

Guidance Note QGN19

Mine surveying and drafting

Mining and Quarrying Safety and Health Act 1999 (Qld)

June 2011

Guidance Note — QGN 19

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This guidance note is issued by the Mines Inspectorate of the Department of Employment, Economic Development and Innovation (DEEDI). It provides a way for Mine Surveyors to comply with section 58 of the *Mining and Quarrying Safety and Health Act 1999* (Qld) and the relevant sections in the associated Mining and Quarrying Safety and Health Regulation 2001.

QGN19 is to be followed by all Mine Surveyors when surveying and mapping a mine site.

A guidance note is neither a guideline as defined in the MQSHA nor a Recognised Standard as defined in the *Coal Mining Safety and Health Act 1999*. In some circumstances, compliance with the guidance note may not be sufficient to ensure compliance with the requirements in the legislation.

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1.0 Introduction

1.1 Purpose and scope

This guidance note provides a way for Mine Surveyors to comply with section 58 of the *Mining and Quarrying Safety and Health Act 1999* (Qld) and the relevant sections in the associated Mining and Quarrying Safety and Health Regulation 2001. It is to be followed by all Mine Surveyors when surveying and mapping a mine site.

1.2 Preparation

This guidance note provides for the measurement, recording, storage and preparation of all mine spatial information. It also provides for the digital recording, storage and preparation of the Mine Workings Plan in accordance with section 58 of MQSHA and Part 8 of the Mining and Quarrying Safety and Health Regulation 2001 (MQSHR).

1.3 Compilation

The Mine Workings Plan shall be referenced to the Map Grid of Australia 1994 (MGA94) based on the Geocentric Datum of Australia 1994 (GDA94) values. The relationship between the mine grid system and GDA94 shall be shown on the Mine Workings Plan. The mining regulation in Queensland requires that a datum station is established near the mine for mine surveys and referenced to GDA94 and Australian Height Datum (AHD).

All mine plans used in the compilation of the Mine Workings Plan should be viewed with caution until their accuracy has been verified, and every effort should be made to obtain all existing information about the extents and location of old workings. Where old workings exist which may be dangerous, it shall be assumed, for the purpose of marking the Mine Workings Plan, that these workings contain water or fill, until the contrary is proven.

If it is not practical for a Mine Workings Plan to show accurately the details required under the Act, the Site Senior Executive (SSE) must ensure that the plan clearly shows the areas where accuracy has not been determined. In addition the SSE must ensure information on the Mine Workings Plan is sufficiently accurate to achieve an acceptable level of risk for any operations at the mine.

1.4 Symbols

The technical symbols, sign conventions and definitions for strata to be shown on the Mine Workings Plan shall be in accordance with this document and conform to those illustrated in Australian Standard *AS 4368–1996 Mine plans—Preparation and symbols*. If a symbol is not provided for in AS 4368, the Mine Surveyor may create a suitable symbol to be shown in the legend of the Mine Workings Plan.

1.5 Liability of a Mine Surveyor

The liability of a Mine Surveyor for the certification of accuracy of the Mine Workings Plan shall be limited to his or her period of appointment as the Mining Surveyor for that mine.

2.0 Definitions

In this document, the following words and terms have the meanings indicated:

AHD

Australian height datum (see height datum).

annotation

An annotation is a note on the Mine Workings Plan that gives additional explanation of a feature or characteristic of the workings not otherwise evident from viewing the plan.

benchmarks

Benchmarks are marks established at or in a mine from which the levels of the mine workings are determined.

borehole

A borehole includes any hole drilled for:

1. exploration (either vertically, horizontally or inclined)
2. gas and water drainage
3. auger holes
4. outburst relief
5. ventilation
6. services (such as power, water and telecommunications)
7. blasting purposes
8. monitoring purposes (such as geotechnical purposes).

Boreholes may affect the safety of a mine

Borehole Plan

A plan prepared in addition to the Mine Workings Plan where the density of boreholes affects the clarity of the Mine Workings Plan.

certification

A written statement signed by the Mine Surveyor attesting that the surveying procedures and plan preparation of the Mine Workings Plan for the period certified have been carried out according to this guidance note. This certification shall be entered in the mine record at least every 12 months. Such an entry does not distract from any information being transferred digitally to the workings plan.

Chief Inspector

Chief Inspector of Mines, under the MQSHA.

Communication System Plan

A plan showing the location of fixed communication devices for underground mines.

control surveys

Substantially marked surveys developed from a mine baseline to define the direction and position of the workings of a mine.

discontinued

Where an open-cut or underground mine or a seam/orebody has ceased being mined within the boundary of land comprising the mine for at least two months, it shall be deemed discontinued, even if the mine is on care and maintenance.

Electrical Installations Plan

A plan showing the location of electrical reticulation lines and electrical installations at the mine.

Escapeways Plan and Refuge Location

A plan for underground mines showing the exit routes to the surface from every part of the mine or to where emergency refuges or fresh air bases are located.

endorsement

In the management of risk, the Mine Surveyor, responsible for the accuracy of mine workings plans under the *Mining and Quarrying Safety and Health Act 1999*, would also be expected to make an endorsement if the accuracy of the plan cannot be verified.

Safe Working Area Plan

Plan prepared to show location of safe working areas during firing times.

Firefighting and Rescue Plan

Plan prepared showing firefighting pipe mains and appliances, and all items that might be relevant in the rescue of personnel or isolation or removal of areas of danger in a mine.

GDA94 and MGA94

The datum for surveys in Queensland is known as the Geocentric Datum of Australia 1994 (GDA94).

Grid coordinates are obtained using a transverse mercator projection known as the Map Grid of Australia 1994 (MGA94), which has the following specifications:

Designation of MGA94 Zones

1. The central meridians and the designation of the several zones are as follows:

Central Meridian Longitude East of Greenwich	Designation of MGA94 Zone
141°	54
147°	55
153°	56

2. The central meridian scale factor is 0.9996.
3. The zone width, 6° longitude plus ½° overlaps on each side.
4. The coordinates of a point on the earth's surface, to be used in expressing the position or location of each point in the appropriate zone, consists of two distances expressed in metres (m) and decimals of a metre; the first expressed of these distances, the East (E) coordinate gives the position in an east direction, the second expressed, the North (N) coordinate gives the position in a north direction.
5. The origin of coordinates of each zone is at the intersection of the central meridian of that zone with the equator, which origin is given the value of E 500,000 m; N 10,000,000 m.
6. The units used will be the international metre.
7. Coordinates stated for any point in the system shall be coordinate values determined in accordance with the principles of the projection of the MGA94 and shall depend on and conform to the coordinates of the State Survey Control marks.

height datum

The height datum for each mine shall be directly related to the Australian Height Datum (AHD). The relationship between the mine level datum and AHD shall be noted on all Mine Workings Plans.

ICSM SP1

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

MGA94

Map Grid of Australia 1994 — see GDA94.

mine baseline

A permanently marked survey line, established on the surface, from which surface and underground surveys are developed. The mine baseline may be computed from conventional or GPS observations.

Mine Control Stations

A Mine Control Station is a substantially monumented position, with historical and physical stability. There should always exist on a mine site a minimum of two Mine Control Stations that are recognised permanent survey marks (PSMs). These PSMs shall be established as part of the State Survey Control Network, as described in the *Queensland Survey and Mapping Infrastructure Act 2003*. For an underground mine, the survey marks comprising the surface mine baseline shall be recognised PSMs.

Mine Surveyor

A Mine Surveyor must be appointed at each mine site by the SSE. The Mine Surveyor's position description shall outline the assigned roles and responsibilities of the position including any legal obligations. The Mine Surveyor is the person responsible for surveying activities at the mine and for certifying the accuracy of the Mine Workings Plan, under section 58 of the MQSHA.

Note: When a survey is carried out in accordance with this guidance note, the Mine Surveyor must exercise such immediate oversight and personal direction of the work as is necessary to ensure that he or she 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 Guidance Note.

Mine Workings Plan

Under section 58 of the MQSHA, a current plan is required to be kept.

MQSHA

Mining and Quarrying Safety and Health Act 1999 (Qld)

MQSHR

Mining and Quarrying Safety and Health Regulation 2001(Qld)

Orebody

A mineralised mass whose characteristics have been deemed commercially viable. The term is used once the economic limits of the mineralised mass and its grade level have been examined.

PSM

permanent survey mark

Seam

any stratum or combination thereof mined as a discrete identity

SSE

Site Senior Executive at a mine site

Surface Facilities Plan

A plan showing the location of entries to mine workings, ventilation fan installations, access roads, administration buildings and other information that may assist in an emergency.

Surface Services Plan

A plan showing the location of both buried and surface services, e.g. water, power, compressed air, around the surface of the mine.

Surface Plan

An overall plan showing the location of mine boundaries, bodies of water and possible inrush sources, surface contours, surface features likely to be affected by subsidence or, if disturbed by mining, cause danger to the mine.

survey records

For the purpose of this guidance note, survey records shall be taken to mean field books, level books, coordinate books, computer data files, calculations and any other notebooks, sheets or plans used for recording or storing relevant survey data, all survey observations, compilations and other relevant survey data whether recorded or stored manually or electronically.

underground control network

A series of interconnected stations appropriately identified and meeting ICSM SP1 Class C (or 1:20,000) accuracy standards that form the basis for all other surveys.

Underground Services Plan

A plan showing the location of services, e.g. water, power, compressed air, installed in the underground workings.

Ventilation Plan

A plan showing all ventilation appliances, airflow and gas-monitoring sites.

Working 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.

3.0 Survey procedures

3.1 Mine co-ordinate system

All surface and underground surveys made and carried out in accordance with this guidance note shall have a known and documented relationship to the MGA94.

All mine surveys and plans shall originate from the Mine Control Network. The connection of the Mine Control Network to the state grid should be to Class B standards of accuracy as defined in ICSM SP1. Levelling on the minesite shall be propagated from a benchmark assigned AHD Reduced Level surveyed to Class LD spirit levelling (ICSM, SP1) or Class B from Trigonometric or GPS heighting.

3.2 Underground baseline

If an underground baseline is used, it shall be in a suitable position and as long as practicable. The terminal marks shall be stable and durable. Baseline details shall be recorded on the Mine Workings Plan.

3.3 Traverses

3.3.1 Accuracy

Each underground control and subsidiary survey shall, where possible, be closed to the standard of accuracy as prescribed in ICSM, SP1 Class D. If closure is not practical, survey techniques recommended for achieving Class D or better should be employed. If loop closure is not practicable, the survey technique recommended is to undertake a two-way check traverse, closing within the accuracies mentioned in this section.

Note: All mine survey control stations that are part of a network of traverses with redundant observations should be adjusted accordingly.

3.3.2 Instrumentation accuracy

Accuracy of all survey equipment must be checked according to manufacturers' recommendations, or site requirements.

The instrumentation used for control surveys and traversing should adhere to the following minimum precision specifications:

- angular measurements (horizontal and vertical)—maximum standard error of $\pm 5''$
- distance measurements—maximum standard error of $\pm (3 \text{ mm} + 5 \text{ ppm})$
- GPS positioning—maximum standard error of horizontal positioning of $\pm (10\text{mm} + 10 \text{ ppm})$
- levelling—maximum standard error of levelling per kilometre of double run of $\pm 4 \text{ mm}$.

3.3.3 Marking

Each underground control station shall be adequately referenced and substantially marked. As far as practicable, the marking shall be placed in a position least likely to be disturbed.

3.4 Correlation of surface and underground surveys

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

An accurate correlation between surface and underground surveys should be established as soon as practicable, using best practice methods. The correlation of surface and underground surveys may be by:

- traversing through an adit or a decline or incline ramp
- plumbing one or more vertical shafts
- using a gyrotheodolite to establish azimuth
- a combination of these methods.

Where methods other than direct traverse through an adit, decline or incline ramp are employed for azimuth or coordinate transfer, the Mine Surveyor should certify that the survey is accurate and meets the requirements of the MQSHA.

Where vertical measurement is necessary for transferring the values from the surface baseline to a nominated underground baseline, best practice methods should be applied.

In correlating surface and underground surveys, where methods other than direct traverse are employed for azimuth or coordinate transfer, the survey records shall disclose what survey methods were used. Where vertical measurement is necessary for transferring the value of the surface benchmark to a nominated underground benchmark, the maximum permissible error should not exceed 0.05 m.

3.5 Accuracy of levelling

3.5.1 Order of accuracy of benchmarks

Such levelling shall be to ICSM, SP1 Class LD standard of accuracy. For open-cut mines, only one benchmark to this accuracy is required.

3.5.2 Order of accuracy of workings

Such levelling shall be to ICSM SP1 Class LE standard of accuracy or to within 0.1 m.

3.6 Survey records and supply of survey information

Systematic care should be taken for the safe and fireproof storage and preservation of mine plans, notebooks, traverse records and associated calculations, correlation records and associated calculations, co-ordinate books, sheets and other records from which the workings have been plotted.

Survey records for each of the following purposes should be kept at the survey office for the mine:

1. surface and subsidence surveys
2. surface levelling
3. underground control surveys
4. underground subsidiary surveys
5. underground levelling
6. calculations
7. any other relevant information.

Such survey records shall be maintained manually on a stable material or microfilm, or stored electronically, or stored by other means not visually perceptible without the aid of a machine or device.

Where survey records are maintained in manual form, the following are to be observed:

1. All survey books shall be maintained in good order and shall have the following description attached:

- a. titled with the mine name
 - b. location name to which the book refers
 - c. consecutive index number.
2. The following procedures shall be adopted for entries into survey books:
- a. All survey observations and measurements shall be recorded at the time of survey.
 - b. In the event of alteration of a mistake there shall be no erasure. The incorrect entry should be struck through and the correction written above.
 - c. The datum line of the survey and the azimuth adopted shall be clearly indicated.
 - d. Lengths shall be entered at the time they are measured. Where appropriate, corrections shall be noted and the lengths deduced there from shall be clearly indicated.
 - e. Bearing and distance from reference marks must be clearly shown.
 - f. Lines re-measured shall be so specified and original distances and bearings shown.
 - g. The Mine Surveyor shall sign the field book to certify that the work shown was performed by him or under his supervision and indicate the date on which the work was performed.

Where survey records are maintained in an electronic or other storage system in a form that can't be seen without the use of a machine or a device, a complete and separate duplicate of these records shall be preserved on paper or microfilm, or on magnetic tape or disc or other permanent electronic medium.

The Manager or the Mine Surveyor of any mine, on the request of the Chief Inspector, shall make all or any survey records or certified copies, available on a stable material.

Once a mine has been abandoned, all survey records relevant to the preparation of the Mine Workings Plan shall be submitted to the Chief Inspector within 14 days (unless otherwise directed in writing).

3.7 Requirements where workings are to become inaccessible

Before any part of the workings of a mine become inaccessible, the position of all points of the workings shall be established from a working survey (where practical and safe to do so). Sufficient levels shall be taken to enable contours of the floor of the working section to be shown on the Mine Workings Plan.

3.8 Surface movement and subsidence

A survey into surface movement and subsidence shall be carried out in accordance with this guidance note. All subsidence data including field notes shall be kept at the mine in accordance with clause 3.6.

4.0 Mine Workings Plan

4.1 General

4.1.1 Authorisation

The Mine Workings Plan is required to be kept at a mine. A yearly archived copy is to be maintained to show historical location of mine workings.

4.1.2 Preparation

The Mine Workings Plan shall be prepared by or under the supervision of the Mine Surveyor. The plan shall be prepared within three months of the opening of the mine or such other time as the Chief Inspector may direct by notice in writing served on the SSE of the mine.

4.1.3 Composition

The Mine Workings Plan (for the purpose of this section) is prepared from the digital form of the plan held in the computer. It is produced in a digital file and in hard copy for presentation and archiving.

In the digital form, the Mine Workings Plan shall be compiled as a number of themes/layers for the whole of the mine as described in section 4.2.1, in a software program of the Mine Surveyor's choice and compatible with the department's software.

The hard copy of the Mine Workings Plan shall consist of bench/level workings sheets for each bench/level being worked, prepared as shown in Appendix A of this guidance note.

4.2 Preparation by digital methods

4.2.1 Group Associations—Themes/layers for underground and open-cut mines

For the preparation of the Mine Workings Plan for the bench/level being worked within the mapping area of the mine plan sheets, information specific to the following shall be captured as a minimum:

- mining
- safety
- survey
- ventilation
- geology and geomechanics
- services
- fixed plant and infrastructure
- other engineering information.

4.3 Hard copy of Mine Workings Plan

A copy of the Mine Workings Plan, to be held at the mine shall be prepared at the end of each 12-month period. It should be prepared from the digitally held data and presented as shown in Appendix A of this guidance note.

The Workings Plan seam sheets will be produced on paper. Previous copies may be archived or destroyed on preparation of the updated copy.

In the case of a Mine Surveyor ceasing duties, a copy of the Workings Plan sheets will be retained in hard copy at the mine.

When the mine is discontinued or abandoned, a copy of the Workings Plan sheets will be sent to the Chief Inspector.

4.4 Additional information

Nothing in this guidance note shall prevent the Mine Surveyor from including any additional information on the Mine Workings Plan, providing it is shown in a manner consistent with this guidance note.

The Mine Surveyor shall show on the Mine Workings Plan any additional information as directed in writing by the Chief Inspector.

The Mine Surveyor shall ensure that any condition that could be hazardous to either the mine or adjacent mines or adjacent work areas is recorded accurately on the plan.

4.5 Endorsement

Where any information shown on the Mine Workings Plan is in doubt or any other information that the Mine Surveyor considers requires endorsement, the Mine Workings Plan shall be suitably endorsed (see Appendix B).

4.6 Old workings/surveys

Where practicable, old workings/surveys should be changed to the current mine datum, related to GDA94, and suitably endorsed.

4.7 Certification

The Mine Workings Plan sheets shall be certified by the Mine Surveyor by:

- signing and dating each working sheet (in the case of the hard copy)
- signing and dating a CD with a permanent marker (in the case where they are stored digitally).

By certifying each sheet of the hard copy or signing the CD of the Mine Workings Plan, the Mine Surveyor is declaring that, for that 12-month period:

1. The Mine Workings Plan has been prepared in accordance with this guidance note.
2. The surveys shown on the Mine Workings Plan have been completed to an accuracy as prescribed in this guidance note.

4.8 Certification history

The Mine Workings Plan sheets, produced from the digital form, shall have a Certification of Accuracy schedule displaying the certification details for each year charted since the commencement of this guidance note.

5.0 Supply of Mine Workings Plan for closed and abandoned mines

5.1 Abandonment

Statutory provisions pertaining to plans of abandoned mines appear in section 58 of the MQSHA. Where a mine is abandoned the person who was the mine operator immediately before the abandonment must send the Chief Inspector the Mines Workings Plan, or an accurate copy prepared under the supervision of the Mine Surveyor, within 14 days after the abandonment.

5.2 Charting for discontinuance or abandonment

On the discontinuance or abandonment of a mine, the Mine Workings Plan shall be charted, dated and signed by the Mine Surveyor to the date of discontinuance or abandonment. The Mine Surveyor shall place a broken line around the extent of the workings at the time of discontinuance or abandonment, and date and initial this line.

The note 'Charted to date of discontinuance' or 'Charted to the date of abandonment' shall be shown in the Certification of Accuracy schedule above the date and the Mine Surveyor's signature. Upon the completion of the required charting or preparation, the Chief Inspector is to be notified by the SSE that the plans are available for inspection.

Where the workings of a mine are deemed discontinued or abandoned, a digital record, suitable for archiving and future reference, and a plan in the form described in Appendix A (supplied on durable stable polyester matt material) shall be provided to the Chief Inspector.

Within 14 days after the abandonment of the mine, the person who was the mine operator immediately before the abandonment, must give the Chief Inspector plans showing the extent of operations undertaken at the mine. The plans must be in a format and of a quality required by the Chief Inspector.

5.3 Cessation of duties of the Mine Surveyor

Before permanent cessation of duties of the Mine Surveyor, the mine workings shall be surveyed in accordance with this guidance note up to the date of cessation of the Mine Surveyor. The Mine Surveyor shall show the date of the workings at the time of cessation on these plans in a similar manner to that of the annually submitted Mine Workings Plan.

The note 'Charted to date of cessation of duties of the Mine Surveyor' shall be shown in the 'Certification of Accuracy' schedule above the date and the Mine Surveyor's signature.

The Mine Surveyor (by signing and dating the Certification of Accuracy schedule and by signing and dating the CD with a permanent marker) shall declare that, for the period from the last annual plan submission:

1. The Mine Workings Plan has been prepared in accordance with this guidance note.
2. The surveys shown on the Mine Workings Plan have been completed to a level of accuracy prescribed in this guidance note.

On the cessation of duties at the mine, the Mine Surveyor shall produce (on a durable medium) a copy of the mine workings for retention at the mine's office. The outgoing Mine Surveyor should, where possible and with the consent of the mine owner, take a copy of the sheets for their own record. The incoming Mine Surveyor should make a copy of the sheets for a record of commencement of work.

6.0 Other plans required

6.1 Plan standards—general

This section refers to all plans other than the Mines Workings Plan (covered elsewhere in this guidance note). These plans should be drafted by, or under the supervision of, the Mine Surveyor and be:

1. prepared in accordance with the relevant Australian Standard—in particular, but not limited to AS 4368, AS 2916 and the Australian Standard(s) for technical drawing
2. drawn at a suitable scale, but not less than 1 in 10,000
3. updated as required
4. provided to all parties mentioned and displayed in locations, as required.

The Mine Surveyor will only be responsible for the accuracy of mine survey data on these plans. The Mine Surveyor will not be responsible for the distribution of these plans.

6.2 Certification of plans by an authorised mine official

A plan referred to in section 6 of this guidance note shall have an appropriate area allocated for certification by the relevant mine official. Such certification shall indicate the origin of the information and that the information shown on the plan is truly represented.

6.3 Combining mine plans

Nothing shall prevent the Mine Surveyor from combining plans in this section, provided legibility of the combined plans is retained.

6.4 Surface and underground mine plans

Note: These plans may use other plans described above.

6.4.1 Mines Rescue Plan

This is considered a due diligence requirement and must be drawn in such a way to assist the mine during a mine's rescue.

6.4.2 Underground Escapeways Plan

This plan shall show primary and secondary escape routes from every part of the mine to the surface, as well as the location and contents of self-rescuer caches, underground telephone stations, other communication devices, places of refuge and ventilation control devices.

As a minimum, a current copy of the Escapeways Plan must be held at the following locations:

1. the surface noticeboard
2. self-rescuer caches
3. underground places of refuge
4. underground crib rooms
5. the mine's control room.

The Underground Mine Manager shall certify the Escapeways Plan for its correctness. This plan is to be updated monthly or as often as it becomes outdated.

6.4.3 Electrical Installations Plan

This plan shall be certified as true and correct for electrical information by the competent person.

6.4.4 Communication System Plan

This plan shall be certified as true and correct for information by the competent person.

6.4.5 Site Services Plan

This plan shall be certified as true and correct for information by the competent person.

6.4.6 Ventilation Plan

The appointed Ventilation Officer for the mine shall certify the Ventilation Plan for its correctness.

Appendix A

Mine Workings Plan: information to be presented on hard copy

General

The mine shall be mapped on each bench and level at a suitable scale. The dimensions of the Working Sheets shall accord with this guidance note and the International Standards Organisation.

Underground mines

Each Level Working Sheet shall show the following detail:

The heading should include the:

1. name of the mine, e.g. *Mine Workings Plan of Acme Mine*
2. Parish and County names and the 1:100000 sheet map name(s) and number(s)
3. name of the level being worked
4. number of the sheet and the number of sheets that make up the extent of Mine Workings, e.g. Sheet 1 of 6.

The map surround should contain:

1. the reduction ratio and a graphical (bar) scale together with a statement that all measurements are in metres
2. a statement that the datum of the coordinates is the MGA94, or conversion parameters to MGA94
3. a north point indicating grid north, and magnetic north
4. a schedule of symbols used on the particular sheet
5. a sheet index showing:
 - all the sheets necessary to cover the mine workings
 - the number of each sheet
 - an outline of the mining lease
 - an outline of the mine workings
 - the particular sheet shown by a heavy outline
6. a schedule of endorsements made by the Mine Surveyor (see Appendix B)
7. a Certificate of Accuracy schedule of the sheet (see Appendix B)
8. the origin of levels and the grid bearing and terminal survey stations of the mine baseline.

The mapping area should show:

1. all detail plotted to a suitable scale
2. the workings of the mine on that level—location of active and unsurveyed voids, and backfilled voids, including type of backfill
3. stope names and sufficient crosscut and drive names/numbers to clarify the naming/numbering system; contours of the floor of the working section at no greater than 5 m intervals for shallow dipping ore bodies
4. the position of all shafts, drives, decline, incline, winzes, raises, ore passes, vertical openings and bins within that sheet
5. the position of haulage (brace level) and ventilation shafts and ventilation fans
6. fresh air bases, escape ladder ways, second means of egress
7. ventilation devices and systems

8. major engineering infrastructure, including all buildings—fixed and portable—including offices, workshops, warehouses, power stations, transformers (major electrical installations), and overhead and underground power transmission lines
9. crushing and grinding plant, metallurgical plant, storage and loading facilities, access roads, car parks and surface haul roads
10. conveyors, stockpile and ROM areas, including reclaim tunnels
11. rail sidings
12. bulk chemical storage bins and process vessels
13. bulk fuel storage tanks and fuelling areas
14. explosives and detonator magazines
15. ANFO plants and storage
16. all workings within 100 m of the current workings including workings of adjacent mines
17. an outline of all workings in any direction within 30 m of the current bench/level being worked
18. the position of all boreholes within that sheet or
 - where it is not practical to show all boreholes on the level workings sheet, a separate 'Borehole Plan', which shall become part of the Mine Workings Plan, shall be produced as an overlay, or
 - an electronic record (database) containing all necessary information and in the same grid reference system as the Working Plans to produce a borehole overlay plan.
19. a reference on the Level Workings Sheet to indicate the existence of the borehole overlay sheet and/or electronic database.
20. all boreholes identified by type, name and current status (e.g. open, sealed, not intersecting level)
21. where boreholes have been drilled in adjacent strata, sufficient reduced levels to indicate their position
22. remnant stubs of any boreholes that may have been removed by the mining process, as these may present a hazard to future mining operations; boreholes that have been entirely removed are not required to be shown
23. nature, location and dimensions, as accurately as they are known, of any metallic, radioactive or other potentially harmful material left in any borehole intersecting or lying within a working seam
24. date lines (by dashed lines) indicating the extent of the workings for each annual survey reporting period and the date and the initial of the Mine Surveyor shall be shown in this location in the format provided by AS 4368.
25. position of survey stations or benchmarks and their identification.
26. boundaries of any creek, river, watercourse, lake, sea, dam, tailings dam or other possible inrush source on the surface within the mine's boundaries or on land adjacent to the mine (shown in blue)
27. boundaries of any road, railway, power line, reserve or easement on the surface that are within the mine's boundaries
28. positions and details of all geological features on the level
29. surveyed locations of all abandoned mining equipment, including, for example, mobile plant and conveyors
30. surveyed locations and other details of all known hazardous substances including rock types and boreholes
31. mine boundaries
32. mining lease boundaries
33. cadastral boundaries with annotated identification
34. Parish and County boundaries with annotated identification
35. locations of any artificial structures on the surface within the mine's boundaries
36. extents of open shafts, stopes or open pits at the surface
37. extent of caved ground due to underground mining
38. decline portals and access roads
39. site fencing and gates

40. tailings pipelines and dams, associated infrastructure
41. waste dumps and material contained
42. tyre dumps
43. drainage and water retention structures, dams and water tanks
44. surface and underground pipelines
45. drainage and service boreholes
46. boreholes that may affect the safety of the mine
47. natural features, including water courses and lakes
48. any disused buildings, plant or shafts from older or defunct mine workings within the mining lease or claim area
49. surface spot levels or contours
50. survey reference marks and baseline.

Open-cut mines

Each bench Working Sheet shall show the following detail:

The heading should include:

1. name of the mine, e.g. *Mine Workings Plan of Acme Mine*
2. Parish and County names and the 1:100000 sheet map name(s) and number(s)
3. name of the bench being worked
4. number of the sheet and the number of sheets that make up the extent of Mine Workings, e.g. Sheet 1 of 6.

The map surround should contain:

1. the reduction ratio and a graphical (bar) scale together with a statement that all measurements are in metres
2. a statement that the datum of the coordinates is the MGA94, or conversion parameters to MGA94
3. a north point indicating grid north , and magnetic north
4. a schedule of symbols used on the particular sheet
5. a sheet index showing :
 - all the sheets necessary to cover the open-cut mine
 - the number of each sheet
 - an outline of the mine facilities and operations
 - the particular sheet shown by a heavy outline
6. a schedule of endorsements made by the Mine Surveyor
7. a schedule of certifications of the accuracy of the sheet
8. the origin of levels and the grid bearing and terminal survey stations of the mine baseline.

The mapping area should contain:

1. all detail plotted to a suitable scale
2. the workings of the mine on that bench
3. contour lines at an interval of 5 m or less on the bench workings floor (shown in brown)
4. outlines of limit of highwall mining
5. outlines of the excavated pits
6. stockpiles, waste dumps,(including material contained) rubbish tips and tyre dumps
7. all workings within 100 m of the current workings including workings of adjacent mines
8. outlines of all workings in any direction within 30 m of the current bench/level being worked

9. date lines (by dashed lines) indicating the extent of the workings for each annual survey reporting period and the date and the initial of the Mine Surveyor shall be shown in this location in the format provided by AS 4368
10. boundaries of any creek, river, watercourse, lake, sea, dam, tailings dams or other possible inrush source on the surface within the mine's boundaries or on land adjacent to the mine (shown in blue)
11. locations of any engineering infrastructure on the surface within the mine's boundaries
12. buildings (fixed and portable), including offices, workshops, warehouses, power stations, crushing and grinding plant, metallurgical plant, and storage and loading facilities, access roads and car parks
13. conveyors and stockpile areas, including reclaim tunnels
14. transformer yards
15. overhead and underground power transmission lines
16. rail sidings
17. bulk chemical storage bins and process vessels
18. bulk fuel storage tanks and fuelling areas
19. in-pit crushing plant and storage bins
20. explosives and detonator magazines
21. ANFO plants and storage
22. boundaries of any road , railway, power line or other type of reserve or easement on the surface within the mine's boundaries
23. positions and details of all known geological features and other significant dislocations
24. borehole positions within that sheet or where it is not practical to show all boreholes on the bench workings sheet then
25. a separate 'Borehole Plan', which shall become part of the Mine Workings Plan, shall be produced as an overlay, or
 - an electronic record (database) shall be kept, containing all necessary information and in the same grid reference system as the Working Plans to produce a borehole overlay plan.
 - a reference on the bench workings sheet is required to indicate the existence of the borehole overlay sheet and/or electronic database.
26. all boreholes identified as to type and name and their current status (for example, open, sealed, whether they intersect the bench).
27. where boreholes are drilled in adjacent strata, sufficient reduced levels should be shown to indicate their position
28. remnant stubs of any boreholes that may have been removed by the mining process, as these may present a hazard to future mining operations; boreholes that have been entirely removed is not required to be shown
29. cadastral boundaries with annotated identification
30. Parish and County boundaries with annotated identification
31. mining lease boundaries
32. the date and the initial of the Mine Surveyor shall be shown in the location corresponding to the position of the workings at the end of the survey reporting period in the format provided by AS 4368
33. the positions of haulage (brace level) and ventilation shafts, and ventilation fans
34. extents of open shafts, stopes or open pits at the surface
35. extents of caved ground due to underground mining
36. decline portals and access roads
37. site fencing and gates
38. drainage and water retention structures, dams and water tanks
39. surface and underground pipelines
40. any disused buildings, plant or shafts from older or defunct mine working within the mining lease or claim area

41. surface spot levels or contours
42. survey reference marks and baseline
43. surface haulroads
44. tops and toes of all batters
45. berms and benches
46. haulage and access ramps between berms
47. spot height levels of berms or benches
48. pumps and sumps
49. overhead powerlines.

Appendix B—Certification of mine plan

The accuracy of the plan is to be certified by the appointed Mine Surveyor

Certification of the mine plan should contain the following statement:

This is to certify that this survey has been done by myself (or by persons under my own supervision), subject to adequate inspection and field check, and is the actual result of the observations and measurements, and the survey and plan have been done in accordance with the requirements of the *Mining and Quarrying Safety and Health Act 1999*

Dated theday of20

Appointed Mine Surveyor Grade Certificate No.

Where any information shown on the mine plan is in doubt or there is any other information that the authorised Mine Surveyor considers requires endorsement, the mine plan should be suitably endorsed. An example of a 'Schedule of Endorsements' is shown below:

Schedule of Endorsements			
Reference	Date	Description /References	Signed

References

- Australian Standard AS 4368–1996 Mine plans—Preparation and symbols
- Australian Standard AS 2916–2007 Symbols for graphic representation of coal seams and associated strata
- Geoscience Australia www.ga.gov.au/
- *Mining and Quarrying Safety and Health Act 1999* (Qld)
www.legislation.qld.gov.au/LEGISLTN/CURRENT/M/MiningQuaSHA99.pdf
- Mining and Quarrying Safety and Health Regulation 2001
www.legislation.qld.gov.au/LEGISLTN/CURRENT/M/MiningQuaSHR01.pdf \