Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

CONTAM system procedures, 6th edition

December 2011

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Contents

Objective

This document has been prepared to explain what is required from mining operators and exploration companies to meet their obligations for sampling, reporting and submitting results for Resources Safety's contaminant monitoring (CONTAM) system. It describes how the system works and provides assistance to complete CONTAM forms.

The CONTAM system procedures should be read in conjunction with:

- Mines Safety and Inspection Regulations 1995
  - Part 7 Division 3 — Hazardous substances
  - Part 9 — Ventilation and control of dust and atmospheric contaminants
- National Model Regulations for the Control of Workplace Hazardous Substances [NOHSC:1005(1994)]

The CONTAM system uses a database to retrieve and record representative, personal exposure monitoring results randomly collected from mining and exploration activities in Western Australia. It is used to assess the efficiency of management programs aimed to control dust and other airborne contaminants, with the main objectives to:

- collect comparative exposure data for different occupation groups, locations, and industry sectors for analysis of emerging trends within the industry;
- identify exposure groups that contribute to long-term health effects in mining employees; and
- monitor statutory compliance in the maintenance of acceptable working environments.

Following these procedures will help to ensure the uniformity and reliability of data collected for the CONTAM database.

CONTAM process

Risk assessment

Resources Safety promotes the application of vigorous risk management and encourages all mining companies to perform regular risk assessment of all mining hazards, including exposure to airborne contaminants (Mines Safety and Inspection Regulations 1995, r. 7.27 Risk assessment). More information on managing occupational health and safety using a risk management approach can be found in Australian Standards AS/NZS 4360:2004 and AS/NZS 4804:2001.

Regular risk assessments of exposure to airborne contaminants are recommended during each phase of all mining operations, including exploration, construction, mining (surface and underground), processing, shutdowns, care and maintenance and rehabilitation activities. This is a requirement of Part 9 of the Mines Safety and Inspection Regulations 1995, and is not specific to the CONTAM system. However, Resources Safety inspectors may request representative sampling results that will be entered into the CONTAM database.

Exploration companies

Sampling quotas are not issued for exploration companies as it is recognised that the nature of their activities make this impracticable. Problems include:

- exploration companies tend to operate with small workgroups;
- work is done at remote and isolated locations without any established occupational health and safety infrastructure or technical support;
- work is seasonal;
- target areas may be campaigned for only short periods; and

- changes to work programs are frequent.

Instead, exploration companies are requested to take a reasonable number of representative personal monitoring samples of exposures to airborne contaminants of all exploration personnel. Important considerations when determining who and how often to sample should include:

- size and nature of the workforce;
- amount of work performed; and
- level of risk associated with the hazardous substances that are encountered during exploration activities.

As a minimum, it is recommended that every employee is sampled at least annually. Where a significant risk is attributed to atmospheric contaminants, additional sampling will be necessary. For example, the sampling frequency must be increased when asbestos is present or suspected.

It is expected that representative personal exposure monitoring will be undertaken when exploring on or near existing mining operations, and the results sent to the CONTAM Manager.

Mining companies

Occasionally, Resources Safety inspectors may request a copy of your company's routine risk assessments and information on how airborne contaminants will be and are managed at your site. Mining companies are also required to complete a workforce survey when they commence mining operations, and update this whenever there is a substantial change in the nature and size of the workforce, and every two years thereafter.

The risk assessment, along with the workforce survey is used by Resources Safety inspectors to determine a sampling program that details the minimum number of samples that should be submitted every three months (quarterly). This sampling program is detailed on the quota allocation report and is known as the "quota".

Workforce survey

All mines must complete a workforce survey every two years, or when there are major changes in the number of staff or level of operations. The survey reports the number of males and females employed by the company or contractor for all occupational groups. It lists the airborne contaminants that each group may be exposed to. This information can be obtained from the latest risk assessment of operations at the mine and the mine's human resources department.

Quota allocation

New mines should complete a risk assessment that identifies and assesses exposure levels of airborne contaminants for exposed personnel during the first year of operations. Working with the Senior Occupational Health Inspector responsible for the site, a quota will be determined using the workforce survey and risk assessment information.

For companies that have previously been involved with the CONTAM system, Resources Safety inspectors will:

- discuss any changes suggested by the site ventilation officer;
- assess the site's compliance with the previous year's quota;
- review the latest workforce survey; and
- allocate a new quota for the next financial year, by the end of June each year.

If there have been significant changes to personnel, process, plant or risk then a new risk assessment and workforce survey should be completed and the quota modified accordingly. This is arranged by liaising with the Senior Occupational Health Inspector who regularly visits your site.

The quota defines the minimum number of "valid" samples that must be collected and submitted for the CONTAM system for each quarterly quota period (see Appendix 1 for example). A valid sample is one

that conforms to the requirements of the approved method for sampling and analysing the contaminant, and satisfies all of the required criteria outlined under “Sample record sheet”.

Resources Safety inspectors occasionally request sampling independent of the quota.

Companies may also submit other sampling that is independent of the quota.

CONTAM forms

Three forms are used to record information for the CONTAM system:

- registered sampler form (Appendix 2);
- workforce survey form (Appendix 3); and
- sample record sheet (Appendix 4).

The forms are available from Resources Safety’s website in the forms section under “Mining”.

Registered sampler form

Only CONTAM registered samplers may submit results to the CONTAM system. To become a CONTAM registered sampler, complete the registered sampler form (Appendix 2) and send it with copies of relevant qualifications to the CONTAM Manager.

The minimum qualification to become a CONTAM registered sampler is the Certificate III (Technician) or IV (Officer) in Surface Ventilation, or completion of a similar course that has been approved by the State Mining Engineer. Subject to proof of qualifications and experience, qualified occupational hygienists, or people with similar qualifications and experience, may be exempted from this certification. Written applications for exemption from the certification requirement must be forwarded to the CONTAM Manager, with the registered sampler form, a curriculum vitae and an example of an occupational hygiene report.

Sampler registration lasts for five years. Samplers whose registration has expired must complete a one-day CONTAM refresher course and send in a new registered sampler form with proof of competency. The CONTAM refresher course updates skills and knowledge about common problems in contaminant monitoring, and introduces new policies and technologies that affect how the CONTAM system functions. Note that similar courses undertaken for professional development to maintain competency and currency of air monitoring skills may satisfy the re-registration requirements — submit a course outline and certificate of competency with the registered sampler form.

Workforce survey form

The CONTAM workforce survey is a summary of routine monitoring and risk assessments for exposure of employees to airborne contaminants. It covers total number of employees working in each occupation group, with a list of contaminants that each occupation group is exposed to. Employee counts distinguish between contractors and company employees, and males and females. The figures reported should be representative of the total workforce during normal operating conditions during the specified 24-hour period. Both rostered and non-rostered employees should be included in the workforce survey. If the specified date is during a shut-down period and is not representative of the normal operations then change the date on the form and report representative figures for the most recent time that usual workforce levels and activities were undertaken.

The workforce survey is required every two years unless there is a substantial change in personnel, plant or processes at the mine, at which time a new workforce survey reflecting the new situation must be submitted as soon as practicable — such as when mining operations cease, expand or go into care and maintenance.

Reporting details

Company: The principal company that operates the site.

Site ID no. and name: Unless sampling is conducted during exploration drilling at a location not associated with a mine site, these are the ones allocated by Resources Safety.

Note that the name and number are allocated when mining first commences. Subsequently, related sites may have been grouped for reporting purposes and a group name allocated by Resources Safety.

Workforce data to be collected for the 24 hour period on: Specified date (or as near as possible) for comparison of all mines in Western Australia. If it is not possible to complete the survey for the specified date, please give an explanation in the comment section.

Workforce data will be used to set quotas for the period: The next financial year.

Return this form by: Specified date, or as soon as practicable, in order to finalise quota allocation.

Comments: Describe the level of operations on the specified date and note the level of operations (e.g. normal operation, shutdown, on care and maintenance, in rehabilitation).

Occupation group: Occupation codes and groups are defined in Appendix 5. The aim of the workforce survey is to count employees, categorising them based on their main occupation. The occupational groups are hierarchical.

For example, a shift boss who works at the process plant will be counted in “General Management / Professional & Supervisory” (codes 110000–165000) while a front end loader operator at a refinery will be counted in “Mobile Plant Occupations” (codes 420000–422000) under the heading of “Ore Treatment Occupations”.

At a surface operation, however, a front end loader operator will be counted in “Surface – Excavation and Ore Transport” (codes 340000–369000).

Workforce totals: Count and record the number of males and females who are employed by the principal operating company and all contract companies (combined) during the specified 24-hour period, including those who were not rostered or were off-site on that day. This figure should be representative of regular operations, excluding special shutdowns.

Company employees: Include everyone who is directly employed by the principal operating company at the site.

Contract employees: Include all people at the site who are not employed directly by the principal company, but are employed to complete tasks to benefit the principal company. Sole traders and those employed by a company contracting or subcontracting to the principal company are all included. Visitors to the mine who are not working to benefit the principal company should not be included.

Contaminants: List contaminant codes (Appendix 6) for all dusts and airborne contaminants that each of the occupation groups may exposed to during work at this site. If there is insufficient space, please use the margins to add contaminants. This information should be available in the latest hazard register, risk assessment or from the material safety data sheet (MSDS) register.

Sample record sheet

Quality control of all sampling, analysis and completion of forms in accordance with these procedures is the responsibility of the CONTAM registered sampler. Only samples that comply with standard sampling and analytical techniques (see regulation 9.13 of the Mines Safety and Inspection Regulations 1995) should be submitted to Resources Safety. Whenever alternative methods are used to sample or analyse contaminants, check their suitability with the CONTAM Manager before submitting the results.

All fields must be completed with correct details otherwise the form will be assessed as “invalid” by the CONTAM system. Invalid forms and samples will not be accepted and will not contribute to the quota for your site. Malfunctions of sampling equipment or problems with analysis commonly lead to an invalid sample. It is the registered sampler’s responsibility to repeat the sample to ensure the quota is met. In the case of unavoidable circumstances, advise the Senior Occupational Health Inspector responsible for your site.

If a sample result exceeds the occupational exposure standard, a detailed report must be sent to the Senior Occupational Health Inspector explaining the circumstances and what control measures have been implemented to prevent a reoccurrence.

A separate sample record sheet is essential for every individual person and sample type measured on unique sampling equipment. For example, a respirable dust sample may be weighed and then analysed for silica content for an individual and could be reported on the same sample record sheet. Alternatively, an inhalable dust sample may also be analysed for individual metals that may all be reported on the same sample record sheet. However, if samples that require different sampling equipment were taken simultaneously, two sample record sheets are required.

If this procedural document does not list appropriate codes or descriptions for your proposed sampling program, contact the CONTAM Manager to discuss an appropriate outcome.

Reporting details

Company details

Company: Enter the name of the company operating the site or, for an exploratory drilling project, the exploration company responsible.

Site ID no. and name: Unless sampling is conducted during exploration drilling at a location not associated with a mine site, these are the ones allocated by Resources Safety.

Note that in some situations, a site code and name have been allocated to represent an administrative group for a mining operation (e.g. underground mine, several open pits and a processing plant, which have their own codes and names). Samples taken within the group may be differentiated using the distinct site codes and names — the CONTAM Manager will provide this information on request.

***Operation Type*:** "Mining" should be selected unless sampling is conducted on people involved with exploration drilling, in which case "Exploration" should be selected and the drilling details entered (see below).

Sample collected by: Clearly print the name of the registered sampler (not signature). Samples are invalid unless submitted by a registered sampler with current registration.

Telephone and email: The sampler's contact details are required in case clarification of results is necessary.

Drilling details (if applicable)

If sampling is conducted on people involved with exploration drilling, then "Exploration" must be marked in the company details section. Mark the "Mining" box for drilling that occurs in normal mining operations such as jumbo drilling and in-pit drilling.

Name of drilling company: Enter the name of the company that employs the drilling employee.

Mining tenement ID: There are three types of tenement identification allocated by the Department of Industry and Resources, based on whether the lease is for exploration (E), prospecting (P) or mining (M) purposes (e.g. E68/001, P60/003, M60/002).

Drilling location: Enter the geographical location of the drilling. If exploration drilling is not associated with a mine site, record the latitude and longitude.

Type of drill rig: The amount of dust generated by drill rigs varies depending on the drilling method. Indicate the type of drill rig and technique used. Codes for the more common drilling methods are listed in Appendix 7.

Employee details

Health surveillance number: Enter the MINEHEALTH number of the employee.

Surname: Enter the surname of the employee (in CAPITALS) as recorded on his or her MINEHEALTH card.

Given name: Enter the given name of the employee (in CAPITALS) as recorded on his or her MINEHEALTH card. Do not use nicknames.

Date of birth: Enter the date (i.e. day, month, year — DD/MM/YYYY) on which the employee was born.

Gender: Mark the appropriate box.

Occupation code: Enter the code (Appendix 5) for the permanent or normal occupation of the employee. Where a person is multiskilled, enter the occupation code that best describes most of the tasks completed during the day.

Name of contracting company: Enter the full name of the contracting company if a contract employee is sampled.

Sample collection details

Sample purpose: Distinguish between samples taken to satisfy the quota and samples requested by an inspector. Additional samples taken by the company independent of the quota should be classified as "Other" (e.g. samples collected during exploration on or near existing mining operations).

Sample date: Enter the date (DD/MM/YY) that sampling commenced.

Start and finish times: Enter times using a 24-hour clock.

Sample type: Mark the appropriate box for time-weighted average (TWA), short-term exposure limit (STEL) or Peak limitation (Peak). If an electronic device is used and TWA, STEL and Peak results are obtained, record the TWA and put additional results in the comments section.

Sampling equipment code: Enter the appropriate code from Appendix 8. If multiple pumps and sampling heads are worn on the same person then a separate form is required for each pump or sample head type.

Flow rate: Enter the average flow rate used to calculate the total volume of air sampled. For valid sampling, the start and end flow rates must not deviate more than 5% (or 10% for asbestos fibre and inhalable dust sampling). Note that flow rate is not applicable for some equipment — Appendix 8 lists acceptable flow rates for specific contaminants.

Fibres: It may be necessary to use consecutive samples using low flow rates to monitor for fibres in underground mines. Explain any deviations from normal sampling in the comments section (e.g. result combines three consecutive samples — 2.5, 2.3, 3 hours at 0.1 L/min).

Respirable dust: Australian Standard AS 2985:2004 supersedes all previous versions. Note the correct code for the cyclone and flow rate used for your sampling using Appendix 8.

Inhalable dust: Australian Standard AS 3640:2004 supersedes all previous versions. Inhalable dust was previously known as inspirable dust, thus the contaminant code is "INS".

State the method used in the comments section if you have not used Australian Standards AS 2985 or AS 3640.

Shift length and pattern: Enter the shift length and pattern for the employee.

Location code: Enter the location code (Appendix 9) where most of the exposure occurred during sampling.

Confined space work: Mark the appropriate box. If yes, indicate the purpose in the comments section.

Respirator: Mark the appropriate box to indicate whether a respirator was worn for the majority of the sample duration.

Workplace exposure conditions: Mark the appropriate box. If exposure conditions were unusual, indicate operating or weather conditions in the comments section.

Sample results details

Contaminant code: Enter the contaminant codes (Appendix 6).

Less than detection limit?: The detection limit is the lowest measurable concentration for analysis of the given contaminant. It is controlled by flow rate, the sampling accuracy of equipment and analytical technique. Always verify the detection limit with the analytical laboratory, record this value and mark the "Less than detection limit" box if the calculated result is less than the detection limit for the contaminant.

Concentration and units: Enter the correct unit of measurement in accordance with Appendix 6. All particulates must be recorded as mg/m^3, fibres as f/mL and solvents and gases as parts per million (ppm). Refer to Appendix 6 for the correct unit of measurement to be reported for specific contaminants. A conversion formula is provided in Appendix 10 to convert airborne solvents and gases from mg/m^3 to ppm.

Comments

Provide details of any factors that may have affected the results reported such as unusual events, conditions or work practices during sampling.

Submitting CONTAM system forms

Completed CONTAM system forms should be submitted by email or posted to:

CONTAM Manager
Resources Safety
Department of Mines and Petroleum
100 Plain Street
East Perth WA 6004

Email: contammanager@dmp.wa.gov.au

Further information

Australian Standard AS 2985:2004 *Workplace atmospheres – Method for sampling and gravimetric determination of respirable dust*

Australian Standard AS 3640:2004 *Workplace atmospheres – Method for sampling and gravimetric determination of inhalable dust*

Australian Standard AS/NZS 4360:2004 *Risk management*

Australian Standard AS/NZS 4804:2001 *Occupational health and safety management systems — General guidelines on principles, systems and supporting techniques*

Appendix 1 – Quota allocation report [sample only]

Department of Mines and Petroleum

GOVERNMENT OF WESTERN AUSTRALIA

CONTAM
Quota Allocation Report

Report as at: 16/08/2011

Company:	XYZ Mines PTY LTD
Site:	S00000 ABC Group
Quota Year:	01 July 2011 to 30 June 2012
Quota Periods covered in this report	July - September 2011 October - December 2011 January - March 2012 April - June 2012

Occupation Subgroup / Contaminant	Samples Per Quota Period				Total Samples for Year
	Jul-Sep 2011	Oct-Dec 2011	Jan-Mar 2012	Apr-Jun 2012	
2A Underground - production and Development Miners (Codes 210000 - 234000)					
RES Respirable Dust	0	1	0	1	2
SIL Silica, crystalline	0	1	0	1	2
2A Underground - Production and Development Miners (Codes 210000 - 234000)					
DP Diesel Particulate	4	4	4	4	16
RES Respirable Dust	1	1	1	1	4
SIL Silica, crystalline	1	1	1	1	4
2B Underground - Loading and Transport Occupations (Codes 240[illegible] - 249000)					
DP Diesel Particulate	3	3	3	3	12
RES Respirable Dust	3	3	3	3	12
SIL Silica, crystalline	3	3	3	3	12
2C Underground - Service Occupations (Codes 2[illegible]79000)					
DP Diesel Particulate	2	2	3	2	10
RES Respirable Dust	1	1	1	1	4
SIL Silica, crystalline	1	1	1	1	4
4A Processing Plant Occupations (Codes [illegible] - 41300)					
RES Respirable Dust	1	1	1	1	4
SIL Silica, crystalline	1	1	1	1	4
4B Mobile Plant Occupations (Co[illegible]420000 - [illegible]2000)					
RES Respirable [illegible]	1	1	1	1	4
SIL Silica, crystal[illegible]	1	1	1	1	4
4D Sam[illegible]g, Assay, L[illegible]ory Occupations (Codes 440000 - 443000)					
DB[illegible] Diisobutyl ketone (DBK)	1	1	1	1	4
INS[illegible]	1	1	1	1	4
-PB Lead, inorgan[illegible]dusts & fumes	1	1	1	1	4
RES Respirable[illegible]st	2	2	2	2	8
SIL Silica, crystalline	2	2	2	2	8
6A Metal Trades (Codes 610000 - 699000)					
RES Respirable Dust	1	0	1	0	2
SIL Silica, crystalline	1	0	1	0	2
WLD Welding fumes (not otherwise c	0	1	0	0	1

Total Number of Samples for Year 2011: 131

Ref: CONTAM\RQA0007802011-3307/16 Aug 2011 08:31

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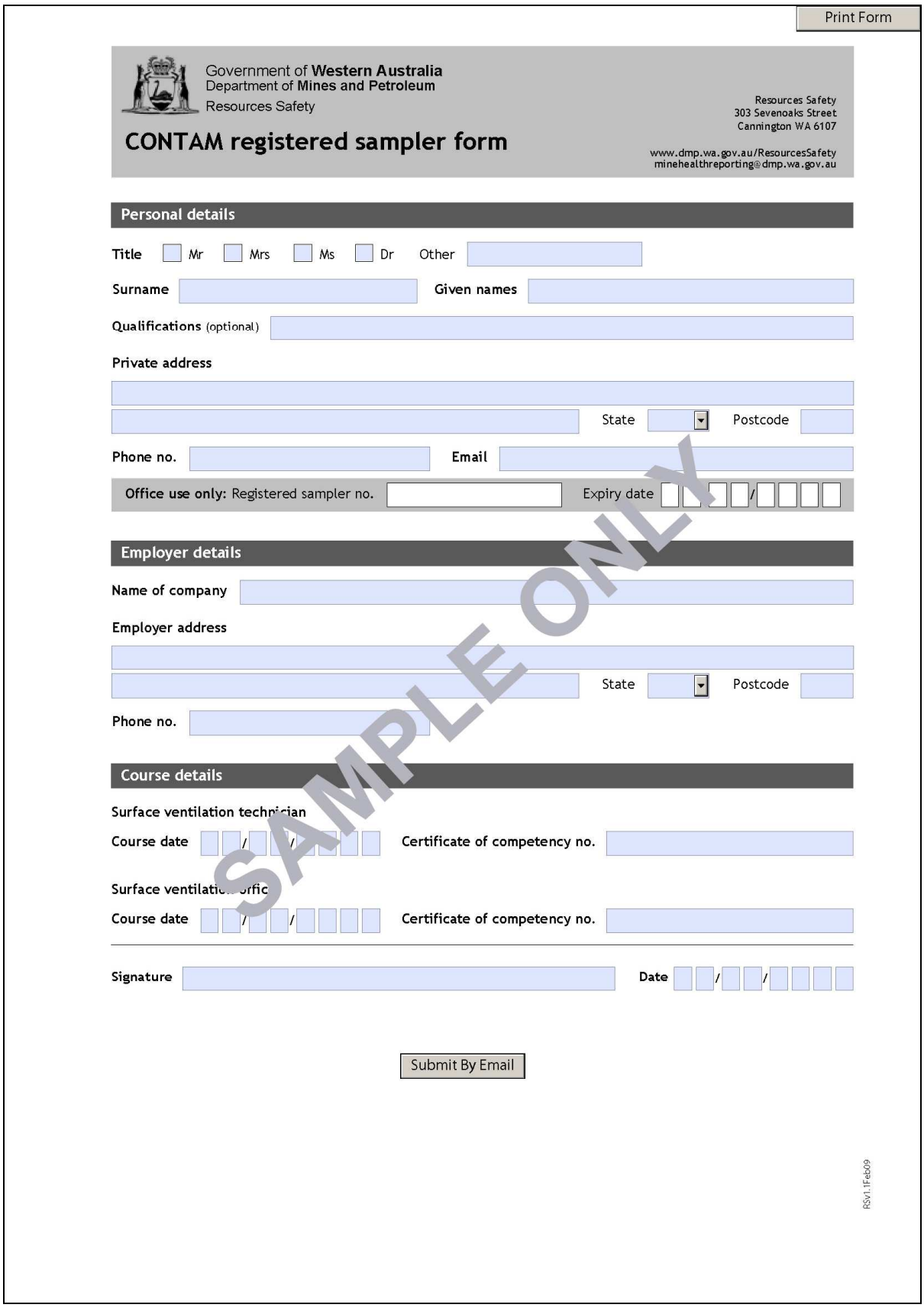
Appendix 2 – Registered sampler form



Print Form

Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

Resources Safety
303 Sevenoaks Street
Cannington WA 6107

www.dmp.wa.gov.au/ResourcesSafety
minehealthreporting@dmp.wa.gov.au

CONTAM registered sampler form

Personal details

Title ☐ Mr ☐ Mrs ☐ Ms ☐ Dr Other

Surname **Given names**

Qualifications (optional)

Private address

State Postcode

Phone no. **Email**

Office use only: Registered sampler no. Expiry date / /

Employer details

Name of company

Employer address

State Postcode

Phone no.

Course details

Surface ventilation technician

Course date / / **Certificate of competency no.**

Surface ventilation officer

Course date / / **Certificate of competency no.**

Signature **Date** / /

Submit By Email

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SAMPLE ONLY

Appendix 3 – Workforce survey form

Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

CONTAM System workforce survey form

100 Plain Street, East Perth WA 6004
Telephone: 08 9358 8461
Fax: 08 9358 8094
contammanager@dmp.wa.gov.au
www.dmp.wa.gov.au/ResourcesSafety

Instructions

- Enter total workforce figures, including all employees (regardless of roster) and record significant atmospheric contaminants that each occupation group is exposed to **OR**, if the results of your previous survey have been supplied, please update the data
- Enter any additional information under 'Comments'

Company details

Company _____ **Site ID no.** _____ **Site** _____

Workforce data to be collected for the 24 hour period on ..... ☐☐/☐☐/☐☐

Workforce data will be used to set quotas for the period ..... ☐☐/☐☐/☐☐ to ☐☐/☐☐/☐☐

Return this form by ..... ☐☐/☐☐/☐☐

Comments

_____

Survey results

Occupation group		Workforce totals				Contaminants			
		Company employees		Contract employees					
		Male	Female	Male	Female				
100000	**Management and supervisory**								
110000–159000	Management and administration								
160000–165000	Supervisory occupations								
200000	**Underground production and services**								
210000–234000	Underground — production and development miners								
240000–249000	Underground — loading and transport operations								
250000–279000	Underground — service occupations								
300000	**Mining production and services (surface)**								
310000–314000	Surface — blast hole drilling								
320000–323000	Surface — charging and blasting								

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Occupation group		Workforce totals				Contaminants			
		Company employees		Contract employees					
		Male	Female	Male	Female				
330000–332000	Exploration drilling								
340000–369000	Excavation and ore transport								
370000–376000	Surface — service occupations								
400000	**Ore treatment occupations**								
410000–413000	Processing plant occupations								
420000–422000	Mobile plant occupations								
430000–433000	Final product handling and transport occupations								
440000–443000	Sampling, assay, laboratory occupations								
500000	**Railway operations occupations**								
510000	Railway operators								
520000–524000	Locomotive crew								
530000–534000	Track laying and maintenance								
600000	**Metal working processing tr[illegible]es**								
610000–699000	Metal trades								
700000	**Electrical and electro[illegible]s**								
710000–790000	Electrical trades								
800000	**Mis[illegible] trades and utilities**								
810000–839000	Miscellaneous trades								
840000–845000	Power plant operators								
850000–890000	Miscellaneous utilities								
900000	**Material handling — stores and warehouse occupations**								
910000–920000	Crane driving occupations								
930000–931000	Storemen not otherwise classified								

Send completed form to the **CONTAM Manager**, Resources Safety, 100 Plain Street, East Perth WA 6004

Appendix 4 – Sample record sheet

Reset Form | Print Form

Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

Resources Safety
303 Sevenoaks Street
Cannington WA 6107

www.dmp.wa.gov.au/ResourcesSafety
contammanager@dmp.wa.gov.au

CONTAM sample record sheet

Company details

Company | Site ID no. | Site

Operation type ☑ Mining ☐ Exploration | Sample collected by

Site phone no. | Site email

Vent. tech./officer phone no. | Vent.tech./officer email

Drilling details

Name of drilling company | Mining Tenement ID

Drilling location | Type of drill rig | Other

Employee details

Health surveillance number

Surname | Given name

Date of birth / / | Gender ☐ Male ☐ Female | Occupation code 000

Name of contracting company *(if applicable)*

Sample collection details

Sample purpose ☐ Quota ☐ Requested by inspector ☐ Other

Sample date / / | Start time hrs | Finish time hrs

Sample type ☐ TWA ☐ STEL ☐ Peak

Sampling equipment code | Flow rate . L/min

Shift length hrs mins | Shift pattern days on / days off

Location code *(where pollutant exposure occurs)* | Confined space work ☐ Yes ☐ No

Respirator ☐ Worn ☐ Not worn | Workplace exposure conditions ☐ Normal ☐ Unusual

Sample results detail

Contaminant code	Less than detection limit ?	Concentration	Unit
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	

Comments

SRSv1.1Feb09

New Sample | Submit By Email

Appendix 5 – Occupation codes

100000 Management and supervisory

110000 General management occupations

Financial manager
Personnel manager
Sales manager
Purchasing manager

120000 Engineering occupations

121000 Mining engineer
122000 Mechanical engineer
123000 Civil engineer
124000 Chemical engineer
125000 Metallurgical engineer
126000 Petroleum engineer
129000 Engineer NOC

130000 Professional and related occupations

131000 Chemist
132000 Geologist or geological assistant
133000 Metallurgist
134000 Environmental scientist or assistant
135000 Surveyor
136000 Draftsman
137000 Health or medical occupations
- Doctor
- Occupational health nurse
- First aid attendant

138000 Industrial hygienist
139000 Professional and related NOC

140000 Management or administration services

141000 Security officer
142000 Safety officer
143000 Training officer
144000 Personnel officer
145000 Clerical or secretarial occupations
146000 Township or accommodation occupations
- Caretaker
- Housekeeper or cleaner
- Handyman
- Gardener
- Groundsman
- Township or accommodation occupation NOC

147000 Catering occupations
- Cook
- Catering assistant
- Kitchen hand
- Canteen attendant
- Catering occupations NOC

148000 Cleaning or laundering occupations
149000 Management or administrative services occupations NOC

150000 Mine management occupations

151000 Mine manager
152000 Underground manager
153000 Assistant underground manager
154000 Under manager
155000 Mine management occupations NOC

160000 Supervisory occupations

161000 Deputy (coal)
162000 Foreman or shift boss underground
163000 Foreman or shift foreman surface
164000 Overman (coal)
165000 Supervisor

200000 Underground production and services

210000 Miners production or development (underground)

211000 Contract miner
212000 Coal miner (underground)
213000 Non-contract miner (underground)
214000 Trainee miner
215000 Miner NOC
216000 Miner's assistant

220000 Long hole drill and blast occupations (underground)

221000 Long hole drill operator
222000 Long hole driller's assistant
223000 Shotfirer
224000 Shotfirer's assistant (charging)

230000 Diamond drillers or raiseborers

231000 Diamond drill operator
232000 Diamond driller's assistant
233000 Raiseborer operator
234000 Raiseborer's assistant

240000 Loading or transport occupations (underground)

241000 Diesel loader operator
242000 Mechanical bogger driver
243000 Scraper operator
244000 Locomotive driver
245000 Truck driver
246000 Plant operator
247000 Underground personnel transport driver
248000 Conveyor attendant or operator
249000 Trucker

250000 Ground or roof support occupations (underground)

251000 Timberman
252000 Roofbolter
253000 Hydraulic fill operator

260000 Services occupations (underground)

261000 Ventilation occupations
262000 Tracklayer or platelayer
263000 Pipefitter
264000 Pumpman or pump attendant
265000 Nipper, salvageman or utilityman
266000 Underground crushing operator
266100 Grizzleyman or pass runner
267000 Underground labourer or tool carrier
268000 Sanitaryman
269000 Underground services occupations NOC

270000 Underground winding and hoisting occupations

271000 Winding engine driver
272000 Hoist driver
273000 Platman
274000 Skipman
275000 Braceman
276000 Brakeman
277000 Onsetter
279000 Winding and hoisting occupations NOC

300000 Mining production and services (surface)

310000 Blast hole drilling surface

311000 Blast hole drill operator
312000 Blast hole drill operator's assistant
313000 Air track or crawl air driller
314000 Sniper drill operator (rubber tyred)

320000 Charging and blasting (surface)

321000 Powder monkey, leading hand or shotfirer
322000 Powder truck driver
323000 Powder crew labourer

330000 Exploration drilling (surface)

331000 Driller
332000 Driller's assistant

340000 Excavation equipment operators (surface)

341000 Bucketwheel operator
342000 Bucketwheel operator's assistant
343000 Dragline operator
344000 Rope shovel operator
346000 Hydraulic excavator operator
347000 Dredge operator
348000 Front end loader operator
349000 Excavation equipment operator NOC

350000 Mobile plant operator (surface)

351000 Bulldozer operator
352000 Grader driver
353000 Backhoe operator
354000 Scraper driver
359000 Mobile plant operator NOC

360000 Driving occupations (surface)

361000 Haulage truck driver
362000 Water truck driver
363000 Explosives truck driver
364000 Fuel, grease or service truck driver
365000 Hiab truck driver
366000 Passenger vehicle driver or bus driver
367000 Equipment transport driver
369000 Driver NOC

370000 Open cut service occupations

371000 Greaser or oiler
372000 Quarry labourer or labourer
373000 Fuel and lubrication serviceman
374000 Wash bay operator
375000 Dump spotter
376000 Weighbridge operator

400000 Ore treatment occupations

410000 Processing plant occupations

411000 Processing plant operator
412000 Processing plant serviceman
413000 Processing plant utility worker

420000 Mobile plant occupations

421000 Front end loader operator
422000 Mobile plant operator NOC

430000 Final product handling or transport occupations

431000 Final product packer, loader or dumper operator
432000 Final product warehouse operator
433000 Final product handling or transport NOC

440000 Sampling, assay, laboratory occupations

441000 Laboratory technician, assistant or analyst
442000 Sample preparation operator
443000 Sampler or sample plant operator

500000 Railway operations occupations

510000 Railway operator NOC

520000 Locomotive crews

521000 Locomotive driver
522000 Observer
523000 Trainee observer
524000 Shunter locomotive driver

530000 Track laying or maintenance

531000 Ganger
532000 Platelayer
533000 Track maintenance machine operator
534000 Track labourer

600000 Metal working processing trades

610000 Sheet metal trades

611000 Metal patternmaker
612000 Sheet metal worker
613000 Coppersmith
614000 Guillotine operator
615000 Millwright

620000 Metal machining trades

621000 Metal machinist
622000 Fitter or turner

630000 Fitter mechanical

631000 Fitter
632000 Fitter — welder
633000 Fitter — diesel
634000 Fitter — pipe

640000 Structural steel trades

641000 Boilermaker or welder
642000 Boilermaker
643000 Welder

650000 Metal trades apprentices

651000 Sheet metal apprentice
652000 Metal machining apprentice
653000 Fitter's apprentice
654000 Boilermaker's apprentice
659000 Apprentice NOC

660000 Trades assistant

690000 Metal trades

691000 Tool and dye setter
692000 Saw setter
693000 Electroplater
694000 Blacksmith
695000 Shipwright
696000 Instrument artificer
697000 Lamp room mechanic or assistant
698000 Toolmaker
699000 Drill doctor

700000 Electrical or electronic trades

710000 Electrical trades

711000 Linesman
712000 Electrical fitter
712100 Cable splicer
713000 Electrical mechanic
714000 Automotive electrician
715000 Refrigeration mechanic
716000 Air conditioning mechanic
717000 Electrical installer
718000 Lift mechanic
719000 Electrician NOC

720000 Electronic trades

721000 Radio technician
722000 Telecommunication technician
723000 Telecommunication trainee
724000 Signals technician
725000 Instrument technician

730000 Electrical or electronic apprentices

731000 Electrical apprentice
732000 Electronic apprentice

790000 Electrical trades assistant

800000 Miscellaneous trades or utilities

810000 Construction trades

811000 Bricklayer
812000 Carpenter or joiner
813000 Painter
814000 Plasterer or tiler
815000 Plumber or drainer
816000 Rigger or ropesplicer
817000 Scaffolder
818000 Construction trades assistant

820000 Conveyor belt repair occupations

821000 Belt repairer
822000 Belt repairers assistant
823000 Trainee belt repairer
824000 Rubber repairer NOC

830000 Motor or engine trades

831000 Motor mechanic
832000 Diesel motor mechanic
833000 Brake mechanic
834000 Tyre fitter
835000 Panel beater
836000 Spray painter
837000 Mechanic NOC
838000 Trades assistant
839000 Sand blaster

840000 Power plant operators

841000 Power plant engine driver
842000 Power plant trainee engine driver
843000 Power plant greaser
844000 Boiler attendant
845000 Fireman

850000 Water treatment plant operator

860000 Waste disposal equipment operator

870000 Gas supply service operator

890000 Utility operator NOC

900000 Material handling — stores or warehouse occupations

910000 Crane driving occupations

911000 Mobile crane driver
912000 Tower crane driver
913000 Overhead crane driver (cabin controlled)
914000 Crane driver NOC
915000 Dogman or cranechaser

920000 Fork lift operator

930000 Storemen NOC

931000 Toolstore attendant

NOC = not otherwise classified

Appendix 6 – Contaminant codes

Contaminant codes and the unit of measurement that must be reported for each contaminant are listed below. As a general rule, solvents and gases must be reported as parts per million (ppm), all particulates (dusts, metals, fumes) must be reported as milligrams per cubic metre (mg/m^3) and fibres must be reported as fibres per millilitre (f/mL).

Contaminant description	Code	Unit of measurement	Sampling equipment code
1,1,1-trichloroethane	TCE	ppm	PM ,ST
1,1,2,2-tetrabromoethane	TBE	ppm	ST
2-ethoxyethanol	EXE	ppm	PM, ST,
2-ethoxyethyl acetate	EXA	ppm	PM, ST
Acetone	ACT	ppm	PM, ST
Acrolein	ACR	ppm	ST
Actinolite	ACN	f/mL	AS
Aldehyde	ALD	ppm	ST
Aluminium metal and oxide	ALM	mg/m^3	7H, IO, FC, C2, CA
Ammonia	NH3	ppm	ED, IP, ST
Amorphous silica	ASL	mg/m^3	C2, CA, IO, 7H
Amosite	AMS	f/mL	AS
Anthophyllite	ANT	f/mL	AS
Antinomy and compounds (as Sb)	-SB	mg/m^3	7H, IO
Arsenic compounds (as As)	-AS	mg/m^3	7H, IO
Asbestos	ASB	f/mL	AS
Benzene	BNZ	ppm	ST
Bromoform	BRO	ppm	PM, ST
Cadmium and compounds (as Cd)	-CD	mg/m^3	7H, IO
Calcium hydroxide (slaked lime)	LIM	mg/m3	7H, IO, C2, CA
Calcium oxide (quicklime)	CAO	mg/m^3	7H, IO
Carbon black	CRB	mg/m^3	7H, IO
Carbon dioxide	CO2	ppm	ED, SB, DT
Carbon disulphide	CS2	ppm	ST
Carbon monoxide	-CO	ppm	ED, SB, DT
Chlorine	CL2	ppm	7H, IO, IP
Chromic acid and chromates (as Cr)	-CR	mg/m^3	7H, IO
Chromium metal	CRM	mg/m^3	7H, IO
Chrysotile	CHR	f/mL	AS
Coal dust (containing <5% quartz)	COL	mg/m^3	C2, CA
Cobalt, metal dust and fume (as Co)	COB	mg/m^3	7H, IO, C2, CA
Copper	-CU	mg/m^3	7H, IO
Copper (fume)	CUF	mg/m^3	7H, IO
Cresol	CRE	ppm	ST

Contaminant description	Code	Unit of measurement	Sampling equipment code
Crocidolite	CRO	f/mL	AS
Cyanides (as CN)	CYN	mg/m^3	7H, IO, IP, ST
Diesel particulate	DP	mg/m^3	DM, CA, C2, FC
Diisobutyl ketone (DIBK)	DBK	ppm	PM, ST
Ethyl acetate	ETA	ppm	ST, PM
Ethyl alcohol (ethanol)	ETL	ppm	PM, ST
Ferrovanadium dust	FVA	mg/m^3	7H, IO
Fluorides (as F)	FLD	mg/m^3	7H, IO, IP
Formaldehyde	FHD	ppm	7H, IO, IP, PM,ST
Graphite (synthetic)	GRT	mg/m^3	C2, CA
Gypsum (calcium sulphate)	GYP	mg/m^3	7H, IO, C2, CA
Heptane (n-heptane)	HEP	ppm	PM,ST
Hexane (n-hexane)	HEX	ppm	PM ,ST
Hydrogen chloride	HCL	ppm	7H, IO, ST
Hydrogen fluoride	-HF	ppm	7H, IO, ST
Hydrogen sulphide	H2S	ppm	7H, DT, ED, IO, ST
Inspirable dust (inhalable)	INS	mg/m^3	7H, IO
Iron oxide fume (Fe_2O_3) (as Fe)	FEO	mg/m^3	7H, IO
Isobutyl alcohol	IBA	ppm	PM, ST
Isocyantes, all (as -NCO)	ISO	mg/m^3	IP, ST
Isopropyl alcohol	IPA	ppm	PM, ST
Lead, inorganic dusts and fumes	-PB	mg/m^3	7H, IO
Limestone (calcium carbonate)	LST	mg/m^3	7H, IO
Manganese (fume) (as Mn)	MNF	mg/m^3	7H, IO
Manganese, dust and compounds (as Mn)	-MN	mg/m^3	7H, IO
Mercury, elemental vapour	-HG	mg/m^3	7H, IO, PM, ST
Methyl chloride	MEC	ppm	ST
Methyl ethyl ketone (MEK)	MEK	ppm	ST
Methyl ethyl ketone peroxide	MKP	ppm	IP, ST
Methyl isobutyl ketone	MBK	ppm	PM ,ST
Methylene chloride	MNC	ppm	PM ,ST
Mica	MIC	mg/m^3	CA, C2
Molybdenum	-MO	mg/m^3	7H, IO
N-propyl alcohol	NPA	ppm	PM ,ST
N-butyl alcohol	NBA	ppm	PM ,ST
Nickel sulphide roasting (fume)	NIS	mg/m^3	7H, IO
Nickel, metal	-NI	mg/m^3	7H, IO, CA, C2
Nickel, soluble compounds (as Ni)	NSO	mg/m^3	7H, IO
Nitric acid	HNO	ppm	ST

Contaminant description	Code	Unit of measurement	Sampling equipment code
Nitric oxide	-NO	ppm	DT
Nitrogen dioxide	NO2	ppm	DT, ST
Octane	OCT	ppm	PM ,ST
Oil mist, refined mineral	OIL	mg/m^3	7H, IO, CA, C2, FC
Ozone	-O3	ppm	DT
Perchloroethylene	PCE	ppm	PM, ST
Polycyclic aromatic hydrocarbon	PAH	mg/m^3	7H, IO, ST
Respirable dust	RES	mg/m^3	C2, CA
Sec-butyl alcohol	SBA	ppm	ST
Selenium	SE	mg/m^3	7H, IO
Silica, crystalline	SIL	mg/m^3	C2, CA
Silver, metal	-AG	mg/m^3	7H, IO
Soapstone (inspirable dust)	SPS	mg/m^3	7H, IO, C2, CA
Sodium hydroxide	NAH	mg/m^3	7H, IO, FC
Styrene, monomer	STY	ppm	PM, ST
Sulphur dioxide	SO2	ppm	7H, IO, DT, ED, FC, IP, ST
Sulphuric acid	HSO	mg/m^3	7H, IO, FC, ST
Synthetic mineral fibres (SMF)	SMF	f/mL	AS
Talc, containing no asbestos fibres	TAD	mg/m3	7H, IO
Talc, fibrous	TAF	f/mL	AS
Tantalum, metal and oxide dusts	TAM	mg/m^3	7H, IO
Tellurium and compounds (as Te)	-TE	mg/m^3	7H, IO, ST
Thallium	THA	mg/m^3	7H, IO
Tin, metal	TIN	mg/m^3	7H, IO
Tin, oxide and inorganic compound (as Sn)	SNO	mg/m^3	7H, IO
Toluene	TOL	ppm	PM, ST
Toluene diisocyanate	TDI	mg/m^3	7H, IO, IP
Total petroleum hydrocarbons	TPH	mg/m^3	ST
Trichloroethylene	TRI	ppm	PM, ST, SB
Tungsten	TUN	mg/m^3	7H, IO
Turpentine	TUR	ppm	ST
Vanadium (as V_2O_5) (respirable)	VAN	mg/m^3	C2, CA
Welding fumes (not otherwise classified)	WLD	mg/m^3	7H, IO, FC
Wood dust (certain hardwoods)	WDH	mg/m^3	7H, IO
Wood dust (soft wood)	WDS	mg/m^3	7H, IO
Xylene (o-, m- and p-isomers)	XYL	ppm	PM, ST
Zinc	-ZN	mg/m^3	7H, IO
Zinc oxide (fume)	ZNF	mg/m^3	7H, IO

Contaminant description	Code	Unit of measurement	Sampling equipment code
Zirconium compounds (as Zr)	ZRC	mg/m^3	7H, IO

Appendix 7 – Drilling method codes

Aircore	AIR
Bulldozer	BULL
Core logging	CLO
Diamond drill	DIA
Ditch witch	DW
Grader	GDR
Hand auger	AUG
Hand sampling	HS
Percussive diamond drill	DIAP
Reverse circulation drill	RC
Rotary air blast drill	RAB
Vacuum drill	VAC

Appendix 8 – Equipment codes

Sampling equipment	Code	Acceptable flowrate (if applicable)
7 hole	7H	2.0 L/min
Aluminium cyclone	CA	2.5 L/min
Asbestos sample head	AS	0.4 - 2.0 L/min
Cyclone (2.2 L/min)	C2	2.2 L/min
Detector tube	DT	Not applicable
Diesel particulate monitor	DM	1.6 - 2.1 L/min
Electronic device	ED	Not applicable
Filter cassette	FC	0.9 - 2.1 L/min
Impinger	IP	0.5 - 2.0 L/min
IOM head	IO	2.0 L/min
Passive monitor	PM	Not applicable
Sorbent/sample tube	ST	0.02 - 1.0 L/min

Appendix 9 – Location codes

040 Exploration (not at a mine site)

100 Underground workplaces

110 Access, travelling or haulage ways

111 Brace or winder building
112 Shaft
113 Plat
114 Decline, adit or drift
115 Haulroad or level
116 Conveyor road
117 Ladderway
118 Return airways

120 Underground production or development areas

121 Underground face area (coal)
122 Underground stope
125 Loading pocket
126 Raise (development)
127 Decline or winze (development)
128 Level (development)
129 Capital (development)

130 Underground workshop

140 Pump chamber

150 Underground storage areas

151 Fuel storage
152 Explosives magazine
153 Underground stores — general

160 Underground ore or waste dumping

161 Ore or waste tip or pass area
162 Grizzly
163 Millhole

170 Underground crushing area

180 Ancillary locations

181 Crib room
182 Latrine

190 Underground

200 Open pit production or development areas

210 Face loading area

220 Bench areas not haul road

221 Drill pattern area
222 Heavy vehicle park up area

230 Haul road

231 Haul road — level
232 Haul road — ramp or incline

240 Waste dump area

250 Ore tipping area

260 In pit crushing

261 In pit crusher area
262 In pit conveyors

270 Stockpile — run of mine

280 Salt production areas

290 Open cut NOC

291 Dredge

300 Surface work areas — general

310 Mine access road (not haul road)

320 Park up area, heavy vehicles or plant

330 Warehouse or stores

340 Explosives magazine

350 Fuel storage area

360 Laboratory

370 Storage yard or rebuild area

380 Lube bay or service bay

381 Wash down area

390 Surface general area

400 Treatment plant or ore processing

411 Process control room

413 Crushing, screening or conveyor

416 Heap, vat or insitu leaching

419 Grinding or classification

422 Gravity concentration or magnetic separation

425 Flotation

428 Leaching

431 Solvent extraction, scrubber or stripper

434 Filter, press or wet screening

437 Thickening or clarification

439 Crystallisation, nucleation or ion exchange

441 Electrowinning or cell house

444 Smelter, roaster or furnace area

447 Gold room and elution facility

451 Tailings storage facility

454 Product packaging or storage

457 Sample plant or station

461 Reagent or raw material storage area

464 Reagent or raw materials preparation plant

467 Water treatment plant

471 Processing plant other

500 Crushed ore areas

510 Stockpiles

511 Stockpile access road

520 Train loading or unloading

521 Train loader or loading area
522 Train unloader or tippler area

530 Stacker reclaimer area

540 Stacker or reclaim conveyor

550 Wharf area

551 Shiploader wharf
552 Conveyors wharf

600 Workshop surface

610 Workshop heavy equipment

620 Workshop elect or instruments

630 Workshop railway

640 Workshop auto or light vehicles

650 Workshop boilermakers

660 Workshop painters or carpenters

670 Workshop tyre fitting

680 Workshop belt repairs

690 Workshop NOC

700 Railways

710 Main lines

711 Main line — on track
712 Main line — off track

720 Sidings

721 Siding — on track
722 Siding —off track

730 Railway access road

740 Railway yard

800 Power generation plant

810 Control room

820 Distribution or sub-station

830 Engine room

900 Administration areas

910 Offices or administration building

920 Crib room, canteen or mess

930 Showers or change room

940 Lamproom

950 Car park

960 Pathways

970 Gardens

990 Administration NOC

NOC = not otherwise classified

Appendix 10 – Measurement conversion

The conversion equations are based on 25ºC and 1 atmosphere.

Conversion formula for ppm to mg/m^3

X ppm = (Y mg/m^3)(24.45) / (molecular weight)

Conversion formula for mg/m^3 to ppm

Y mg/m^3 = (X ppm)(molecular weight) / 24.45