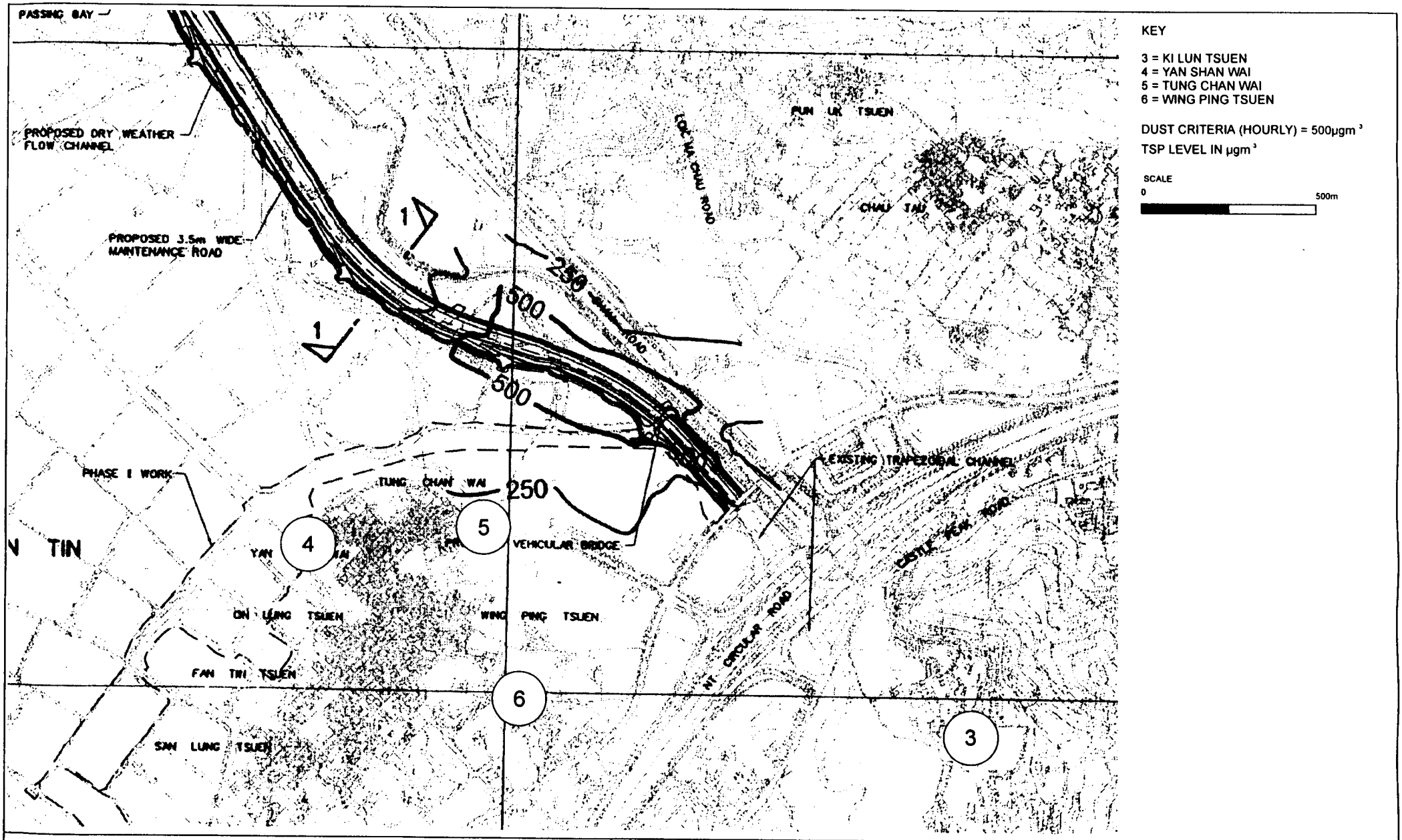


FIGURE 8.4c

ISOPLETHS OF HOURLY TSP LEVEL

FILE: C1618_3
DATE: 26/03/99

Environmental Resources Management

ERM