4 Air Quality

4.1 Introduction

The EIA has considered the potential air quality impacts during both the construction and operational phases of the Project. Fugitive dust would be the key impacts in the construction phase during excavation, material handling etc. Odour would be the key impacts during operational phase.

4.2 Mitigation Measures

The EIA Report has recommended dust control and odour control measures. All the proposed mitigation measures are summarized in the Project Implementation Schedule (PIS) in **Appendix 2-2**.

4.3 Air Quality Parameters

4.3.1 Construction Dust

Monitoring and audit of the Total Suspended Particulate (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.

One-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The 1-hour and 24-hour 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). Upon approval of the IEC, 1-hour TSP levels can be measured by direct reading method 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 any other local atmospheric factors affecting or affected by site conditions, etc., shall be recorded down in detail. A sample data sheet is shown in **Appendix 4-1**.

4.3.2 Odour

Monitoring of Odour Emission, Acid Volatile Sulfite (AVS) and Redox potential in the sediment of Shenzhen River shall be carried out to ensure the odour removal efficiency and longevity of odour control on the Shenzhen River.

Odour patrol shall be conducted by independent trained personnel / competent persons patrolling and sniffing in the vicinity of the planned ASR along an odour patrol route within the LMC Loop to determine the operational odour impacts.

4.4 Monitoring Equipment

4.4.1 Construction Dust

High volume samplers (HVSs) complying with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:

a) 0.6 – 1.7 m^3 per minute adjustable flow range;

b) Equipped with a timing / control device with +/1 5 minutes accuracy for 24 hours operations;

c) Installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;

d) Capable of providing a minimum exposed are of 406cm^2;

e) Flow control accuracy: +/-2.5% deviation over 24-hour sampling period;

f) Equipped with a shelter to protect the filer 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) Easily changeable filter; and

m) Capable of operating continuously for a 24-hour period.

The ET is responsible for the provision, installation, operation, maintenance, dismantle of the monitoring equipment. They shall ensure that sufficient number of HVSs with an appropriate calibration kit is 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 fortnightly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The concern parties such as IEC shall properly document the calibration data for future reference. All the data should 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 in the data sheet as mentioned in **Appendix 4-1**.

If the ET proposed to use a direct reading dust meter to measure 1-hour TSP levels, they shall submit sufficient information to the IEC to prove that the

instrument is capable of achieving a comparable results to the HVS. The instrument should also be calibrated regularly, and the 1-hour sampling shall be determined periodically by the HVS to check the validity and accuracy of the results measured by direct reading method.

Wind data monitoring equipment shall also be provided and set up for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the IEC. For installation and shall be proposed by the ET and agreed with the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:

a) The wind sensors should be installed 10m above ground so that they are clear of obstructions or turbulence caused by buildings;

b) The wind data should be captured by a data logger, the data shall be downloaded for analysis at least once a month;

c) The wind data monitoring equipment should be re-calibrated at least once every six months; and

d) Wind direction should be divided into 16 sectors of 22.5 degrees each.

In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from the IEC.

4.4.2 Odour

4.4.2.1 Odour Emission Sampling

The procedure for collecting gaseous odour sample and determination of specific odour emission rate (SOER) is summarized below:

(a) Odour sample will be collected on the surface of selected locations by dynamic flux hood method, whereby a wind tunnel is placed on the odour emission surface of selected locations and a stream of odour-free nitrogen gas from a certified gas cylinder is supplied into the wind tunnel at flow velocity of 0.01m/s to simulate a parallel wind blowing on the main section of sampling hood. The emission rate is then determined by the air flow through the hood and the odour concentration of the exit air.
(b) An empty Nalophane (NA) odour bag is connected with the odour sampling system. Odour samples will be collected by odour bag under action of air sampling pump. About 60L gas will be collected for each sample.
(c) Meteorological conditions of the site including mean wind speed, prevailing wind direction, relative humidity and temperature shall be recorded during sampling period.
(d) After sampling, odour samples will be transported to an approved odour laboratory for olfactometry analysis within the same day.
(e) The odour samples will be analysed within 24 hours.
(f) Exposure of direct sunlight shall be avoided for the collected samples. If any condensate is observed on the inner surface of the sampled bag, the sample shall be discarded.

4.4.2.2 Sediment Sampling

Sediment sample shall be collected by using a K-B core made by polycarbonate material for laboratory analysis to determine the AVS and redox potential level. The core shall be inserted into the sediment at least 1m deep or until refusal. One-way valve shall be equipped on top of the core to prevent sediment spillage during the sediment collection. Upon the retrieval of sediment sample, the core shall be capped underwater water. Length of every collected core shall be recorded and documented.

4.4.2.3 Redox Potential

In-situ field measurements on sediment in terms of Redox potential shall be conducted by using Redox Potential Meter (Pt-Ag/AgCl electrode).

4.4.2.4 Acid Volatile Sulfite

Sediment sample collected by the K-B core shall be sliced into segments of 10 cm. On each sample segment, sub-sample shall be taken and stored into an amber glass bottle. All sub-sample should be delivered to a HOKLAS accredited laboratory for AVS analysis.

4.4.2.5 Alternatives

ET may propose alternative methods to obtain representative data upon approval from the ER and agreement from the IEC and EPD.

4.5 Laboratory Measurement / Analysis

4.5.1 Construction Dust

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 should be HOKLAS accredited.

If on-site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be demonstrated to the satisfaction of the ER and IEC. IEC shall regularly audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

Filter paper of size 8” X 10” shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hours 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 shall then be returned to the laboratory for reconditioning in the humidity-controlled chamber followed by accurate

weighing by an electronic balance with readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

4.5.2 Odour

4.5.2.1 Odour Emission

Odour concentration of sample collected will be determined by a Force-choice Olfactometer (Olfactomat-n2) in accordance with the European Standard Method (EN13725). Each odour testing session will comprise at least five qualified panellists. The panellists will be screened by using a certified n-butanol standard gas, with his detection thresholds of n-butanol comply with requirements stipulated in EN13725.

Panellists will not eat or smoke during and prior to the testing session. Use of perfumes, shave lotions or other fragment essences before the session is not allowed. Panellists will be in healthy conditions, without any influenza or any other health problems which will affect performance of his/her nose.

Regular calibration of the olfactometer will be made to check the accuracy and repeatability of its dilute settings and to establish its calibration history. The odour laboratory will be ventilated to maintain an odour-free environment and to provide fresh air to the panel members.

The specific odour emission rate (SOER) at each odorous source will be calculated using the following equations (assuming a dynamic flux hood is used):

SOER (ou/m.s) = Odour concentration (OU/m) x air flow rate inside hood / covered water surface area

Where air flow rate inside hood = flow velocity inside hood x width of hood x height of hood

4.5.2.2 AVS

AVS level in each sub-sample of sediment shall be determined by using methylene blue spectrophotometric method in accordance with GB17378.5-2007. The method uses fixed nitrogen distillation unit as the reactor and zinc acetate solution as the absorption liquid, then detect the absorbance of Methylene blue produced in the reaction at 650 nm wavelength. The quality control for the analysis shall be performed by controlling the correlation of Standard curve and performing Parallel test.

4.5.2.3 Odour Patrol

Odour patrol should be conducted by independent trained personnel / competent persons patrolling and sniffing in the vicinity of the planned ASRs along an odour patrol route within the LMC Loop to determine any potential operational odour impacts arising from Shenzhen River. The odour patrol member should be participated in a set of screening tests using a certified n-butanol gas with their individual thresholds (n-butanol) complied with the requirement of European Standard Method (EN13725) in the range of 20 to 80 ppb. They should also be

free from any respiratory diseases and do not normally work at or live in the area in the vicinity of the LMC Loop.

4.6 Monitoring Locations

Most representative and affected ASRs were selected as monitoring stations. Details of sensitive receivers could refer to the EIA report. For easy reference, the sensitive receiver locations are attached in **Appendix 4.2**.

4.6.1 Construction Dust

Figure 4.1 and **Table 4.1** shows the locations of the proposed dust monitoring. The status and locations of air quality sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall proposed updated monitoring locations and seek approval from ER and agreement from the IEC and EPD. The ER/IEC/EPD may also request a closer locations based on on-site conditions and environmental complaint.

Table 4.1 Monitoring locations for construction dust

ID	ASR ID in EIA	Location
DMS-1	HWTR-1	Village House along Ha Wan Tsuen Road
DMS-2	LMCR-5	Village House along Lok Ma Chau Road
DMS-3	BR-4	Village House along Border Road
DMS-4	MTL-20	Village House along Village House in Ma Tso Lung

When alternative monitoring locations are proposed, the proposed site should, as far as practicable:

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

b) be close to the sensitive receptors; and

c) take into account the prevailing meteorological conditions.

The ET shall agree with the ER in consultation with the IEC on the position of the HVS for the 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 meters 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 meters of separation from walls, parapets and penthouses is required for rooftop samplers;

e) a minimum of 2 meters 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 meters 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.

4.6.2 Odour Emission / AVS / Redox Potential

Figure 4.2 and **Table 4.2** shows the locations of the proposed odour monitoring for odour emission, sediment AVS and sediment redox potential. The status and locations of monitoring stations may change after issuing this manual. If such cases exist, the proposed alternative monitoring locations should be agreed by EPD.

Table 4.2 Monitoring locations for odour

ID	Location
ASZR1	River bank (HK side) at Shenzhen River
ASZR2	River bank (HK side) at Shenzhen River
ASZR3	River bank (HK side) at Shenzhen River

4.6.3 Odour Patrol

The ET shall propose the odour patrol route and the proposed sniffing locations in the vicinity of the planned ASRs during operational phase. The route shall be certified by ET Leader and verification by IEC and obtained approved from EPD.

4.7 Construction Dust Monitoring

4.7.1 Baseline Monitoring

Baseline monitoring shall be carried out at all of the designated monitoring locations for construction dust (see **Table 4.1**) for at least 14 consecutive days prior to the commissioning of major construction works to obtain 1-hour and 24-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the impact stations. One-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.

During the baseline monitoring, there should not be any major construction or dust generation activities in the vicinity of the monitoring stations. Before commencing baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that, if required, the IEC and ER can conduct on-site audit to ensure accuracy of the baseline monitoring results.

In case the baseline monitoring cannot be carried out at the designated monitoring locations, the ET Leader shall propose and carry out the monitoring at alternative locations that can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER and agreed with the IEC.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and 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 once every three months. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should 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, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC, ER and EPD.

A summary of the requirements for the baseline dust monitoring is shown in **Table 4.3**.

Table 4.3 Summary of Baseline Dust Monitoring Programme

Monitoring Period	Duration	Parameter	Frequency
Baseline Monitoring	14 consecutive days prior to commencement of major construction works	1-hour TSP	3 times per day
		Continuous 24-hour TSP	Daily

4.7.2 Impact Monitoring

The ET shall carry out impact monitoring at all designated monitoring locations for construction dust (see **Table 4.1**) during the entire construction period. For regular impact monitoring, the sampling frequency of at least once in every 6 days, shall be strictly observed at all the monitoring stations for 24-hour TSP monitoring. For 1-hour TSP monitoring, the sampling frequency of at least 3 times in every 6 days should be undertaken when the highest dust impact are likely to occur. Before commencing impact monitoring, the ET shall inform the IEC and ER of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the monitoring results.

The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and be strictly followed by the ET.

In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in the following section, shall be conducted within the specified timeframe after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified, and agreed with the ER and the IEC.

A summary of the requirements for the impact dust monitoring is shown in **Table 4.4**.

Table 4.4 Summary of Construction Dust Impact Monitoring Programme

Monitoring Period	Duration	Parameter	Frequency
Impact Monitoring	Throughout the construction period	1-hour TSP	At least 3 times in every 6 days

Monitoring Period	Duration	Parameter	Frequency
			when the highest dust impact are likely to occur or when one documented complaint is received.
		24-hour TSP	Once per 6 days

4.8 Odour Monitoring

4.8.1 Baseline Monitoring

Baseline monitoring shall be carried out at all of the designated monitoring locations for odour (see **Table 4.2**) under ample sunlight with ambient temperature exceeds 30^{o}C.

A trial test (**Figure 4.3**) for bio-remediation shall be conducted and completed before the first population intake and the relationship between odour emission, sediment AVS and sediment Redox potential shall be established by monitoring. 9 different dosage shall be tested as follows:

0.6N, 0.7N, 0.8N, 0.9N, N, 1.1N, 1.2N, 1.3N, 1.4N

While N is the optimum dosage which could be obtained by the following equation[1]:

Calcium nitrate dosage = C_{AVS} x 8/5 x 14/32

where:
C_{AVS} = the AVS content in sediment, unit is mg-S/kg dry sediment
8 – when HS- is oxidized to SO_4^{2-}, the valence number change of S is 8
5 – when NO3- is reduced to N_2, the valence number change of N is 5
14 – molar mass of N
32 – molar mass of S

A total of 18 measurements for all parameters including odour emission, sediment AVS and sediment Redox potential shall be conducted in 2 batches. 1st batch of 9 measurements shall be conducted prior to the commencement of bioremediation, while the 2nd batch of 9 measurements shall be conducted one month after bioremediation. The methodology of trial test shall be agreed by EPD prior to measurement.

Correlation curve of odour emission (in OU/m^2) against sediment AVS level and correlation curve of odour emission (in OU/m^2) against sediment Redox potential shall be established at all designated monitoring locations.

[1] Shenzhen River Contaminated Sediment Remediation Strategy Joint Study Bioremediation Bench-scale Study (April 2012)

4.8.2 Impact Monitoring

After the first population intake, odour monitoring (as indicated by AVS and Redox potential) shall be carried out at all designated monitoring locations (see **Table 4.2**). For regular odour monitoring (as indicated by AVS and Redox potential), the sampling frequency of at least in quarterly intervals shall be strictly complied. In case of non-compliance with the proposed criteria, more frequent monitoring as specified in the Event and Action Plan, shall be conducted within the specified timeframe after the result is obtained. This additional monitoring shall be continued until the excessive odour emission or the deterioration in air quality is rectified, and agreed with the ER and the IEC.

A summary table for baseline and impact monitoring is shown in **Table 4.5**.

Table 4.5 Summary of Odour Baseline and Impact Monitoring Programme

Monitoring Period	Duration	Parameter	Frequency
Baseline Monitoring	Before trial test of bioremediation	Odour emission, sediment AVS and sediment Redox Potential	9 measurements
	Within one month after trial test of bioremediation		9 measurements
Impact Monitoring	After first population intake of the Development of LMC Loop	Odour emission, sediment AVS and sediment Redox Potential	Quarterly

4.9 Odour Patrol

4.9.1 Baseline Monitoring

Prior to the implementation of the proposed in-situ bioremediation, a baseline odour patrol shall be undertaken along proposed odour patrol route. The baseline odour patrol shall be carried out weekly along the same odour route and at the same sniffing locations. The odour patrol shall be carried out during daytime and evening/night time. No odour patrol shall be conducted during rainy days.

The objective of the baseline odour patrol is to provide some baseline data for future validation of the effectiveness of the odour mitigation measures. The independent trained personnel / competent persons shall record the findings including time of survey, weather condition such as sunny, fine, cloudy and rainy, odour intensity, odour nature and possible odour sources, and also the local wind speed and direction at each sniffing location.

In addition, the following information shall be obtained:

- Meteorological conditions (including temperature, wind speed, wind direction, relative humidity) from the nearest Hong Kong Observatory's Weather Station during the monitoring;
- Any abnormal observation during the monitoring.

4.9.2 Impact Monitoring

Odour patrol shall be conducted by independent trained personnel / competent persons patrolling and sniffing along the proposed odour patrol route.

Monthly odour patrol shall be conducted during the operational phase after completion of the odour remediation works including in-situ bioremediation. The monitoring events shall be carried out during daytime and evening/night time. No odour patrol shall be conducted during rainy days.

The independent trained personnel / competent persons shall:

- Have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80 bbp/v required by the European Standard Method (EN 13725);
- Be free from any respiratory illnesses;
- Be engaged for a sufficient period to build up and monitor/detect at several monitoring location;
- Not be allowed to smoke, eat, drink except water) or use chewing gum or sweets 30 min before and during odour intensity analysis; and
- Take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics.

Subject to the prevailing weather forecast condition, odour patrol shall be conducted by independent trained personnel / competent persons along the proposed odour patrol route. During the patrol, the sequence should start from less odorous locations to stronger odorous locations.

The independent trained personnel / competent persons shall use their nose (olfactory sensors) to sniff odours at different locations. The main odour emission sources and the areas to be affected by the odour nuisance shall be identified.

The perceived odour intensity is to be divided into 5 levels which are ranked in the descending order as follows:

- 0 – Not detected. No odour perceived or an odour so weak that it cannot be easily characterized or described;
- 1 – Slight Identifiable odour, and slight chance to have odour nuisance;
- 2 – Moderate Identifiable odour, and moderate chance to have odour nuisance;
- 3 – Strong Identifiable, likely to have odour nuisance;
- 4 – Extreme Serve odour, and unacceptable odour level.

The independent trained personnel / competent persons shall record the findings including time of survey, weather condition such as sunny, fine, cloudy and rainy, odour intensity, odour nature and possible odour sources, and also the local wind speed and direction at each location. In addition, some relevant meteorological data such as daily average temperature, and daily average humity, on that day shall be obtained from the nearest Hong Kong Observatory's Weather Station for reference.

4.10 Action / Limit Levels

4.10.1 Construction Dust

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the construction dust impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. **Table 4.3** shows the air quality criteria, namely Action and Limit Levels to be used.

Table 4.3 Action / Limit Levels for construction dust

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

4.10.2 Odour

AVS and Redox Potential

The ET shall determine the Limit Level for AVS and Redox potential from the correlation curves established in **Section 4.8**. The limit levels refer to the AVS/Redox potential level at the point where the odour removal was 98% in the correlation curve or otherwise agreed with EPD. **Table 4.4** shows the AVS/Redox potential criteria, namely Action and Limit Levels to be used.

Table 4.4 Action / Limit Levels for AVS and redox potential

Parameters	Action	Limit
AVS	70% of Limit Level, or otherwise agreed with EPD	at the point where the odour removal was 98% in the correlation curve[1] or otherwise agreed with EPD
Redox potential	70% of Limit Level, or otherwise agreed with EPD	at the point where the odour removal was 98% in the correlation curve [2] or otherwise agreed with EPD

[1] If the derived AVS limit level is lower than 100mg/Kg, 100mg/Kg should be adopted subject to the agreement with EPD.

[2] if the derived Redox potential limit level is lower than -200mV, -200mV should be adopted subject to the agreement with EPD

Odour Patrol

Table 4.5 shows the odour patrol criteria, namely Action and Limit Levels to be used.

Table 4.5 Action / Limit Levels for odour patrol

Parameters	Action	Limit
Odour nuisance	- When one documented	- When two documented

Parameters	Action	Limit
	complaint is received; or - Odour intensity of 2 is measured from odour intensity analysis	complaints are received; or - Odour intensity of 3 is measured from odour intensity analysis

4.11 Event and Action Plan

4.11.1 Construction Dust

Should non-compliance of the air quality criteria occur, actions in accordance with the Event and Action Plan in **Table 4.6** shall be carried out.

Table 4.6 Event / Action Plan for construction dust

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
Action Level exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC, ER and Contractor; 3. Repeat measurement to confirm finding; and 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; and 3. Review and advise the ET and ER on the effectiveness of the proposed remedial measures.	1. Notify Contractor.	1. Identify source, investigate the causes of exceedance and propose remedial measures 2. Rectify any unacceptable practice and implement remedial measures; and 3. Amend working methods agreed with ER if appropriate.
Action Level exceedance for two or more consecutive samples	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC, ER and Contractor; 3. Advise the ER	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; and 3. Supervise and ensure remedial measures	1. Identify source, investigate the causes of exceedance and propose remedial measures 2. Submit proposals for remedial actions to ER

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
	and Contractor on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC, ER and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; and 8. If exceedance stops, cease additional monitoring.	possible remedial measures; 4. Advise the ET and ER on the effectiveness of the proposed remedial measures; and 5. Supervise Implementation of remedial measures.	properly implemented.	with a copy to ET and IEC within 3 working days of notification; 3. Implement the agreed proposals; and 4. Amend proposal if appropriate.
Limit Level exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform ER, Contractor, IEC and EPD; 3. Repeat measurement to confirm finding; 4. Increase	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET, ER and Contractor on possible remedial measures; 4. Advise the ER	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; and 3. Supervise and ensure remedial measures properly implemented.	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit proposals for remedial actions to ER

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
	monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	and ET on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.		with a copy to ET and IEC within 3 working days of notification; 4. Implement the agreed proposals; and 5. Amend proposal if appropriate.
Limit Level exceedance for two or more consecutive samples	1. Notify IEC, ER, Contractor and EPD; 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 be implemented; 6. Arrange meeting with IEC, Contractor and ER to discuss the remedial actions to be taken; 7. Assess effectiveness of	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 4. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 5. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented; 4. Supervise and ensure remedial measures properly implemented; and 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	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit proposals for remedial actions to ER with a copy to ET and IEC within 3 working days of notification; 4. Implement the agreed proposals; 5. Resubmit proposals if problem still not under control; 6. Stop the relevant portion of works as determined by

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
	Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.		abated.	the ER until the exceedance is abated.

Note:

- ET – Environmental Team
- IEC – Independent Environmental Checker
- ER – Engineer's Representative
- Each step of actions required shall be implemented within 1 working day unless otherwise specified or agreed with EPD.

4.11.2 Odour

Should non-compliance of the sediment AVS and sediment Redox potential occur, actions in accordance with the Event and Action Plan in **Table 4.7** shall be carried out.

Table 4.7 Event / Action Plan for odour

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
Action Level exceedance	1. Notify IEC, ER and Project Proponent; 2. Repeat measurement to confirm findings; 3. Increase monitoring frequency to weekly; 4. If exceedance continues in a month, liaise with IEC and ER whether bio-remediation is required; and 5. If exceedance stops, cease	1. Check monitoring data submitted by ET; and 2. Advise the ET whether additional bio-remediation by injection of calcium nitrate is required.	1. Confirm receipt of notification of failure in writing; 2. Instruct the Contractor to commence bio-remediation if required by the IEC; and 3. Ensure bio-remediation properly implemented.	1. Rectify any unacceptable practice; and 2. Implement the bio-remediation if required by the IEC and ER.

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
	additional monitoring.			
Limit Level exceedance	1. Notify IEC, ER, Project Proponent and EPD; 2. Repeat measurement to confirm findings; 3. Increase monitoring frequency to weekly; 4. If exceedance continues in a month, liaise with IEC and ER to discuss the bio-remediation to be taken; and 5. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; and 2. Advise the ET, ER and IEC to implement the additional bio-remediation by injection of calcium nitrate.	1. Confirm receipt of notification of failure in writing; 2. Instruct the Contractor to commence bio-remediation; and 4. Ensure bio-remediation properly implemented.	1. Rectify any unacceptable practice; and 2. Implement the bio-remediation if exceedance continues in a month.

Note:

- ET – Environmental Team
- IEC – Independent Environmental Checker
- ER – Engineer's Representative
- Each step of actions required shall be implemented within 1 working day unless otherwise specified or agreed with EPD.

4.11.3 Odour Patrol

Should non-compliance of the odour patrol occur, actions in accordance with the Event and Action Plan in **Table 4.8** shall be carried out.

Table 4.8 Event / Action Plan for odour patrol

Event	Action	
	Person in-charge of odour monitoring	**Project Proponent**
Action Level		
Exceedance of action level (odour patrol)	1. Identify source/reason of exceedance; and 2. Repeat odour patrol to confirm finding.	1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 weeks;

		2. Rectify any unacceptable practice; 3. Implement more mitigation measures if necessary; and 4. Inform EPD or DSD if exceedance is considered to be caused by expedient connections or floating debris.
Exceedance of action level (odour complaints)	1. Identify source/reason of exceedance; and 2. Carry out odour patrol to determine odour intensity.	1. Carry out investigation to identify the complaint whether it is related to potential odour emission from the project; 2. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 weeks; 3. Rectify any unacceptable practice; 4. Implement more mitigation measures if necessary; and 5. Inform EPD or DSD if exceedance is considered to be caused by expedient connections or floating debris.
Limit Level		
Exceedance of Limit Level	1. Identify source/reason of exceedance; 2. Repeat odour patrol to confirm findings; 3. Increase odour patrol frequency to bi-weekly; 4. Assess effectiveness of remedial action; and 5. If exceedance stops, cease additional odour patrol.	1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 weeks; 2. Rectify any unacceptable practice; 3. Formulate remedial actions; 4. Ensure remedial actions properly implemented; 5. If exceedance continues, consider enhanced mitigation measures; and 6. Inform EPD or DSD if exceedance is considered to be caused by expedient connections or floating debris.