



DRAFT

Code of Practice

SURVEY AND DRAFTING DIRECTIONS FOR MINE SURVEYORS



Image courtesy of Queensland Department of Employment, Economic Development and Innovation



safe work australia

TABLE OF CONTENTS

FOREWORD	4
SCOPE AND APPLICATION	4
1 INTRODUCTION.....	6
1.1. COMPILING MINE PLANS	6
1.2. SYMBOLS.....	6
1.3. FUNCTIONS OF A MINE SURVEYOR.....	6
1.4. INSPECTION	7
2 SURVEY STANDARDS AND PROCEDURES.....	8
2.1. ORIGIN OF CO-ORDINATES	8
2.2. UNDERGROUND BASELINE	8
2.3. CONTROL SURVEYS AND SUBSIDIARY SURVEYS	8
2.4. CORRELATION OF SURFACE AND UNDERGROUND SURVEYS.....	8
2.5. SURVEY RECORDS AND SUPPLY OF SURVEY INFORMATION.....	9
2.6. REQUIREMENTS BEFORE WORKINGS BECOME INACCESSIBLE	10
2.7. SURFACE MOVEMENT AND SUBSIDENCE	10
2.8. SURVEY OF BOREHOLES	10
3 MINE WORKINGS PLAN	11
3.1. PREPARING THE MINE WORKINGS PLAN.....	11
3.2. UPDATING THE MINE WORKINGS PLAN.....	11
3.3. COMPOSITION OF THE MINE WORKING PLAN.....	11
3.4. PRESENTATION AND ARCHIVING – HARD COPY.....	11
3.5. LEVEL, SEAM AND OPEN CUT VOID SHEETS.....	11
3.6. INFORMATION TO BE SHOWN ON THE MINE WORKINGS PLAN	11
3.7. ADDITIONAL INFORMATION.....	13
3.8. DOUBTFUL INFORMATION.....	13
3.9. OLD WORKINGS/SURVEYS.....	13
3.10. CERTIFICATION	13
3.11. CERTIFICATION HISTORY	14
3.12. CATALOGUE NUMBER	14
4 MINE SPATIAL INFORMATION	15
4.1. PREPARATION	15
4.2. COMPOSITION	15
5 CLOSING PLANS.....	16
5.1. DISCONTINUANCE	16
5.2. CHARTING FOR DISCONTINUANCE	16
5.3. CHARTING FOR ABANDONMENT.....	16
5.4. CESSATION OF DUTIES OF THE MINE SURVEYOR.....	16
5.5. REPLACEMENT OF BUSINESS OPERATOR	16
6 SUPPLY OF MINE WORKINGS PLAN AND DIGITAL DATA	17
6.1. SUPPLY PERIOD	17
6.2. SUPPLY ON DISCONTINUANCE AND ABANDONMENT	17
6.3. SUPPLY ON CESSATION OF DUTIES OF A MINE SURVEYOR.....	17
6.4. CERTIFICATION	17
7 OTHER PLANS REQUIRED	18

7.1.	COMBINING TWO (2) OR MORE PLANS	18
7.2.	ENDORISING COMBINED PLANS	18
7.3.	SUBSIDENCE MANAGEMENT PLANS	18
7.4.	VENTILATION PLAN (UNDERGROUND OPERATIONS).....	18
7.5.	FIRE FIGHTING PLAN (UNDERGROUND MINES).....	18
7.6.	ESCAPE AND RESCUE PLAN (UNDERGROUND OPERATIONS).....	19
7.7.	SURFACE PLAN	19
7.8.	SITE SERVICES PLAN (UNDERGROUND AND OPEN CUT MINES)	20
7.9.	TAILINGS DAMS/WASTE DUMP AREAS	20
7.10.	EMPLACEMENT AREAS	20
7.11.	PLAN STANDARDS - GENERAL.....	21
7.12.	DECLARATION	21
8	STANDARDS FOR THE PREPARATION OF MINE SPATIAL INFORMATION.....	22
8.1.	THEME ATTRIBUTE NAMES AND DEFINITIONS.....	22
8.2.	THEME ATTRIBUTE ALLOCATION AND FEATURE TYPE.....	22
8.3.	THEME ATTRIBUTE CATEGORIES.....	22
8.4.	ATTRIBUTE VALUES	23
8.5.	DATE	23
8.6.	METADATA STATEMENTS	23
8.7.	PRECISION	23
8.8.	PREPARATION OF ADDITIONAL THEMES.....	23
8.9.	PREPARATION OF ADDITIONAL ATTRIBUTES.....	23
	APPENDIX A - TABLES	24
	TABLE 1 - THEME ATTRIBUTE NAMES AND DEFINITIONS	24
	TABLE 2 - THEME ATTRIBUTE ALLOCATION AND FEATURE TYPE	27
	TABLE 3 - FILE NAMING CONVENTION.....	28
	TABLE 4 - METADATA STATEMENT	29
	APPENDIX B – MEANING OF KEY TERMS	33

FOREWORD

This Code of Practice on survey and drafting directions for mine surveyors is an approved code of practice under section 274 of the *Work Health and Safety Act* (the WHS Act).

An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulations (the WHS Regulations).

A code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in the WHS Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks which may arise. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and Regulations. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

Compliance with the WHS Act and Regulations may be achieved by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.

This Code has been developed by Safe Work Australia in conjunction with the National Mine Safety Framework Steering Group as a model code of practice under the Council of Australian Governments' *Inter-Governmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety* for adoption by the Commonwealth, state and territory governments.

A draft of this Code was released for public consultation on *[to be completed]* and was endorsed by the Select Council on Workplace Relations on *[to be completed]*.

SCOPE AND APPLICATION

The WHS Regulations require that mine operators ensure that a detailed plan of the mine is prepared by a competent person and kept at the mine. Mine operators may do this a number of ways. They may engage the services of a registered mine surveyor on a contract basis or they may employ a surveyor.

No matter which method is used to by the mine operator to comply with their legal duty, this code will provide assistance to those developing the mine plan. By following this code a detailed plan can be developed which complies with the legal requirements.

This code provides guidance for preparation of the hard copy, digital themes, storage and preparation of the Mine Plan with respect to mine workings and Mine Spatial Information for the whole of the mine. It provides guidance to the preparation of other plans based on the mine's stored data.

This Code applies the conduct of surveys, the preparation of mine plans and storage of data for mines in Australia.

Who should use this code?

The principal users of this code are mine operators and mine surveyors. The mine operator may use this code to ensure that the plans developed by employed or contract surveyors will meet the mine operator's legislative duty.

How to use this code of practice

This Code includes references to both mandatory and non-mandatory actions. The references to legal requirements contained in the WHS Act and Regulations (highlighted in text boxes in this Code) are not exhaustive and are included for context only.

The words 'must', 'requires' or 'mandatory' indicate that legal requirements exist, which must be complied with.

The word 'should' indicates a recommended course of action, while 'may' indicates an optional course of action.

1 INTRODUCTION

This code should be followed by mine surveyors in all mines. This code should be used in the compilation of a Mine Workings Plan for each mining operation.

A Mine Workings Plan consists of a number of sheets showing the entire workings of a mine in plan or section. Each sheet represents a part or whole of one or more mining horizons or an area of the mining or quarrying operation shown in plan. The Mine Workings Plan in this code includes any cross section or longitudinal section sheets used.

1.1. Compiling mine plans

The mining operation may operate on a local survey grid/datum however all Mine Workings Plan and Mine Spatial Information should be compiled on the Map Grid of Australia 1994 (MGA94) based on the Geocentric Datum of Australia 1994 (GDA94) values.

The Mine Workings Plan should be sectionalised into sheets that best fit individual mines. In determining the best fit for the sheet layout the Mine surveyor should be mindful of the need to provide for expansion of the mine and adjoining mine workings.

Where old workings exist it should be assumed, for the purpose of marking the Mine Workings Plan, that they constitute a danger until proven otherwise. All plans should be regarded with suspicion until their accuracy has been verified and validated. All reasonable effort should be made to obtain all existing information about old workings which should be recorded on the Mine Workings Plan.

1.2. Symbols

The technical symbols, sign conventions and definitions for strata to be shown on the Mine Workings Plan and the Mine Spatial Information should be in accordance with:

- *Australian Standard for Mine Plans – Preparation and Symbols (AS-4368)*, and
- *Australian Standard for Geological Symbols (AS-2916)*.

If a symbol is not provided for in AS4368 or AS2916 the Mine surveyor may create a suitable symbol to be shown in the legend.

1.3. Functions of a Mine surveyor

The functions of the Mine surveyor include the following.

- To competently develop mines plans Bring to the attention of the mine operator:
 - any variation in mine workings from a Mine Workings Plan of which the surveyor becomes aware, or
 - any interference with or obstruction to the surveyors' performance or functions, or
 - any doubt about the accuracy of any plans, *Conversion to Map Grid of Australia 1994 (MGA94)*

When new sheets of the Mine Workings Plan are being prepared and the workings of any part of the mine should be completed, sealed or otherwise become inaccessible, it is acceptable to draw an outline of such workings and to endorse the new Mine Workings Plan and to refer to the previously prepared Mine Workings Plans for detail.

Any previously prepared Mine Workings Plan may also be a historical set of mine drawings that are accessible and in good condition. The relationship of the origin and height datum of any set of drawings to the current mine grid and datum or to MGA94 and AHD should be established.

Should the workings become active, or used for access in an area previously shown in outline, the survey of the workings should be transferred in full to the new Mine Workings Plan.

Nothing should prevent the Mine surveyor from transferring inactive mine workings in full to the new Mine Workings Plan.

1.4. Inspection

The mine operator must keep the mine survey plan available for inspection under the Act. It must also be readily accessible on request to workers at the mine.

2 SURVEY STANDARDS AND PROCEDURES

2.1. Origin of Co-ordinates

All surveys should originate from the Mine baseline or any other mark included in the state survey control network having a standard of accuracy consistent with that of the Mine Baseline.

The survey of the Mine Baseline should be planned and surveyed to Class “B” standards of accuracy as defined in ICSM SP1.

Where required, at each end of the Mine Baseline there should be a reference mark of durable nature connected by bearing and distance to the baseline permanent mark.

If the position or co-ordinate values of the Mine Baseline change, this information should be reported in accordance with any regulations.

Where required, a hard copy plan and an electronic record with digital survey data should be forwarded to any regulatory body.

For an existing mine, the current baseline marks should be retained provided they are of a durable nature.

2.2. Underground Baseline

Each underground mine should establish underground baselines, in suitable positions in the underground workings and as long as practicable. The terminal marks should be stable and durable. Underground Baseline details should be recorded on the Mine Workings Plan.

2.3. Control Surveys and Subsidiary Surveys

Where no prescribed accuracy is defined, each Control Survey should achieve a standard of accuracy as prescribed in ICSM, SP1 to Class D or better. When calculating compliance to ICSM SP1 Class D using the formula $r = c(d + 0.2)$ this direction specifically defines d as the following: d = distance to any station in km, with a minimum value of 1(km).

Marking: each control survey station should be adequately referenced and substantially marked. As far as practicable the marks should be placed in a position least likely to be disturbed.

Subsidiary surveys should be employed by the Mine surveyor where necessary to within an accuracy of 2m of position.

2.4. Correlation of Surface and Underground Surveys

Correlation between surface and underground surveys should be consistent with a Class D survey as prescribed in ICSM SP1.

In correlation of surface and underground surveys where methods other than direct traverse are employed for azimuth or co-ordinate transfer, the surveys should be shown on a plan separate from the Mine Workings Plan and should disclose the special survey methods employed. The plan should be retained at the operation and the Mine surveyor should certify that the survey shown on the plan is accurate.

2.5. Survey Records and Supply of Survey Information

Systematic and reasonable care should be taken to ensure the safe preservation of all survey records

Records should be kept at the survey office for each of the following purposes:

- control surveys,
- subsidiary surveys,
- surface movement and subsidence surveys.

Survey Records should be maintained either manually (in a field book or other stable material) or electronically. Where a machine or other device is required to access the stored data the Mine surveyor should ensure the data is regularly updated to a media and format that is currently available.

Survey Records should be permanently recorded and maintained so that they can be utilised for future surveys

- All survey books should be maintained in good order and should have the following description clearly and permanently marked on the cover and inside title page:
 - the name of the mine, and
 - for underground mines, the level name and catalogue number to which the book refers, and
 - consecutive index number.
- The following procedures should be adopted for entries into survey books
 - all survey observations and measurements should be recorded at the time of survey;
 - in the event of alteration of a mistake there should be no erasure
 - the erroneous entry should be struck through and the correction written above
 - the datum line of the survey and the azimuth adopted should be clearly indicated
 - lengths should be entered at the time they are measured and where necessary corrections should be clearly indicated
 - bearing and distance from reference marks should be clearly shown
 - reference marks and bench marks placed by the surveyor should be noted with the positions and descriptions shown by a sketch in the appropriate book
 - lines remeasured should be so specified and original distances and bearings shown, and
 - the mine surveyor should sign and date the field book showing the work was performed by him or under his supervision.

Where surveys are recorded in electronic form the information recorded should be consistent with that required for survey books. A complete and separate duplicate of such records should be preserved on paper or disc or other permanent electronic medium. Where a machine or other device is required to access the stored data the mine surveyor should ensure the data is regularly updated to a media and format that is currently available

The mine surveyor should make available any records (or copies) to the regulatory body when requested

Upon Discontinuance of a mine all Survey Records relevant to the preparation of the Mine Workings Plan should be prepared by the Mine surveyor for submission to the regulatory body for retention

2.6. Requirements before workings become inaccessible

Before any part of the workings of a mine becomes inaccessible the position of the workings should be established from a control or subsidiary survey (where reasonably practical and safe to do so).

Where inaccessible workings are unable to be surveyed; the Mine surveyor should take all reasonably practicable steps to assist completion of the Mine Workings Plan.

2.7. Surface Movement and Subsidence

Surveys should be undertaken to record surface movement, including subsidence induced by mining.

These surveys should be carried out under the supervision of, and certified by, the Mine surveyor.

A copy of all surface movement and /or subsidence survey data including field notes should be retained by the mine operator.

2.8. Survey of Boreholes

Boreholes should be identified by unique name or number and should be shown on the Mine Workings Plan. Collar and/or commencement locations of Boreholes, should be established from a control or subsidiary survey. The following information should be utilised, when available, from direct survey or other source to define the position of a borehole and suitably endorsed (for example a driller's log or geophysical survey):

- total length (or depth);
- inclination (or declination); and
- plan projection (bearing or azimuth) when other than near vertical.

3 MINE WORKINGS PLAN

3.1. Preparing the Mine Workings Plan

The Mine Workings Plan should be prepared by or under the supervision of the Mine surveyor.

3.2. Updating the Mine Workings Plan

Except where the mine is considered discontinued or abandoned, the WHS Regulations require the Mine Workings Plan to be updated:

- when there has been a significant mine modification; and
- at least every 3 months in relation to the parts of the plan identify points of access and egress and refuges; and
- otherwise at least annually.

3.3. Composition of the Mine Working Plan

In the case of an underground mine the Mine Workings Plan should comprise sheets for each Seam or Level, Cross Sections and Longitudinal Sections, and other layout data for the whole of the Mine as required by this code.

In the case of an open cut mine, the Mine Workings Plan should be compiled on the Open Cut Void Sheets and Cross Sections.

3.4. Presentation and archiving – hard copy

A hard copy of the Mine Workings Plan should be produced on stable and durable material.

The hard copy will comprise all sheets on which workings have occurred.

3.5. Level, Seam and Open Cut Void Sheets

The underground mine workings or open cut voids should be mapped on Level Sheets, Seam Sheets or Open Cut Void Sheets .

The Level Sheets, Seam Sheets and Void Sheets should be compiled at a scale that best reflects the mine workings with sufficient clarity and number of sheets to cover the extent of the workings and necessary adjacent workings.

3.6. Information to be shown on the Mine Workings Plan

The WHS Regulations require that the mine plan show

- the workings of the mine, including disused workings and incorrectly located bores
- the ventilation system, including all ventilation fans
- the location of electrical installations associated with the distribution of electricity at the mine
- the location of telephones and other fixed plant associated with the radio and telecommunications systems
- water dams and tailings dams
- natural features surrounding the mine
- places where hydrocarbons or explosives are stored, and
- points of access and egress, including emergency exits.

General information for both underground and open cut mines

- Adjacent mine workings - an outline of all workings in any direction within 100 metres of the current mine being worked.

- Barriers and restricted zones.
- Borehole locations:
 - Where it is not practical to show all Boreholes on the Level Workings sheet, a separate "Borehole Plan", which should become part of the Mine Workings Plan, should be produced as an overlay.
 - A reference on the Level Workings Sheet is required to indicate the existence of any Borehole Plan sheet.
 - All Boreholes should be identified as to type and name.
 - Any borehole removed by the mining process or is in the void is not required to be shown. Remnant stubs of these holes that may present a hazard to future mining operations should be shown.
- Cadastral Parcels.
- MGA Grid Lines.
- Mining Approvals/ Acceptances (if applicable from State prescribed legislation).
- Mining lease boundaries.
- Potential sources of Inrush to be shown (outlined in green).
- State regulated dams
- Survey control stations including bench marks.
- Surveyed geological features - all known outcrops, subcrops, faults, dykes, cinder belts, and other significant dislocations, as surveyed.
- Mine operation boundaries.

Underground mines - Level Sheets

- Development.
- Mine underground access mine shafts, rises, winzes, adits, and declines.
- Stopes.
- Inferred block/sublevel cave zone of influence
- Date lines (dashed) indicating the extent of workings for each survey reporting period along with the date and initials of the Mine surveyor.
- Working level floor heights.
- Level names.
- All major ventilation devices.

Underground mines - Seam Sheets

- Development.
- Mine underground access - drifts, mine shafts and adits.
- Extracted Areas.
- Date lines (dashed) indicating the extent of workings for each survey reporting period along with the date and initials of the Mine surveyor.
- Working level contours.
- Panel names.
- All major ventilation devices

Open cut mines (Open Cut Void Plans)

- Void contours at five (5) metre vertical intervals.
- Void detail line (breaklines)

Sheet heading Information

- The name of the mine.
- The Mine Workings Plan Catalogue Number, where available
- The name of the level/seam being represented.

- The number of the sheet and the number of sheets that make up the mine operation.

Map surround area information

- The reduction ratio and a graphical (bar) scale together with a statement that all measurements are in metres.
- A north point indicating grid north.
- A schedule of symbols used on the particular sheet.
- A sheet index showing (a vertical level index may be necessary):
 - all the sheets necessary to cover the mine operations boundary; and
 - the number of each sheet; and
 - the particular sheet shown by a heavy outline; and
 - the outline of mine workings.
- A schedule of endorsements made by the Mine surveyor,
- A statement or schedule certifying the accuracy of the sheet, including:
 - name and signature of the certifying Mine surveyor; and
 - certifying surveyor's identification/authorisation/certificate number; and
 - date of the certification.
- The origin of levels and the grid bearing and terminal survey stations of the mine baseline or survey control marks used for surveys within the sheet.
- A schedule or schedules of survey marks and bench marks containing their identification, coordinates and height.
- For underground mines, a schedule of shafts, rises, winzes, boreholes, with coordinates and heights of the commencing and finishing locations.
- A schedule of boreholes showing names, coordinates and heights of the collar.

3.7. Additional Information

The Mine surveyor should show on the Mine Workings Plan any additional information required by the regulator

Any additional information discovered by or indicated to the Mine surveyor which may present a hazard either to the mine, adjacent mines or persons in those mines should be recorded on the Mine Workings Plan.

3.8. Doubtful Information

Where any information shown on the Mine Workings Plan is considered to be in doubt, the Mine surveyor should identify and endorse this information.

3.9. Old workings/surveys

Where old surveys or old workings are converted to the current mine Grid/Datum or GDA 94/MGA94 such conversion should be endorsed by the Mine surveyor on the Mine Workings Plan.

3.10. Certification

Unless prescribed by State legislation, the following certification should be utilised.

- The hard copy of the Mine Workings Plan should be certified (signing and dating) by the Mine surveyor in the certification of accuracy schedule; after the most recent Reporting Period has been charted.
- The Mine surveyor by signing and dating the certification of accuracy schedule declares:
 - the Mine Workings Plan has been prepared ; and

- the surveys shown on the Mine Workings Plan have been completed to an accuracy .

3.11. Certification history

The Mine Workings Plan should have a schedule of certification of accuracy schedule, showing the certification details for each plan update.

3.12. Catalogue number

Any regulatory body cataloguing system in force should continue for each mine. This unique number is to be clearly identified on the Mine Workings Plan or any copy thereof.

4 MINE SPATIAL INFORMATION

This section refers to the preparation, composition and supply of the Mine Spatial Information as a digital file.

4.1. Preparation

The Mine Spatial Information should be prepared by or under the supervision of the Mine surveyor.

The Mine Spatial Information should be prepared to the standards required by this code.

4.2. Composition

The Mine Spatial Information should be digital files of the whole of the mine. Digital files should be in 3D format and should be compatible with the regulatory body software.

The following Mine Spatial Information is the minimum themes to be supplied, as appropriate for each mine:-

- For underground mines – Mine Workings (wall, roof and floor), Extraction areas.
- For open cut mines – Mine Workings Outline, Open Cut Void Breaklines and Open Cut Void Points

5 CLOSING PLANS

5.1. Discontinuance

Where a mine has been discontinued the mine operator should have the Mine Workings Plan charted to the date of discontinuance.

5.2. Charting for Discontinuance

These procedures should be followed in the case of the discontinuance of a mine:

- The Mine Workings Plan should be charted, dated and signed by the Mine surveyor to the date of discontinuance. The Mine surveyor should place a broken line around the extent of the workings, which should be dated and initialled.
- The note "Charted to date of Discontinuance" is to be shown with the date and the Mine surveyor's signature.

5.3. Charting for Abandonment

These procedures should be followed in the case of the abandonment of a mine:

- The Mine Workings Plan should be charted, dated and signed by the Mine surveyor to the date of abandonment. The Mine surveyor should place a broken line around the extent of the workings, which should be dated and initialled.
- The note "Charted to date of Abandonment" is to be shown with the date and the Mine surveyor's signature.

5.4. Cessation of duties of the Mine surveyor

Upon permanent cessation of duties of the nominated Mine surveyor, the Mine Workings Plan should be charted, dated and signed by the Mine surveyor. The Mine surveyor should show the date of the workings at the time of cessation in a similar manner to that of the normal survey reporting period.

The note 'Charted to date of Cessation of duties of the Mine surveyor' is to be shown with the date and the Mine surveyor's signature.

The Mine surveyor by signing and dating declares (for the period from the last reporting period until the date of cessation of duty):

- The Mine Workings Plan has been prepared.
- The surveys shown on the Mine Workings Plan have been completed to an accuracy prescribed in this code.

5.5. Replacement of business operator

When the mine operator ceases to operate the mine they should update the mine workings plan and provide the updated plan to the incoming operator and/or mine holder.

6 SUPPLY OF MINE WORKINGS PLAN AND DIGITAL DATA

6.1. Supply Period

Where required the mine surveyor should supply to the regulator, in the specified time, copies of mine working plans and digital data.

6.2. Supply on Discontinuance and Abandonment

Where a mine has been discontinued, the Mine Workings Plan should, after charting, be supplied to regulator. The Mine Spatial Information should be supplied on a CD-R (Compact Disc – Read only) or equivalent

The following information will be recorded on the label of the CD-R (or equivalent) with a permanent marking pen:

- The name of the mine operation.
- The Mine Workings Plan catalogue number for the associated Mine Workings Plan.
- The name and signature of the certifying Mine surveyor.
- The certifying Mine surveyor's registration Number.
- The date of certification.

Upon Discontinuance of a mine, all survey records relevant to the preparation of the Mine Workings Plan, should be prepared by the Mine surveyor for submission to the regulatory body.

6.3. Supply on Cessation of Duties of a Mine surveyor

At the cessation of duties after certification has taken place, the Mine surveyor should produce a hard copy of the Mine Workings Plan and a copy of the Mine Spatial Information electronically for retention at the office for the mine.

The outgoing Mine surveyor, with the consent of the person conducting the business, should take a copy of the Mine Workings Plan and Mine Spatial Information for their own records.

The incoming Mine surveyor should make a copy of the Mine Workings Plan and Mine Spatial Information for a record of commencement of work

6.4. Certification

The Mine surveyor, by signing and dating the CD-R, declares that the Mine Spatial Information contained on the CD-R, were used in the preparation of the Mine Workings Plan.

7 OTHER PLANS REQUIRED

Unless prescribed by State legislation, the following plans should be utilised for mining operations. These plans are a minimum requirement and does not prevent the Mine surveyor or the mining operation from generating further plans for purposes of emergency response or ongoing mine management.

7.1. Combining two (2) or more plans

The Mine surveyor can combine two (2) or more of the following plans provided legibility of the combined plan is retained.

7.2. Endorsing combined plans

Combined plans should be prepared and should be certified and endorsed by the Mine surveyor and Mine Manager (or equivalent statutory official).

7.3. Subsidence Management Plans

These plans may be required by Mining Lease conditions and are prepared in accordance with the regulatory body guideline. Plans prepared under the guideline should be prepared in accordance with the standards required by this code. All such plans will be certified by the Mine surveyor and suitably endorsed where necessary.

Regulatory bodies may publish guidance notes for applications under legislation and the subsidence management plan process and these should be referred to

7.4. Ventilation Plan (underground operations)

The ventilation plan should be compiled at a scale that best reflects the mine workings and ventilation appliances.

The plan should show ventilation walls, trapdoors, regulators, ventilation doors, the direction and nature of ventilation, auxiliary fans, booster fans and air reading stations (with air quality and quantity), in relation to the mine workings. The plan will also show the locations of fixed gas monitoring plant.

A legend will be shown on the plan depicting symbols used together with a graphical representation of the scale.

This plan should be updated monthly.

7.5. Fire Fighting Plan (Underground Mines)

A Fire Fighting Plan is to be prepared for all underground parts of an operation. The Fire Fighting Plan should be compiled generally at a scale not less than 1:10,000. Fire fighting appliances will be symbolised in accordance with AS 4368.

The plan should show positions in which pipe mains, hydrants, isolation valves, fire substations and fire depots are situated. This plan will also show the position of stoppings, trapdoors, regulators, seals, prepared seal sites, overcasts, air crossings, ventilation doors, belt conveyors, main electric supply cables, fixed electrical apparatus, high voltage cables and switchgear, telephones and the direction of ventilation in the roadways.

The plan is to be updated at no greater than three month intervals.

7.6. Escape and Rescue Plan (underground operations)

The Escape and Rescue Plan should be compiled generally at a scale that best reflects the mine workings and displayed appliances. The plan will include all workings of the mine to enable the self escape and/or rescue of personnel from anywhere in the mine.

Symbols used will be in accordance with AS 4368 and AS2916.

This plan should show main roads, the means of egress from each part of the mine to the surface, all self-escape systems and all underground telephone stations, in relation to the mine workings.

This plan should also show main access roads, the means of egress from each part of the mine to the surface, all self-escape systems, refuge chambers, the positions of first aid stations, underground telephone stations, belt conveyors, any gas drainage mains and branches, known falls, accumulations of water, stowage identified as non-passable.

The plan should also show any information from the fire fighting plan and the ventilation plan or any additional information identified as necessary for the dealing with an emergency at the operation.

The plan should also show any information including ventilation or any additional information identified as necessary for the dealing with an emergency at the operation.

The plan should be displayed, reviewed and updated every three months. The regulation requires review, and if necessary revision, when there has been a significant mine modification, at least every three months in relation to the identification of points of access, egress and refuges, and otherwise annually.

7.7. Surface Plan

A surface plan should be kept at the mine. The Surface plan should be of a scale to best represent the surface features of the mine and should cover the areas where mining operations have been or are being carried out and construction zones, as required by any regulation.

Topography may be shown if it adds to the interpretation of the plan. Compilation should be generally and the plan may be maintained as spatial information.

In the case of an underground mine, the Surface Plan should show all streets, roads, reservoirs, swamps, water bodies, unconsolidated surface deposits, railways, main pipelines and any other feature whether of the same or of a different kind which, if disturbed by mining operations, is likely to cause damage to or danger in the mine.

In the case of an open cut mine, the Surface Plan should show all streets, roads, reservoirs, swamps, water bodies and any other permanent feature whether of the same or of a different kind which, if disturbed by mining operations, is likely to cause damage to or danger in the open cut workings.

This plan should be updated as often as it becomes necessary.

7.8. Site Services Plan (underground and open cut mines)

The site services plan should be at a suitable scale. Symbols used will be in accordance with AS 4368. Compilation should be generally and the plan may be maintained as spatial information.

This plan should show only surface improvements and infrastructure that are part of the mine, including but not limited to:

- buildings including administration, bathhouse and workshops, mine access points (portals, shafts, ramps);
- mine access roads including parking areas;
- processing plants and stockpiles;
- power reticulation including sub stations;
- water reticulation;
- compressors and compressed air reticulation;
- gas reticulation;
- sewer mains;
- treatment plants and transpiration areas;
- telephone and other communications lines;
- magazines including buffer zones;
- fire fighting equipment including fire stations, hydrants, extinguishers, depots;
- hazardous materials locations;
- dams and surface drainage;
- boreholes which can be used for gas testing;
- underground/buried services and cable locations;
- any information which may assist in the case of an emergency;

Topography may be shown if it adds to the clarity and understanding of the plan.

This plan should be updated as often as it becomes necessary.

7.9. Tailings Dams/Waste Dump Areas

These plans should be prepared in accordance with any relevant guidelines

The guidance contained in this code should be used when developing tailings or waste dump plans.

The plan should be certified and suitably endorsed by a Mine surveyor.

7.10. Emplacement Areas

These plans should be prepared in accordance with any relevant guidelines

The guidance contained in this code should be used when developing emplacement plans

The plan should be certified and suitably endorsed by the Mine surveyor.

7.11. Plan standards - general

Any plan (including, where appropriate, plans subject to this code) required to be drafted by the Mine surveyor for purposes of the mine, should be prepared in accordance with the relevant Australian Standard in particular, but not limited to, AS 4368, AS 1100 and AS 2916.

7.12. Declaration

A plan referred to in Section 8 of this code should have an appropriate area on the plan allocated for certification by the mine manager (or equivalent statutory position) and the Mine surveyor. Certification should indicate the origin of the information and that the information shown on the plan is truly represented.

8 STANDARDS FOR THE PREPARATION OF MINE SPATIAL INFORMATION

This section:

- Provides for the construction and preparation of the Mine Spatial Information.
- Identifies how each theme should be represented graphically and the attribute information that should be included to describe each featured object in the theme.
- Identifies supporting information that is required may have to be submitted electronically.
- Assist in the preparation of spatial information in support of such requirements for subsidence management plans, mining operations plans, annual environmental management reports and periodic geological reporting.

8.1. Theme Attribute Names and Definitions

Appendix A - Table 1 identifies attribute names and definitions that should be used for all Mine Spatial Information themes.

Attribute names are not to exceed ten characters in length. All theme names attribute names and individual attribute values can be in either upper or lowercase.

Underscores should be used to join multiple words as gaps are not permissible.

8.2. Theme Attribute Allocation and Feature Type

All objects in a theme should have attributes attached and be of the same feature type (e.g. point, line, or polygon). Each theme required is listed in **Appendix A - Table 3** with corresponding attributes and feature types that should be used to represent the theme spatially.

In some instances a Mine Spatial Information theme may need to be represented by more than one theme. For example, Borehole Locations would normally be points for vertical boreholes and lines for horizontal or inclined boreholes. Where multiple shapes should be used to represent a theme, and a separate theme is created, attribute fields should be consistent with that particular Mine Spatial Information theme.

8.3. Theme Attribute Categories

Mine Spatial Information themes attributes are divided into three categories. The attribute categories are as follows and the attribute names for each category are identified in **Appendix A - Table 3**.

Core attributes are those attributes that are common to all the themes and include such attributes as mine name, catalogue number, date the theme data was charted to, and the person charting the theme data to the Mine Workings Plan.

Additional attributes are those attributes that are unique to a particular theme or maybe common to several themes. Attributes that are common to several themes may include type of workings and when the workings were driven or mined.

Metadata attributes are attributes that are required to be attached to the themes only when they are written electronically

8.4. Attribute Values

Where possible standard attribute values should be used. This will allow other users of the themes to develop standard enquiries through their GIS software. Values for all attributes are required to be attached for all objects in the theme.

All themes should be prepared using the database format specified in Table 9.2. Numbers with decimal values should be stored as floating number. All other numbers should be stored as integers or characters.

8.5. Date

Date attributes should be in database format 'character' and be in the form "dd/mm/yyyy" where date of workings are accurately known, general format "month year" (May 2006) or as a time period (1950-2000 or pre 2000) when the charted period cannot be accurately shown.

8.6. Metadata Statements

The metadata statement should include information such as version date, custodian name, coordinate system, accuracy, potential limitations for data use, definitions of any codes used within the dataset and any other information about the data that is not evident in the attributes attached to the theme.

The completed metadata statement should be disseminated with the dataset that it describes. It may be one document sectionalised for each Mine Spatial Information or a separate document for each theme. Where two or more themes or a group of themes have the same metadata, a single metadata statement may be prepared that clearly lists all themes relating to the statement.

8.7. Precision

Spatial themes should be provided in the best available precision.

8.8. Preparation of Additional Themes

Additional themes should be consistent with this code.

8.9. Preparation of Additional Attributes

Any additional attributes (including formats) should be developed consistent with this code.



APPENDIX A - TABLES

Table 1 - Theme Attribute Names and Definitions						
Attribute Name	Description	Database Format	Max Length	Input Value	Example	Options List

Table 1 - Theme Attribute Names and Definitions

Attribute Name	Description	Database Format	Max Length	Input Value	Example	Options List
Caution	Warning on use of theme	Character	254	Compulsory and should be in the form described in the options list.	This theme should not be read in isolation. It is one of many digital themes.	
Chart_date	Date the feature was inserted into the theme	Character	10	Chartor determined	30/11/2005	
Chartor	Person inserting the feature into the theme	Character	50	Chartor determined	Joe Bloggs	
Descript	Description of feature and/or theme.	Character	100	Chartor determined		
Endorse	Feature status	Character	254	Chartor determined		
Height	Height (AHD)	Character	20	Chartor determined	123.123	
Level or Seam_Name	Name of Underground Mining horizon or seam worked	Character	20	Chartor determined	Level 980	
Minimum_RL	Minimum RL (AHD) on underground level	Character	50	Chartor determined	100	
Maximum_RL	Maximum RL (AHD) on underground level	Character	50	Chartor determined	120	
Mine_name	Name of the operation relating to the MWP	Character	50	Chartor determined	Acme Colliery	
Cat_No	Catalogue Number	Character	10	Chartor determined	MWP123	
Provider	Mine surveyor certifying the spatial information.	Character	50	Provider determined		

Table 1 - Theme Attribute Names and Definitions

Attribute Name	Description	Database Format	Max Length	Input Value	Example	Options List
Source	Feature status	Character	50	Select from Options List		Mine survey, Other survey, Digitised, CAD drawn, Calculated, Coordinate entry, Mine records, Department records, Mining lease, Planning Approval, Mining Approval, other
Status	Feature status	Character	50	Select from Options List		Working, Discontinued, Abandoned, Current, Final, Destroyed, In progress, Temporary, Sealed, Open, Adopted by mine, Flooded, Indicated, Inferred
Theme name	Name of theme	Character	50	Provider determined		
Work Start	Date when workings first commenced in this horizon	Character	10	Chartor determined	30/11/2005	
Work Finish	Date when workings completed in this horizon	Character	10	Chartor determined	30/11/2005	

Table 2 - Theme Attribute Allocation and Feature Type

Theme Name	Underground or Open Cut	Description	Feature Type	Minimum Attributes
Mine Workings Walls	Underground	Extent of workings at each level or seam of an underground mine	Polygon	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Level or Seam Name, Minimum RL, Maximum RL, Work Start, Work Finish, Status
Mine Workings Floor	Underground	Floor spot heights taken in underground workings	Points	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Level or Seam Name, Minimum RL, Maximum RL, Work Start, Work Finish, Status
Mine Workings Roof	Underground	Roof spot heights taken in underground workings	Points	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Level or Seam Name, Minimum RL, Maximum RL, Work Start, Work Finish, Status
Mine Workings Extraction	Underground	Extent of extraction at each level or seam of an underground mine	Polygons	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Level or Seam Name, Minimum RL, Maximum RL, Work Start, Work Finish, Status
Open Cut Void Outline	Open Cut	Extent of workings of the mine.	Polygons	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Level Name, Minimum RL, Maximum RL, Work Start, Work Finish, Status
Open Cut Void Pointss	Open Cut	Extent of the Open Cut void depicted by spot heights	Points	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Height, Status.
Open Cut Void Breaklines	Open Cut	Breaklines of the Open Cut void depicting edge of void, ramp edges, tops and toes etc	Lines	Mine Name, Catalogue Number, Chart Date, Source, Endorse, Chartor, Descript, Theme Name, Caution, Provider, Height, Status.

Table 3 - File Naming Convention

Theme name	Filename definition	Example
Mine Workings Walls	ug_wall_[CAT number]_ [Chart_date]	wall_CAT701_Dec2008 (Mine Workings Outline theme for CAT701 charted December 2008)
Mine Workings Floor	ug_floor_[CAT number]_ [Chart_date]	floor_CAT701_Dec2008 (Mine Workings Outline theme for CAT701 charted December 2008)
Mine Workings Roof	ug_roof_[CAT number]_ [Chart_date]	roof_CAT701_Dec2008 (Mine Workings Outline theme for CAT701 charted December 2008)
Mine Workings Extraction	ug_extract_[CAT number]_ [Chart_date]	extract_CAT701_Dec2008 (Mine Workings Outline theme for CAT701 charted December 2008)
Open Cut Void Outline	void_out_[CAT number]_ [Chart_date]	extents_CAT701_Dec2008 (Mine Workings Outline theme for CAT701 charted December 2008)
Open Cut Void Pointss	void_pts_[CAT number]_ [Chart_date]	Void_pts_CAT701_Dec2008 (Open Cut Void Pointssrs theme for CAT701 charted December 2008)
Open Cut Void Breaklines	void_break_[CAT number]_ [Chart_date]	Void_break_CAT701_Dec2008 (Void Breaklines theme for CAT701 charted December 2008)

Table 4 - Metadata Statement

Category	Element	Definition
Theme	Theme name (user input)	Theme file name. (user input)
Features	Feature Type	Point, line or closed polygon. (user input)
Department Reference	Catalogue Number	Mine Workings Plan catalogue number. (user input)
Custodian	Mine Operator	Corporation or individual person that operates the mine. (user input)
	Mine Name and Address	The name and postal address of the mine. (user input)
Description	Abstract	Brief summary description of the content of the theme. (user input)
Data Currency	Date of First Version	When the theme was first created. (user input)
	Date of this Version	Date of this version of the theme. (user input)
Theme Status	Progress	The status of the process of theme creation. (user input)
	Maintenance and update frequency	Frequency of changes or additions made to the theme. (user input)
Access	Stored data format	The format in which the theme is stored by the Mine Surveyor. (user input)
	Available format type	The format in which the theme is available. (user input)

Table 4 - Metadata Statement

Category	Element	Definition
Access (cont'd)	Access constraints	Restrictions or legal prerequisites that may apply to the access and use of the theme including licensing, liability, and copyright. (user input)
Data Quality	Lineage	A brief history of the source or production the theme. (user input)
	Accuracy Statement	A brief assessment of the closeness of the location of objects in the theme in relation to their true position on the Earth.
	Accuracy Attribute	A ranking that best determines the positional accuracy for a particular feature in the theme. 1: Error ellipse no greater than 100mm 2: 100mm - 500mm 3: 500mm - 2m 4: 2m - 10m 5: Greater than 10m
	Logical Consistency	A brief description of the degree of adherence of logical rules of data structure, attribution, and relationships. (user input)
	Completeness	An assessment of the extent and range in regard to completeness of coverage, attributions and verification. (user input)
Attributes (All)	Attributes attached to each feature object in the theme.	List each attribute attached as a data field to the features in the theme.
	Caution	Warning as to use of the theme.
	Chart_date	The date the feature object was recorded on the Mine Workings Plan.

Table 4 - Metadata Statement

Category	Element	Definition
	Chartor	Person recording feature object onto the Mine Workings Plan.
	Descript	Description of feature object.
	Endorse	Reference to a field book or other appropriate notation
	Height	Height (AHD) of feature.
	Horizon Name	Name of the underground horizon.
	Minimum_RL	Minimum RL of the underground horizon.
	Maximum_RL	Maximum RL of the underground horizon.
	Mine_name	Name of the colliery relating to the Mine Workings Plan.
	MWP_No	Department Catalogue Number of the Mine Workings Plan.
	Provider	Surveyor providing the theme to the Department.
	Source	Where the feature object was sourced from.
	Status	The status of the feature object in the Mine Workings Plan. Where the feature object was sourced from.
	Theme_name	The name of the theme.
	Work_start	The date work commenced in an underground horizon.
	Work_finish	The date work ceased in an underground horizon
Miscellaneous	No. of features:	Number of individual features, for example, 500 boreholes

Table 4 - Metadata Statement

Category	Element	Definition
	Source Pathname:	Data location. This not required for submission but may support internal data management.
	Application Environment:	Development environment.
Projection:	Name :	Map Grid Australia (MGA 94)
	Zone:	MGA [zone] (user input)
	Units :	Metres
	Datum:	Geocentric Datum of Australia 1994 (GDA94)
	Ellipsoid:	GRS80
Metadata date	Metadata date	Date on which the metadata record was created or modified. (user input)

APPENDIX B – MEANING OF KEY TERMS

In this code the following words and terms have the meanings indicated:

Abandoned

A mine is an abandoned mine where the working of the mine, or deposit have been discontinued, and not merely suspended, and there is no care and maintenance in place.

Adit

Means a horizontal or near horizontal entrance to a mine.

Attribute

A database field attached to a feature object in a theme used to describe spatial data and is also known as “object data”.

Australian Height Datum (AHD)

AHD is the datum surface approximating mean sea level that was adopted by the National Mapping Council of Australia in May 1971.

Bench Marks

Marks established at or in a mine from which the levels (heights) of the mine workings are determined.

Borehole

A Borehole includes any hole (whether vertical, horizontal, inclined, or a combination of these), that may affect the safety of the mine, drilled for:

- a) exploration,
- b) gas or water drainage,
- c) auger holes,
- d) for transport of materials including (but not limited to), sand, inflammable materials or fuels, cement, slurry, sewage or water
- e) services (for example power, water and other services) or
- f) any other purpose.

A borehole does not include blast holes from the working section that do not intersect another working section of an underground mine.

Borehole Plan

A plan or plans prepared as an addition to the Mine Workings Plan where density of boreholes affects the clarity of the Mine Workings Plan.

Care and Maintenance

Discontinued mine workings are said to be under care and maintenance where mining is suspended and when the mine workings are maintained in a generally safe and accessible condition.

Certification

A written statement or a schedule signed by the Mine surveyor attesting that the surveying procedures and plan preparation for the period certified, have been carried out pursuant to the standards required by this code.

Control Surveys

Substantially marked surveys forming a closed network completed in accordance with ICSM SP1.

Cross Section Sheet

Where prescribed by State legislation, a sheet prepared as part of the Mine Workings Plan for open cut or underground operations, which shows the cross sections referred to on the plan sheets of the Mine Workings Plan.

Development

In relation to a mining operation, includes all work undertaken to open up a mine by driving development openings or pre-stripping an open-cut body of ore.

Endorsement

A notation created, initialled and dated by the Mine surveyor, drawing attention to any aspect of the compilation of the Mine Workings Plan or Mine Spatial Information that is considered necessary or informative.

Geocentric Datum of Australia (GDA)

A datum surface approximating the shape of the earth's surface that was adopted by the Inter- Governmental Committee for Surveying and Mapping in May 1990.

Hard Copy

Plans prepared on a durable medium.

ICSM SP1

The Inter-Governmental Committee on Surveying and Mapping Special Publication 1 "Standards and Practices for Control Surveys".

Inrush

An unplanned or uncontrolled flood of liquid, gas or material into the workings of the mine having the potential to create a hazard.

Potential sources of inrush include tidal waters, impounded waters, rivers, streams, dams, reservoirs, aquifers, unconsolidated surface deposits, adjacent mine workings, bulk sample locations or other natural or man-made feature whether the same or of a different kind which, if disturbed by mining operations, may put the mine or persons at the mine at risk. This definition includes any material that flows when wet or flammable or noxious gases.

Level

In relation to an underground mining operation, are a set of workings broken into varying horizons comprising of a network of development roadways and extraction areas. Connections may exist between these levels via boreholes, shafts, rises, raises, winzes or other drives.

Longitudinal Section Sheet

Where prescribed by State legislation, a sheet prepared as part of the Mine Workings Plan for open cut or underground operations, which shows the longitudinal sections referred to on the plan.

Map Grid of Australia 1994 (MGA94)

Map Grid of Australia, that is, a rectangular co-ordinate system using a Universal Transverse Mercator projection with zones 6 degrees wide and based on the Geocentric Datum of Australia.

Metadata

“Information about data” and is used to inform the user of the lineage, accuracy and limitations that may exist within the data. The aim of metadata is to enable the end-user to work with the data with a known level of confidence.

Mine Baseline

A permanently marked survey line derived from or part of the state survey control network.

Mine Workings Plan (MWP)

A plan kept to accurately show the position of the Mine workings and compiled .

Mine Spatial Information

Digital files containing 3D Mine Workings data in the form of digital information prepared .

Mine surveyor

A Registered/Authorised/Certified mine surveyor who is nominated/appointed by the mine operator to be responsible for the conduct of surveys and preparation of plans for the mine.

Open Cut

A method of extracting rock or minerals from the earth by their removal from an open pit.

Open Cut Void

All excavations, ramps and disturbed ground; include in-situ blasted material within an open cut mine.

Reporting period

The reporting period will be as required by the regulatory body covering the operation.

Seam

Any coal bearing stratum or combination thereof mined as a discrete entity.

Shaft

Means an opening into a mine having an inclination to the horizontal of 15° or more through which persons or materials are raised or lowered, or which is used as a main intake or outlet for ventilation.

Stope

Means an excavation (other than development workings) made for the purpose of excavating ore.

Subsidiary Survey

A survey based on Control Surveys to develop the workings of a Mine or to locate the position of the workings of a Mine.

Supervision

When a survey is carried out the Mine surveyor should exercise such personal oversight and direction of the work as is necessary to ensure that the Mine surveyor has the knowledge to certify all aspects of the survey and that the survey has been carried out in accordance with sound professional practice and this code.

Survey Records

For the purpose of this code, survey records should be taken to mean any plan, survey or spatial information required under this code and includes field books, level books, co-ordinate books, calculations and any other note books, sheets or plans used for recording relevant survey data, all survey observations, and compilations whether recorded or stored in written, photographic, digital or electronic form.

Suspended Mine

Any discontinuance of all work at a mining operation (where mining is suspended but the operation is kept on Care and Maintenance, see definition above).

Underground

Any mining operations beneath the natural surface of the earth.

Underground Baseline

A permanently marked survey line established in underground workings; from which underground surveys are developed. The underground baseline is to be connected by Control Survey to the Mine Baseline

Winze

Means a vertical or steeply inclined development excavated downwards from a drive or crosscut.