2 AIR QUALITY

2.1 AIR QUALITY PARAMETERS

Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.

1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B.* One-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded down in details. A sample data sheet is shown in the *Annex A.*

2.2 MONITORING EQUIPMENT

High volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:

(a) 0.6-1.7 m^3/min (20-60 SCFM) adjustable flow range;
(b) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
(c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
(d) capable of providing a minimum exposed area of 406 cm^2 (63 in^2);
(e) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
(f) equipped with a shelter to protect the filter and sampler;
(g) incorporated with an electronic mass flow rate controller or other equivalent devices;
(h) equipped with a flow recorder for continuous monitoring;
(i) provided with a peaked roof inlet;
(j) incorporated with a manometer;
(k) able to hold and seal the filter paper to the sampler housing at horizontal position;
(l) easy to change the filter; and
(m) capable of operating continuously for 24-hr period.

The ET Leader is responsible for provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.

Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data shall be converted into standard temperature and pressure condition.

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down in the data sheet as mentioned in *Annex A*.

If the ET Leader proposes to use a direct reading dust meter to measure 1-hr TSP levels, the instrument should be calibrated bi-monthly, and the 1-hr sampling shall be every 2 months by HVS to check the validity and accuracy of the results measured by direct reading method.

2.3 *LABORATORY MEASUREMENT / ANALYSIS*

A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory shall be HOKLAS accredited.

Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.

After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

All the collected samples shall be kept in a good condition for 6 months before disposal.

2.4 *MONITORING LOCATIONS*

The dust monitoring location is shown in *Figure 2.4a* and summarised in *Table 2.4a*. The status and locations of dust sensitive receivers may change after issuing this Manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER.

Table 2.4a ***Air Quality Monitoring Stations***

Air Quality Monitoring Station	Air Monitoring Location
AM1	Lok Ma Chau Control Point

When alternative monitoring locations are proposed, the following criteria, as far as practicable, should be followed:

(a) at the site boundary or such locations close to the major dust emission source;

(b) close to the sensitive receptors; and

(c) take into account the prevailing meteorological conditions.

The ET Leader shall agree with the ER on the position of the HVS for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

(a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;

(b) no two samplers should be placed less than 2 meter apart;

(c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;

(d) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;

(e) a minimum of 2 metre separation from any supporting structure, measured horizontally is required;

(f) no furnace or incinerator flue is nearby;

(g) airflow around the sampler is unrestricted;

(h) the sampler is more than 20 metres from the dripline;

(i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;

(j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and

(k) a secured supply of electricity is needed to operate the samplers.

2.5 *BASELINE MONITORING*

The ET Leader shall carry out baseline monitoring at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be done at least 3 times per day while the highest dust impact is expected. Before commencing the baseline monitoring the ET Leader shall inform the IC(E) of the baseline monitoring programme such that the IC(E) can conduct on-site audit to ensure accuracy of the baseline monitoring results.

During the baseline monitoring, there shall not be any construction or dust generation activities in the vicinity of the monitoring stations.

In case the baseline monitoring cannot be carried out at the designated monitoring locations at AM1 during the baseline monitoring period (e.g. construction or dust generating activities conducted in the vicinity of the station), the ET Leader shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER.

In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET Leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring shall be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, shall be revised. The revised baseline levels and air quality criteria shall be agreed with EPD.

2.6 *IMPACT MONITORING*

The ET Leader shall carry out impact monitoring during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six-days, shall be strictly observed at all the monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs.

In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Action Plan in *Section 2.7*, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

2.7 *EVENT AND ACTION PLAN FOR AIR QUALITY*

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET Leader shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. *Table 2.7a* shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occurs, the ET Leader, the ER and the Contractor shall undertake the relevant action in accordance with the Action Plan in *Table 2.7b*.

Table 2.7a *Action and Limit Levels for Air Quality*

Parameters	Action	Limit
24 Hour TSP Level in $\mu g/m^3$	For baseline level $\leq 200\ \mu gm^{-3}$, Action level = (Baseline level * 1.3 + Limit level)/2; For baseline level $>200\ \mu gm^{-3}$, Action level = Limit level	260
1 Hour TSP Level in $\mu g/m^3$	For baseline level $\leq 384\ \mu gm^{-3}$, Action level = (Baseline level * 1.3 + Limit level)/2; For baseline level $>384\ \mu gm^{-3}$, Action level = Limit level	500

Table 2.7b Event/Action Plan for Air Quality

EVENT	ACTION			
	ET Leader	IC(E)	Engineer	CONTRACTOR
ACTION LEVEL				
1. Exceedance for one sample	1. Identify source 2. Inform IC(E) and ER 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily	1. Check monitoring data submitted by ET 2. Check Contractor's working methods	1. Notify Contractor	1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	1. Identify source 2. Inform IC(E) and ER 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with IC(E) and Contractor for remedial actions required 6. If exceedance continues, arrange meeting with IC(E) and ER 7. If exceedance stops, cease additional monitoring	1. Check monitoring data submitted by ET 2. Check Contractor's working methods 3. Discuss with ET and Contractor on possible remedial measure 4. Advise ER on the effectiveness of the proposed remedial measures 5. Supervise implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Ensure remedial actions properly implemented	1. Submit proposals for remedial actions to IC(E) within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate
LIMIT LEVEL				
1. Exceedance for one sample	1. Identify source 2. Inform ER and EPD 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Contractor's remedial actions and keep IC(E) EPD and ER informed of the results	1. Check monitoring data submitted by ET 2. Check Contractor's working methods 3. Discuss with ET and Contractor on possible remedial measure 4. Advise ER on the effectiveness of the proposed remedial measures 5. Supervise implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Ensure remedial actions properly implemented	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IC(E) within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	1. Notify IC(E), ER, Contractor and EPD the causes & actions taken for the exceedances 2. Identify source 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to implemented 6. Arrange meeting with EPD and ER to discuss the remedial actions to be taken 7. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring	1. Discuss amongst ER, ET and Contractor on possible remedial measures 2. Revise Contractor's remedial measures whenever necessary to ensure their effectiveness and advise the ER accordingly 3. Supervise implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. In consultation with IC(E), agree with the Contractor remedial measures to be implemented 4. Ensure remedial measures properly implemented 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IC(E) within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

2.8 *DUST MITIGATION MEASURES*

The EIA Study has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

The following dust control measures shall be incorporated into the Contract Specification to minimise dust nuisance arising from the construction works:

- vehicle washing facilities shall be provided at the exit point of the site;
- every haul road shall be sprayed with water to maintain the entire road surface wet;
- any debris or materials shall be covered entirely by impervious sheeting or stored in a debris collection area sheltered on the top and the three sides;
- water spray or dust suppression chemical shall be provided during material handling, excavation; and
- the load on the vehicle shall be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle.

If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and implement the mitigation measures.

2.9 *ODOUR MITIGATION MEASURES*

The EIA Study has recommended the odour mitigation measures. The Contractor shall be responsible for the implementation of these measures.

- any odorous dredged material should be placed remote from air sensitive receivers;
- any odorous stockpiled material shall be removed within two days of work to reduce the amount of time available for decomposition; and
- any odorous stockpiled material shall be covered with plastic tarpaulin sheets in the stockpile area.

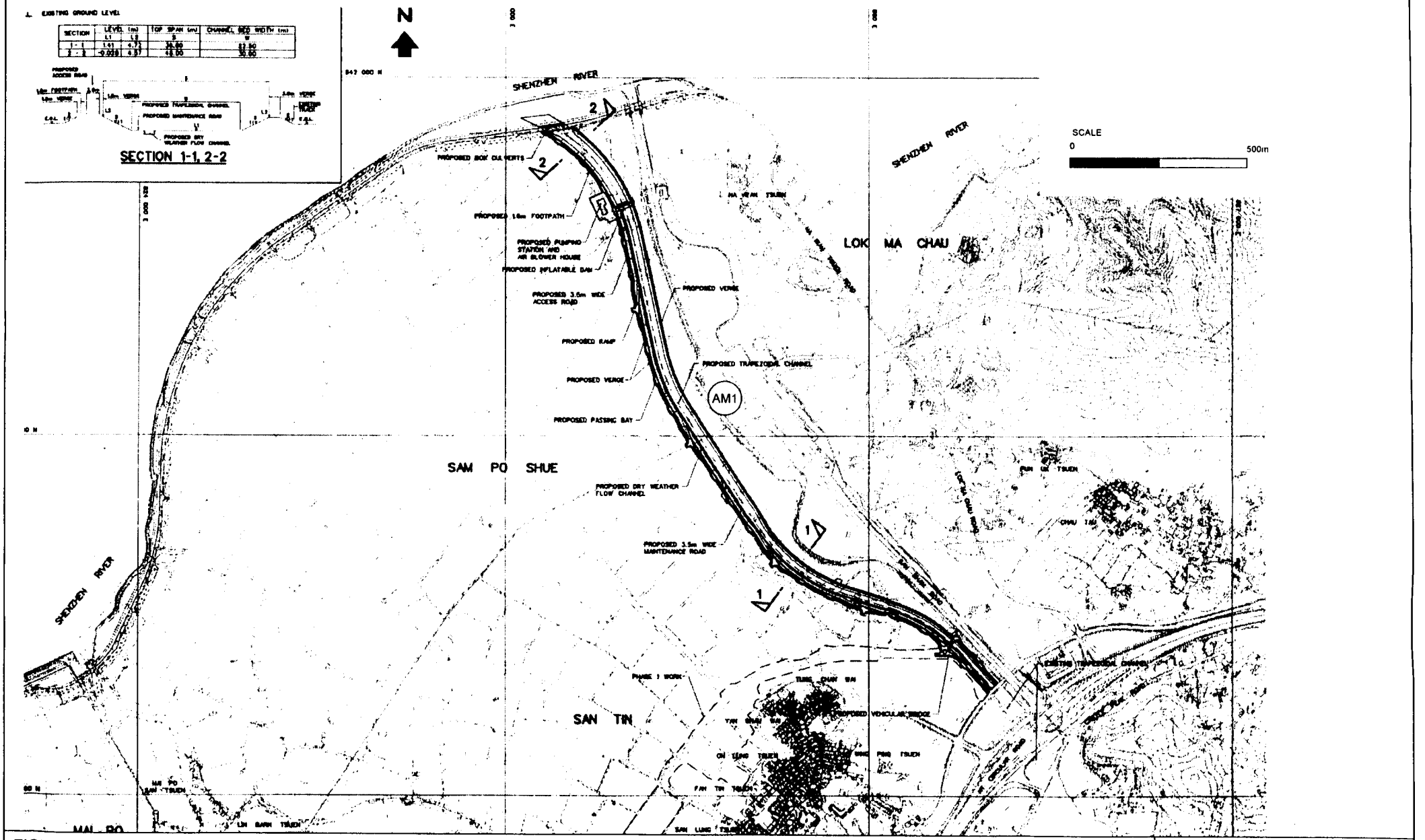

FIGURE 2.4a

LOCATION OF DUST MONITORING STATION

FILE: C1618Z68
DATE:29/03/99

Environmental Resources Management

ERM