FEASIBILITY STUDY TECHNICAL ASSISTANCE PROJECT: THE APPLICATION OF MINING OPERATIONS PLANS AND ALTERNATIVE DOCUMENTS FOR ONGOING REVIEW OF PROJECTED MINING ACTIVITY

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QUALIFICATIONS

Bachelor of Engineering in Mining Engineering, Honours (University of Sydney).

PROFESSIONAL APPOINTMENTS

Chairman, International Mineral Valuation Committee (IMVAL). *IMVAL is an umbrella organization with representatives from various bodies responsible for the formulation of codes relating to the valuation of mineral assets. The committee is tasked with the global harmonization of international standards for valuation of mineral assets*.

Executive Member, VALMIN Committee. *The VALMIN Committee is a joint committee of the Australasian Institute of Geoscientists and the Australasian Institute of Mining and Metallurgy (AusIMM). It is responsible for the formulation, review and governance of the Australasian Code for the Public Reporting of Technical Assessments and Valuations of Mineral Assets (VALMIN Code)*.

PROFESSIONAL AFFILIATIONS

Chartered Professional (Mining), Australasia.
Fellow, Australasian Institute of Mining and Metallurgy.
Member, American Institute of Mining, Metallurgical and Petroleum Engineers.

Australia Mongolia Extractives Program is supported by the Australian Government and implemented by Adam Smith International.

Adam Smith International

Scope

AMEP (Australia Mongolia Extractives Program) is tasked with reporting on the use of documents (other than feasibility studies) used in jurisdictions outside of Mongolia to report future mining plans and activities to relevant government authorities.

AMEP understands the current situation in Mongolia to be as follows. The holder of a mining licence is obliged to prepare and submit a Feasibility Study (as defined by regulation) before the first anniversary of the granting of that licence. Submitted Feasibility Studies are employed by government agencies in assessing the safety and sustainability of the proposed operations, the economic impact of the mine and planning future infrastructure support and other works. These studies are required to be updated on a regular basis, namely: (i) after a change of mining licence holder; (ii) after 3 years of non-operation; and (iii) every 5 years after approval of the initial feasibility study.

In general practice in developed nations and in many developing nations feasibility studies are used for financing purposes, and are not used as mechanisms to provide information to government. In some jurisdictions, including Canada and Australia, executive summaries of feasibility studies are released to the public prior to project financing in the form of NI 43-101 reports and stock exchange releases, and government has access to these public releases. However, neither the public nor government is provided with the full studies, and subsequent changes to the mining plan are only provided to the public in summary form. Consequently, other mechanisms are used to ensure that the mining regulator is provided on an ongoing basis with information sufficient for its purposes.

A Feasibility Study Working Group with broad representation has been established under the direction of the Ministry of Mining and Heavy Industry. The Working Group seeks advice regarding the processes in other jurisdictions that provide information similar to that available in Feasibility Studies.

This study reviews future plan reporting arrangements in various Australian and US jurisdictions. In this report these are referred to as ‘alternative documents’.

Supplementary requirements and restrictions

In many cases, the alternative documents provide information required by several government agencies, in particular environmental permitting and monitoring authorities. In these cases, the mining regulator acts either as a central collecting and forwarding agent for the alternative documents. Usually, the information associated with environmental planning and outcomes forms the greater part of an alternative document. Nevertheless, the operational information remains an important component. This report discusses only those items likely to be required by the Ministry of Mining and Heavy Industry (MMHI).

In most alternative documents financial outcomes are not quantitatively revealed, and where they are revealed (mainly in the case of annexures to royalty returns, as discussed below, and then only for the coming year) it is done so under confidentiality cover..

Alternative Models

The review undertaken has revealed that there is a very wide range of reporting requirements for future mining activities. The differences between the jurisdictions appears to be related to the following issues.

1) The level of economic reliance on the mining industry. Where the mining industry is relatively mature and has higher impact on the economy, the alternative documents tend to be simpler.

2) The scale of the mining industry.

3) The prevalence of alternative land uses in mining regions. Where other land uses are prevalent or intensive, the alternative documents tend to be more sophisticated. This reflects the level of participation by outside stakeholders in the alternative document process.

The various jurisdictional models for the ongoing provision of future works can be grouped in the following general categories, in order of increasing comprehensiveness.

1) No information is required on a regular basis

2) A mine operating plan (MOP) is required at each mining licence application and renewal date

3) Future work programs are to be outlined in the mining lease annual reports; and

4) Mine operating plans are required on a regular basis

Model 1: No information is required on a regular basis

In this case, a mining plan is lodged prior to granting of the lease. No subsequent formal mining plan is required.

The mining regulator relies on alternative mechanisms to assess the current and future activities at the site. These mechanisms include (i) construction and other permits (which provide limitations to operational size, type and activities); and (ii) instructions from the Mines Inspectorate in accordance with relevant legislation.

Construction permits, or development approvals, are issued by either state (provincial) or local government authorities, depending on the scale of the project. The particular parameters of the project are stipulated, including scale and location of site infrastructure, earthworks, structural plans, electrical installations etc. Operational restrictions (noise, dust, effluent control, activity footprint etc.) are imposed at this level. Note that the mining regulator is also at state (provincial) level in Australia and Canada, whereas the mining regulator is at national level in countries such as South Africa. In the USA, the mining regulator is also established at national level, but the authorities to whom a mine operator must report spreads across a wide spectrum of Federal and State agencies.

In practice, the parameters imposed by the initially accepted plan cannot be contravened without a subsequent mining plan being submitted and approved. Whereas this option first appears to be less restrictive than others, the control imposed by government is not overtly lessened.

Model 2: Mining programs are provided at each application or renewal date

The mining program is used to assist the regulator in assessing whether the proponent should be granted the licence. Resubmission is not required until the licence renewal date. However, as with Model 1 plans, they cannot be varied without resubmission.

The principal objectives of a mining program are to:

- provide a better understanding to the regulator of the nature and extent of the proposed development and production of mineral resources from the licence area;
- allow an assessment of the proposed development and whether it is appropriate (this is particularly important with respect to mineral resources that are not currently being mined or have not been developed for some time);
- assess the prospective Mineral Resource utilisation and identify any resource sterilisation issues; and
- allow appropriate resource management decisions to be made.

Scope of mining programs

The scope of mining programs will vary depending on the size and complexity of the proposed mining operations. The plan for an alluvial gold project or a small open cut operation, for instance, would require less detail than a multi-seam open cut and underground operation that also had coal seam gas extraction issues.

The program must be submitted for each mining licence. If the mining licence supports other permits or forms part of a project, the program described must describe the project and clearly show the relationship of this mining licence.

Typical content includes:

1) the identity of the mining licence and mining licence holder;

2) the date operations commenced, or are intended to commence, on the licence area;

3) a statement as to whether the licence area is being or is to be operated as part of a project involving other mining permits (if so, details of the project must be provided, including a description of the relationship of this licence to the project, and why this licence is required for the project or operation of other permits);

4) an outline of the method of operations;

5) a list of attached documents to support the mining program; and

6) the applicant's declaration, including the applicant's confirmation that he or she understands his or her obligations as a holder of a mining licence; that he or she has truthfully declared all relevant details; and that if any part of the mining program has been completed by another person the applicant declares the information as set down is true and correct and has been included with the applicant's full knowledge, consent and understanding.

With respect to Item 3, a map showing the extent of the project must be included with the program, and the other licences and permits must be identified.

With respect to Item 4, the method of operations must:

- cover every mineral the licence holder has the right to mine;
- describe the method in enough detail to support the size and shape of excavations, depositions and structures ie pits, stockpiles, dumps, processing facilities, tailings storage, infrastructure etc;
- provide adequate graphic representations (ie maps, photographs, diagrams) of the Mineral Resource and mining information to support the proposed use;
- include a description of infrastructure to be constructed/maintained on the licence area;

- describe the methods proposed for rehabilitation works; and
- include a description of the workforce required to establish/maintain this operation.

With respect to Item 6, the declaration will show for each signatory the name, position, signature and date signed.

This approach is often applied where a separate plan of operations is required by the environmental regulator on a regular basis.

Model 3: Future work plans are provided in annual reports

The plans are restricted in detail, but are more frequently provided compared to other models. They are generally provided as attachments to the annual reports on the tenements submitted to government, or as attachments to royalty returns (again on an annual basis). Although mining licence annual reports are still required where other future work plan models apply, they do not seek detailed information relating to future plans, as that information is provided elsewhere.

Under this model, the licence holder will have provided a mining plan prior to the grant of the mining licence. That mining plan will include the following information:

- details of the proposed operation, including stages of development, for the requested term of the mining licence;
- details of the method of mining;
- details of progressive and final rehabilitation of the area of land to be disturbed by operations;
- management strategies for dealing with geological and environmental issues associated with the development.

The licence holder must provide in the annual report "details of mining operations to be undertaken in the next year under the mining plan." Obviously, this must be considered in light of not only the information provided before the grant of the mining licence, but also in light of the historical information required in a mining licence annual report. Typically, the historical information for the past year includes a summary of:

- the quantity and value of products sold or held in stock;
- the quantities of ore and waste mined and ore processed;
- the sources of ore and waste mined and details of waste disposed of;
- mine development undertaken, if any;
- process development, if any;
- a breakdown of capital expenditure;
- operating costs of any mining and exploration;
- workforce details;
- details of on-licence exploration as the regulator Director requires;
- details of Mineral Reserves and Mineral Resources, by individual ore deposit, in accordance with standards published by the Australasian Joint Ore Reserves Committee.

Consequently, any projected material changes relating to items in the above list should be detailed. In addition, the following information is also required:

- a statutory declaration of the accuracy of the report;
- exploration expenditure for the reporting period;
- where available, digital copies of drilling and associated geoscience databases, wireframes of geological features and mineralisation, the topographic surface model,

wireframes of open pit and underground workings (including stopes), mine plans (including development and face mapping), orebody block models, and appropriate metadata for all of these;
- details of any associated reports and plans on the development and maintenance of waste storage infrastructure, such as tailings storage facilities and waste rock dumps; and
- details and any associated reports on progressive and final rehabilitation activities undertaken.

Information provided in this model is kept confidential until the mining licence expires, and in general financial information is not released.

Model 4: Mine operating plans are provided on a regular basis

Mine operating plans provided on a regular basis are submitted every 3 to 5 years at least, or every 7 years if a mine is dormant or closed. They must also be re-submitted before any proposed change of status (mining method, processing method, tailings storage, waste rock and soil storage, product handling infrastructure, production rate, expansion, contraction, entering care-and-maintenance, closure, or recommencement of operations) or change of any material aspect of the plan. This is the most highly regulated procedure. In certain cases, the interval between successive mine operating plans can be as short as six months.

Information Provided in Mining Operations Plans

The information provided varies considerably. However, the following list incorporates many of the elements typically required.

Note that this list is compiled from various state examples, and that no one MOP includes all of the information included in this list. It therefore behoves any regulator wishing to compile a suitable MOP contents list to first select whether the listing is to be generic (as is the case in New South Wales, for example, where it is the responsibility of the applicant to ensure that all aspects that may reasonably be considered relevant are incorporated) or specific (as is the case in South Australia, for example).

Also note that this list excludes the environmental permitting and monitoring elements.

Title block

Typically, the information contained within the title block will include:

- Name of Mine
- MOP Commencement Date
- MOP Completion Date
- Mining Authorisations (Lease / Licence No.)
- Name of Authorisation / Authorisation Holder(s)
- Name of Mine Operator (if different)
- Name and Contact Details of the Mine Manager (or equivalent)
- Name and Contact Details of Environmental Representative
- Name of Representatives of the Authorisation Holder(s)
- Title of Representatives of the Authorisation Holder(s)
- Signature of Representatives of the Authorisation Holder(s)
- Date
- Version

For the purpose of Representative in the above title block information, the details and signature must be of a Company Director or Company Secretary.

Statutory declaration

A typical statutory declaration is set out as follows.

"I, [*name*], of [*town*] in the state of [*state or province*], solemnly and sincerely declare as follows:

1) I am the duly appointed Operations Manager for [*project*];

2) I am authorised to make this declaration on behalf of [*applicant*];

3) All works and activities described in the Mining Operations Plan to which this declaration is attached comply with the conditions of the title of the mining licence (or mining licences) shown in the Mining Operations Plan, and with the conditions of Development Consent and all other relevant Government Agency approvals and licences granted in respect of them.

4) I confirm that all the works and activities referred to in the previous paragraph lie wholly within the area shown in the Mining Operations Plan and that the tenements (mining licences, land ownership) details are correct.

and I make this solemn Declaration conscientiously believing the same to be true and by virtue of the provisions of the [*Oaths Act or similar legislation*]

in the presence of a witness who states [*followed by a signed statement in the form required by the Oaths Act or similar legislation*]."

History of operations

The applicant must provide a brief history of previous operations and previous MOPs submitted. The objective is to provide sufficient information to give adequate context to the MOP.

Current consents, authorisations and licences

The applicant should provide in tabular form the identifier, date of grant and duration of current consents, authorisations and licences, including:

- Project Approval / Development Consent
- Mining Licences and Authorisations
- Exploration Authorisations; and
- all other approvals and licences (including environmental approvals, hazardous material permits, etc) issued by Government Agencies in respect of the mining operations.

Land ownership and land use

The applicant must provide an overview of the tenure of the general area in addition to a schedule of land ownership, occupancy and title over the authorisation area. All tenures must be correctly identified as to type: eg private freehold, vacant crown land, park reserves. It is not necessary to identify the individual land owners.

Stakeholder consultation

Where this information is required, the applicant must summarise (i)

Project Description

The mining project should be summarised, including production rates and expected mine life. The general sequence and staging of mining operations over the mine life should be described. This information would also include:

- a general description of the geology, including location, dimensions and strike, dip and folding (if known) of the deposit, areas of instability (slips, faults, karst features or geological unit boundaries);
- rock or sand composition, including minerals that may occur in minor amounts and are hazardous to human health (eg radioactive minerals, asbestos);
- ore composition;
- waste and proportion of waste, including minerals that may occur in minor amounts that may pollute the environment (eg sulphide minerals that may generate acid);
- description and results of exploration work carried out;
- description of the standard commodity to be extracted and sold ex mine or quarry gate;
- current Mineral / Coal Resource and Ore / Coal Reserve estimates within the mining licence area.

Asset register

The applicant must list the domains within the MOP area and indicate their size. The operational domains are: open pit void, underground mining area, infrastructure area including processing plant, tailings storage area, overburden / waste rock emplacement area, stockpiled material area, and water management area. The secondary domains indicate post-mine land use, and comprise: infrastructure, water management area, rehabilitation areas (marked as grassland, pasture, woodland, forest, or rural land), relinquished land and final void. The major assets within each domain should be listed, including fixed plant and infrastructure (crusher stations, processing plant, rail loops, offices etc) with notations indicating use, footprint area and height as necessary.

Exploration

The applicant should identify and describe scheduled exploration activities and the requirements of the mining licence and, if applicable, of any exploration licence that may surround the mine and on which exploration activity may be conducted in conjunction with exploration on the mining licence(s). Exploration activities may include, but are not limited to:

- types of drilling (rotary air blast, aircore, reverse circulation, rotary mud, diamond core);
- geophysical techniques likely to be used (eg downhole surveys, magnetics, gravity, induced polarisation, seismic);
- earthworks required to conduct exploration activities (eg drill pads, sumps, access tracks); and
- equipment required to conduct exploration activities.

Construction

The applicant must identify and describe any construction or demolition activities scheduled for the MOP period. Current key infrastructure must be identified, together with any proposed changes during the term of the MOP.

Mining operations

The method of mining development and sequencing must be described, together with general mine features. Any plans to disturb previously rehabilitated areas must also be discussed. Typically, a description of the mining operations will include:

- the mining method adopted (underground, open pit etc), ore processing involved (crushing, washing, grinding, flotation, leaching etc);
- equipment, with detail on type, size and capacity of machines, noise and exhaust outputs, ignition sources (eg exhausts) and approximate number of units;
- sequence of operation, commencing with relationship to any existing workings, an indication of the starting point, and the direction of progressive work stages;
- modes of operation (continuously or periodically) and proposed hours and days of operation;
- use of explosives, with detail on type, estimated frequency of blasting, storage of explosives (amount, detailed location and method of storage); including copies of any statutory licences issued for explosives use; and
- location, size, shape and height of ore, product, subsoil and topsoil stockpiles, together with method of placement, method of stabilisation and erosion control, and water movement through stockpiles.

Rock / overburden emplacement

The applicant must describe the areas identified for emplacements, the sequencing of emplacements, emplacement construction and emplacement management. Typically, a description of rock emplacement will include:

- location, size, shape and height of permanent and temporary mine waste rock storage facilities;
- method of placement;
- method of stabilisation and erosion control of storage facilities;
- slope stability assessment to demonstrate acceptable safety; and
- surface water runoff control on disturbed and rehabilitated areas.

Crushing and processing

The following information should be provided on the specifications of processing plants

- area, size, type of construction and location of fixed or mobile plant and associated structures (concrete batching plant, wheel wash facilities, silos, fuel tanks, water tanks, chemical storage etc) used for processing minerals or coal on site;
- a description of rock or sand processing (eg crushing, washing, drying, screening, separation)
- the type(s) of processing / value adding used on the raw material (eg concrete, bitumen, separation, drying);
- if processing water is used, a water balance, approximate water volumes required and source;
- heat duties in mine water for all drying or other heating operations in the plant;
- a mass balance for the plant
- noise sources;
- dust sources and composition; and
- ignition sources; and
- proposed hours and days of crushing, processing and product transport.

Tailings and processing residues

Tailings facilities, disposal methods and locations should be identified and briefly described. Typically, the following information will be provided on any processing wastes generated:

- volumes of waste processing water, water content of residues, and method of disposal or recycling;
- disposal and management of chemical additives (eg flocculants); and
- management and disposal of slimes.

Waste materials management

The applicant must describe waste disposal and material handling operations over the MOP period. This should include the disposal of putrescible waste, hydrocarbons, hazardous materials, and the management of contaminated soils. Typically, the information provided on any industrial and domestic wastes will include:

- putrescible waste disposal facilities; number, size, location and construction details;
- oil;
- other onsite waste disposal or recycling (eg workshop waste, tyres, drums and oil filters);
- offsite disposal;
- a description stating the type, area and layout of sewage systems installed at the site, and if the system has been or will be approved by the relevant authority.

Supporting infrastructure

The following information should be provided regarding supporting infrastructure

- number, area, size, type of construction and location of onsite personnel accommodation buildings, caravans or camp and associated structures (eg car park, office buildings, mess hall, water tanks) to be used on site; and if temporary or permanent.
- a description of the sources of external services that are supplied to the mine or quarry, such as power, water and telephones
- if new connections to public infrastructure are required, the proposed routes for connection;
- a description of, and the effects to, any existing surface infrastructure that has been or may be affected by the mining operations;
- public roads that have been or are proposed to be upgraded and the transport system(s) used to and from the mine or quarry, including details of the estimated number of vehicle movements per day;
- a description of any existing or proposed vegetation (ie species and densities of planting) or other type of visual screening; and
- a general description of infrastructure and measures that have been adopted to prevent unauthorised access by the public, including fencing and signage.

Decommissioning and demolition activities

The applicant should identify and describe those areas and structures to be decommissioned and/or demolished during the term of the MOP.

Temporary stabilisation

The applicant should identify the location of, and reasons for undertaking, any temporary stabilisation works. Information on proposed landforms, stabilisation methods and time frames for temporary rehabilitation should be specified.

Silt control and drainage information should include:

- location and design of silt management structures (eg silt retention dams);
- runoff control on disturbed and rehabilitated areas; and
- storage, diversion and disposal of clean water (ie discharge water complying with the applicable statutory water policy).

Progressive rehabilitation

The applicant is required to identify and describe areas within the Mining Licence that will be rehabilitated during the term of the MOP, and any areas where rehabilitation is or will be completed.

Production schedule

A summarised material production schedule is required, in the form shown in the table below:

Table 1: Material Production Schedule During the MOP Term

Material	Unit	Year 1	Year 2	Year 3	Year 4	Year 5
Stripped topsoil	m^3					
Waste rock / Overburden	m^3					
Ore or ROM Coal	Mt					
Reject Material	Mt					
Product	Mt					
Backfill	Mt					

Reject material includes (where relevant) tailings, coarse rejects, and any other wastes resulting from beneficiation. Backfill should be specified as being derived from waste rock, reject material or from a dedicated quarrying operation. Should operations

Environmental risk assessment

[*Not within the scope of this report*]

Environmental risk management

[*Not within the scope of this report*]

Post mining land use

[*Not within the scope of this report*]

Rehabilitation planning and management

[*Not within the scope of this report*]

Reporting

The applicant is required to list the various reporting mechanisms required to verify compliance with the MOP.

Plans

Plans should be based on a survey, orthophoto maps or aerial photo but may be accepted as survey plans.

All plans must show:

- name of mine;

- name of titleholder
- date of plan preparation;
- title of the plan;
- who prepared the plan;
- authorisation boundaries;
- project approval area (ie mining areas defined in the development consent);
- project disturbance area;
- signature of appropriate responsible officer, ie manager or authorisation holder;
- mining title details, including boundaries and lease numbers;
- north point;
- source date of the base aerial;
- scale - the scale must allow for clear representation of relevant detail;
- grid lines (MGA);
- surface contours (5-metre contour intervals are standard for coal mines, although 1-metre or less may be required for some areas (such as plant sites, rail loops etc); and
- legend of symbols and colours

Typical plans to be included are:

- project locality (in a state-wide context, identifying the nearest local government areas and major towns);
- natural environment (pre-mining, identifying)
- built environment (pre-mining);
- mining domains at commencement of MOP (being the operational domains and the secondary domains for post-mine land use);
- a series of plans showing the annual sequence of mining and rehabilitation activities over the term of the MOP;
- final rehabilitation and post-mining land use plan; and
- final rehabilitation and post mining land use longitudinal and cross-sections.

Cross sections

An appropriate selection of cross sections and longitudinal sections should be provided to the extent that they clearly indicate the proposed geometry of excavations and emplacements.

Examples of Procedures in Various Jurisdictions

The differences in the following jurisdictions reflect: scale of mining industry, depth of public service, available resources, importance of mining to the economy, community perception.

New South Wales (Australia)

New South Wales (NSW) has major coal mining areas at the northern, southern and western extremities of the Sydney Basin. In the west and mid-west of the state are a number of world-class underground base metal mines and medium- to large-scale gold mines, including Australia's largest gold mine, Cadia, which produces about 900,000 ounces of gold per year.

The NSW Mining Operations Plan follows the Model 4 procedure. It is probably the most complex of the examples set out in this report, and is heavily oriented to provide and monitor environmental response and rehabilitation. It is a multiple-department document with oversight centralised with the mining regulator. New South Wales probably has the highest level of public participation and public scrutiny of the various state MOPs, as many of the mine sites are located in fertile areas with competing land uses. In particular, the main open pit coal

mining region, the Hunter Valley, is also the host of vineyard, horse studs, and intensive agriculture and grazing.

The NSW MOP generally follows the content described under 'Information Provided in Mining Operations Plans' above. The mining regulator publishes a guide (currently 79 pages in length) to preparing MOPs. The content requirement in the mining section is less specific than in other states, but is more detailed and outcome oriented in the environmental sections. For example, the information included in the bullet points (except for title block and plans) do not appear in the published guidelines, but may be included in any provided environmental licences and (for completeness) should be included in the MOP.

The NSW regulator states that it will attempt to process a submitted Mining Operations Plan within 30 business days of submission. However, "stop the clock" provisions may apply, particularly if the regulator requires clarification or material amendment to the MOP. Stopping the clock means that the time between stopping and restarting the 'clock' is not counted in determining the application processing period. Consequently, the regulator recommends that MOPs are submitted 3 months prior to expiry of the preceding MOP. In the author's experience, an applicant for a project in New South Wales should submit a renewal MOP 6 months ahead of expected MOP commencement date to ensure continuity of operations.

The NSW regulator considers an MOP as a publicly available document. It can be viewed (not copied) in the regulator's regional office in the region in which the operation is located. At the sole discretion of the regulator, an MOP which is deemed to be in the public interest may be published on the regulator's website. If the regulator opts to load the MOP onto the website, it must remove all identifying information relating to private individuals if such removal is requested by the individual concerned and if such information is deemed as being commercially sensitive.

Northern Territory (Australia)

Because of the sparse population of the Northern Territory (about 0.25 million), the relatively small-scale mining industry has a disproportionately high impact on the regional economy. The mines, mainly gold, uranium and base metals, tend to be of small- to medium-scale. Exceptions are the world class McArthur River zinc-lead mine near the Gulf of Carpentaria and the GEMCO manganese mine on the island of Groote Eylandt.

The Northern Territory Mining Management Plan (MMP) follows the Model 4 procedure. The Northern Territory Australian MOP generally follows the content described under 'Information Provided in Mining Operations Plans' above. The mining regulator publishes a guide (currently 33 pages in length) to preparing an MMP. The requirements with respect to proposed operational characteristics are more specific are more specific than those of other states (such as New South Wales), making it more straight-forward for the applicant to comply in that area. The required content is a little more detailed concerning the mining and processing operations than the South Australian MOP, but is fairly similar in layout. The MMP guide includes a checklist of required inclusions.

The high-level content requirements of an MMP are as follows:

- Introduction (operator details, organisational structure and responsibility, mining licence details, project location, project summary and improvements);
- Site Conditions (climate, land systems, flora, fauna, current land use, identified stakeholders and consultation, workforce description and demography, community affairs)
- Requirements (statutory requirements, non-statutory requirements, heritage sites);

- Operational Activities (mining activities, mine design, waste rock dump, mining reserves and geology, mining performance against previous MMP, treatment and ore processing operations, residue / tailings storage facility, process / mine water dams, processing performance against previous MMP, exploration activities);
- Environmental Management [*not in the scope of this report*];
- Water Management Plan (current conditions, information / knowledge gaps, water balance, risk management, monitoring, management, actions proposed over the reporting period and their potential to impact on water quality);
- Incident Reporting
- Closure Planning (life-of-plan unplanned closure, background for costing, security estimate)
- Appendices (risk assessment matrix, waste rock characterisation and management, Dangerous goods handling and storage, supporting information, diagrams, abbreviations)

The MMP is a confidential document and is not publicly available.

Queensland (Australia)

Queensland is one of the two largest mining industry states in Australia. It is Australia's largest coal-producing state with both metallurgical coal and and thermal coal extracted from a range of locations, but particularly centred on the Bowen Basin. The world class Mount Isa copper/lead/zinc mine is located in the north-western portion of the state, in a region that hosts a number of smaller base metal operations. Other medium-scale gold and base metal mines are located in the central eastern and north-eastern parts of the state.

With respect to mining information as distinct from environmental information, Queensland has adopted Model 2. Applicants for a mining licence or for a mining licence renewal must submit a mining program with the application. As discussed previously, the scope of the mining program varies depending on the size and complexity of the operation.

Queensland 'plans of operation' (the Model 4 equivalent) are submitted to the Department of Environment and Science. They are very much oriented on compliance with the project Environmental Approval, and as such are not dealt with in detail in this report. The plan of operations has a maximum time frame of 5 years.

South Australia

South Australia hosts the world-class Olympic Dam copper-gold-uranium mine, plus a number of smaller base metal and iron ore operations.

The South Australian MOP follows the Model 4 procedure. Although the regulator will accept separate MOPs for each mining licence in a contiguous group of mining licences, it prefers that one MOP is submitted to cover the activities of the contiguous group.

The South Australian MOP generally follows the content described under 'Information Provided in Mining Operations Plans' above. The mining regulator publishes a guide (currently 66 pages in length) to preparing MOPs. As with the Northern Territory, the requirements with respect to proposed operational characteristics are more specific than those of other states (such as New South Wales), making it more straight-forward for the applicant to comply in that area.

However, the approval process is more iterative than that of other states such as New South Wales and incorporates a formal appeal procedure (see Figure 1). As a first step, the applicant must submit a draft set of objectives and criteria to be applied in the MOP. The Director of

Mines may accept the draft set of objectives and criteria, or (after consultation with the applicant) require alterations. Appeals may be heard in the Warden's Court. The Warden's Court may (i) confirm the decision of the Director of Mines; (ii) vary or revoke the decision of the Director of Mines; (iii) make any consequential order that it considers necessary or expedient.

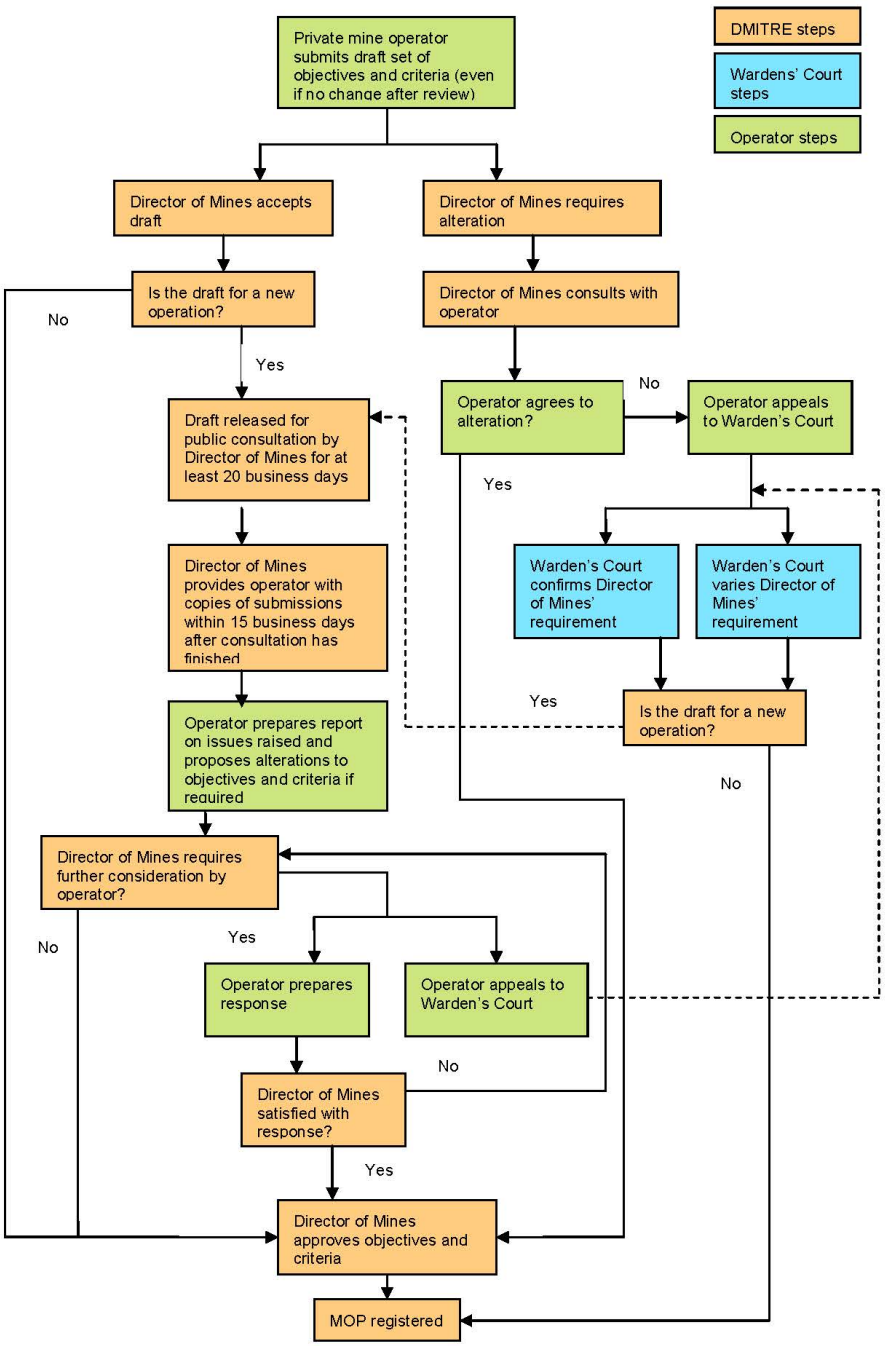

Figure 1 Approval process for MOP objectives and criteria.

In February 2020, South Australia introduced a new annual reporting code, designed to confirm compliance with MOPs. The required content of these annual reports is as follows:

- copy of the cover note for public liability insurance;
- identification (mining licence number(s), name of the mine operation, general location details, name(s) of the tenement holder and mine operator(s), site contact, dates of the reporting period, and report submission date)
- a summary list and the status of currency of all tenements covered by the approved MOP, including a plan of the mining operation showing all tenement boundaries;
- a summary list and the status of currency of any other approvals obtained to authorise the mining operation, that are relevant in the achievement of environmental outcomes within the approved MOP and or compliance with the tenement conditions;
- a statement of current mineral resources and ore reserves (as defined under the JORC Code or an equivalent CRIRSCO-accepted foreign code) broken down by individual deposits where possible, including a statement of change from those designated in the approved MOP;
- a summary of any new delineation or exploration drilling activities on the tenement, or any other potential sources of ore (eg from nearby mines) that may have a significant effect on the future production levels and mine life;
- a statement of the estimated mine life;
- a summary of the quantity of ore mined and processed in the reporting period, and the expected quantity to be mined and processed in the next reporting period;
- a summary of the quantity of ore currently stockpiled on the tenement, the amount of concentrate or other products exported from the tenement in the reporting period, and the amount expected to be exported in the next reporting period;
- a summary of the amount of overburden / waste mined during the reporting period, the amount of overburden / waste mined during the next reporting period, and the amount of overburden / waste mined since the commencement of mining operations;
- a statement that operations were, or were not, compliant with each environmental outcome (including mine completion outcomes) specified in the tenement conditions or approved MOP;
- signature of appropriate responsible officer, ie manager or authorisation holder;
- mining title details, including boundaries and lease numbers; and
- a series of environmental compliance statements, not subject of this report.

The set of objectives and criteria upon which the approved MOP is based is publicly available upon request.

Tasmania (Australia)

Tasmania is an island state to the south of the Australian mainland, and is the smallest in size and (excepting the territories) population. It hosts one large iron ore (magnetite) mine and a number of medium-scale gold, tin and base metal operations.

Tasmania requires that particular records and information sources are developed and maintained at the mine site. The list is universally applied, and includes capital costs, operating costs, accurate surface plans of any workings and accurate underground plans of any workings. Upon request by the Director of Mines, the mine operator must submit a copy of records, plans and other information. The information outline in Model 3 is applicable to the Tasmanian regulatory environment.

Reports on a mining licence remain confidential for as long as the mining licence is in force.

Victoria (Australia)

Although Victoria was historically the earliest large-scale gold mining region in Australia, its mining industry has dwindled considerably. There is now only one medium scale gold mine in operation (Fosterville) with a number of small- to medium-scale operation for gold and other

minerals. A large-scale brown coal mining area supplying power generation plants in central eastern Victoria is being scaled down because of environmental concerns.

The Victorian regulator requires that a work plan is submitted and approved before mine construction or operation commences. The regulator has published a 100-page guide for the preparation of work plans and work plan variations.

At the discretion of the regulator, the developer of low-risk mines may instead be permitted to adhere to some or all of the provisions of the Code of Practice rather than submit a work plan. Low risk mines are defined as a mine that:

- occupies 5 hectares or less; and
- does not involve underground operations; and
- does not involve blasting; and
- does not involve clearing of native vegetation; and
- does not involve the use of chemical treatments.

The work plan:

- describes the nature and scale of the proposed mining activities;
- identifies and assesses all risks the mine may provide to the environment, to the public, or to nearby land, property or infrastructure;
- includes a risk management plan that specifies the measures that a licence holder will use to eliminate or minimise identified risks and monitor performance;
- includes a community engagement plan; and
- includes a rehabilitation plan.

Changes in work which involve a significant increase in risk (or any continuation of risk above 'medium' level, or a change to the community engagement plan as a result of new work or a change in work, or a change to the rehabilitation plan as a result of new work or a change in work, all require the submission of a work plan variation for approval by the regulator.

The submission of the variation follows the same process as the submission of the initial work plan. This process is set out in Figure 2.

Figure 2: Recommended pre-submission steps

The initial proposal information should include:

1) A description of the operation, including (where relevant):

- maximum depth of works (open pit and / or underground;
- for open pits, the batter and bench profile detail;

- method of processing;
- annual production estimate (tonnes);
- containment dams (water / tailings);
- predicted offsite discharges;
- impact to native vegetation
- presence of waterways and potential waterway interception;
- groundwater interception; and
- blasting.

2) Evidence that the mine owner has reached a commercial and / or a compensation agreement with the relevant landholder(s):
3) Planning, being an indication of whether a planning permit is required. A planning permit is separate to the work plan and involves the consent of local government authorities. Also required is a state-issued planning property report (issued free of charge) and land title documentation (issued for a fee)
4) Maps with scale and key showing:

- the mining licence boundary with co-ordinates provided for each corner defining the mining licence area and, in the case of a work plan variation, the current and proposed extent;
- the extent of the activity footprint;
- the nearest sensitive offsite receptors;
- the extent of the geotechnical risk zone; and
- any relevant landform feature (e.g. river) and / or infrastructure (e.g. high-voltage power line, road or highway)

The information obtained by the regulator from the holder of a mining licence cannot be divulged without the consent of the licence holder.

Western Australia

Western Australia has the largest mining industry segment in the country, comprising world class iron ore mines in the Pilbara region and prolific medium- to large-scale gold mines in the Eastern Goldfields, extending from south of Kalgoorlie to north of Wiluna.

The Western Australia regulator requires the mine operator to notify the district inspector of mines and submit a Project Management Plan (PMP):

- before mining operations are commenced at the at the mine; or
- before mining operations are recommenced after their suspension; or
- before mining operations are abandoned; or
- before mining operations are suspended.

Operations may not commence until approval in writing is received from the State Mining Engineer.

The PMP should include the following.

- details of the applicant;
- intended date on which mining operations, including construction and development work, are to commence;
- mine details (name of the mine, its location, number of mining licences or interests, local government authority in which the mine is located, mining operations, mining operation commencement date and expected duration of the mining operations;

- GPS (global positioning system) co-ordinates of the location of the mine;
- principal employer details (company name, company registration number, telephone number, email address, street number, street name, suburb, state and postcode);
- project overview (summary of the proposed project, outline of the major stages of its life cycle, the number of persons employed, location, access, previous mining history, outline of work rosters and contractor management, supporting documentation);
- mine geology (outline, major known structural features that may affect the safety of the mine or mining method, appropriate plans and sections illustrating relationship of major structural features to the proposed mine development, an assessment of the competence of the ore and waste rocks);
- details of analysis of multiple samples of ore and waste rock made to determine the presence or otherwise of undesirable contaminants such as asbestiform or fibrous materials, mercury, lead, arsenic, cadmium, vanadium, chromium and uranium, and an assessment whether the treatment or processing of ores could concentrate heavy metal contaminants;
- if an underground operation is involved, details of the main accesses to the underground workings, type of equipment, underground layout plans and sections, development and stoping methods, second means of egress, ventilation, geotechnical considerations, any planned underground storage of explosives and fuel, and supporting documents;
- if an open pit or quarry is involved, a general description, sub-surface water control measures, open pit or quarry plans, communications and pit control, proposed mining sequence, type of equipment, geotechnical considerations, planned surface storage of explosives and fuel, and supporting documents;
- treatment, processing, smelter and refinery facility details (general description and layout, details of dangerous goods and hazardous substances, dust control, laboratories, tailings disposal, radiation hazards and management);
- details of any dredge operation;
- details of any other operation, such as ports, material handling, construction and development work;
- a general location plan (general arrangement) to an appropriate scale showing the proposed mine layout and facilities in relation to the tenement boundaries, the national grid and RL datum levels;
- a contour map covering the general area of the tenements;
- an aerial photograph of the project area showing the topographical drainage features;
- a description of the water flow pattern and details on the potential for flooding of the mine and associated facilities, and flood control measures taking into consideration one-in-one-hundred-year events;
- details of treatment, process, smelting and refinery facilities (general description and layout, dangerous goods and hazardous substances, dust control, laboratory, tailings disposal, supporting documents);
- emergency preparedness, communications and control, induction and training, and supporting documents;
- safety and risk management (statement of company commitment to safety, risk identification and management process, identified hazards, risk assessment and supporting documents;

The regulator provides a checklist for submissions.

United States of America

The American permitting process is complex and involves, as in Australia, consents from numerous government departments both at Federal and State levels. Different rules apply for various categories of existing land ownership and land use. On Federal public lands, mining and exploration permits are administered by the US Bureau of Land Management. The

content of a Plan of Operations required by the Bureau is described in Regulation 36 CFR 228.4. In the author's opinion, the descriptions provided are less prescriptive that generally occur in Australia, and appear to give considerable authority to the regulator to vary the submitted detail at their discretion. However, this regulation provides a basic outline that applies only to a subset of land administered by the Bureau.

The Plan of Operations is required to include:

- the name and legal mailing address of the operators (and claimants if they are not the operators) and their lessees, assigns, or designees;
- a map or sketch showing information sufficient to locate the proposed area of operations on the ground, existing and / or proposed roads or access routes to be used in connection with the operations and the approximate location and size of areas where surface resources will be disturbed;
- information sufficient to describe the type of operations proposed and how they would be conducted, the type and standard of existing and proposed roads or access routes, the means of transportation used or to be used, the period during which the proposed activity will take place, and measures to be taken to meet the requirements for environmental protection;

The Plan of Operations should cover the requirements under the third bullet point above as foreseen for the entire operation for the full estimated period of activity. If the development of a plan for an entire operation is not possible at the time of preparation of a plan, the operator is required to file an initial plan setting forth the proposed operation to the degree reasonably foreseeable, and thereafter file a supplemental plan or plans whenever it is proposed to undertake any significant surface disturbance not covered by the initial plan.

At any time during operations under an approved plan of operations, the Bureau may ask the operator to furnish a proposed modification of the plan detailing the means of minimizing unforeseen significant disturbance of surface features.

When reviewing operating plans, the Bureau will arrange for consultation with appropriate agencies of the Department of the Interior with respect to significant technical questions concerning the character of unique geologic conditions and special exploration and development systems, techniques, and equipment, and with respect to mineral values, mineral resources, and mineral reserves. Similarly, the mine operator may request the Bureau to arrange for similar consultations with appropriate agencies of the U.S. Department of the

Information and data submitted by a mine operator is made available for public examination at the local Office of the District Ranger. Specifically identified information and data submitted by the mine operator as confidential concerning trade secrets or privileged commercial or financial information will not be available for public examination. Information and data withheld from public examination may include, but is not limited to:

- the known or estimated outline of the mineral deposits and their location, attitude, extent, outcrops, and content,
- the known or planned location of exploration pits, drill holes, and mining excavations; and
- other commercial information which relates to the competitive rights of the mine operator.

In order to comply with the requirements of other agencies in some regions and to limit the delays that might be caused by requests for additional information, the Bureau published a

more extensive listing of Plan of Operations inclusions in Regulation 43 CFR 3809.401, which in particular details required elements in the description of operations.

Document Author Qualifications

The MOP is to be prepared by an officer of the company, on behalf of the registered holder of the mining licence. Applicants are expected to ensure that the MOP is prepared by a person with "appropriate qualifications or experience to ensure that the MOP addresses all relevant issues and does not contain false or misleading information." Under the legislation covering mining licences, the provision of false or misleading information in an application is an offence.

"Appropriate qualifications and experience" means that although no formal registration of the author(s) is required they are expected to be suitably qualified. These qualifications will vary according to the scale and complexity of the proposed operation. There is no stipulated requirement in most jurisdictions that these persons be members of a professional association, such as the AusIMM. However, in some jurisdictions (such as Queensland), all engineers planning or implementing any construction or excavation within the state or province must be registered as a Registered Professional Engineer. Within the mining industry, the assessment and registration role on behalf of the Board of Professional Engineers of Queensland is undertaken by the Australasian Institute of Mining and Metallurgy under its Chartered Professional program.

In general, the MOP signatory will be the registered mine manager (termed the Senior Site Executive in some jurisdictions), but input on geology and hydrogeology is expected to be provided by a qualified geologist, input on processing is expected to be provided by a qualified metallurgist, input on infrastructure is expected to be provided by qualified civil, mechanical or electrical engineers, and input on environmental impact is expected to be provided by a qualified environmental scientist.

Relationship of MOP to Feasibility Study

There is no overt relationship between the MOP and the Feasibility Study in these jurisdictions, as the development application and the inaugural MOP (rather than the Feasibility Study) are the initial documents submitted to government. The regulator monitors operations by comparison of actual activities and impacts compared to the plans summarised in the MOP.

Review and Approval

The MOP must be submitted well ahead of its proposed commencement date, in order to ensure that it can be processed before mining operations are planned to be commenced or before the current MOP expires.

The MOP will be assessed by a small committee (usually 3 or 4 persons) who are employees of the regulator. The committee may include the regional mines inspector in addition to technically qualified specialists (mining engineers in particular). Where environmental issues are dealt with under the MOP (as is the case in most Australian states) a representative of the environmental regulator will also be a member of the committee. Where additional specialist environmental expertise is required by the committee to assess the MOP, the environmental representative will co-ordinate that input. No external (industry) specialists are involved in the assessment procedure.

In assessing the MOP, the regulator is seeking information that is specific, produces measurable data, and demonstrates that proposed outcomes are achievable and realistic within given timeframes. To be acceptable, the MOP must:

- be consistent in format and content with published guidelines (such as those described under 'Information Provided in Mining Operations Plans' above);
- be consistent with any mining licence, environmental licence and development consent requirements;
- be consistent with safety management plans;
- be based on objectives and outcomes developed with stakeholder involvement; and
- provide sufficient details, supported by scientific and engineering assessment and/or peer review where appropriate, to clearly demonstrate that the objectives and outcomes defined in the MOP will be met.

There exists a multi-departmental recipient profile. The mining regulator receives MOP applications in all jurisdictions, the environmental regulator also receives them in many jurisdictions, and planning authorities also receive them in some jurisdictions. In Ontario (Canada), up to 8 authorities might be involved in approving initial documents. In some Canadian provinces, the mining regulator has attempted to establish a 'one-stop shop' to act as the primary contact with the applicant and to co-ordinate the activities of the other regulatory participants. In the author's view, this has not streamlined the process to the extent initially expected. Almost universally, however, only the mining regulator is involved in assessing mining criteria (pit slopes, interim dump slopes, etc).

Within the regulator's staff, a number of different personnel with different roles are involved in the MOP assessment process. These include:

- be consistent in format and content with published guidelines (such as those described under 'Information Provided in Mining Operations Plans' above);
- be consistent with any mining licence, environmental licence and development consent requirements;

be consistent with safety management plans

MOP Reporting and Control

Annual reports must be submitted in accordance with the conditions of the authorisation.

The regulator may conduct an audit at any time to determine whether the activities being carried out by the authorisation holder are consistent with those described in the approved MOP. Failure to comply with an approved MOP is an offence.

Confidentiality

Documents often contains commercial-in-confidence information, and the regulator may be subject to liability if such information is published. Consequently, regulators positions on this issue vary from

- maintaining strict confidentiality, and not publishing the MOP or mining program;
- maintaining confidentiality with respect to the MOP, but publishing the preliminary input criteria; or
- retaining the MOP as an accessible document at the regulator's regional office; or

- publishing the MOP, with either no commercially sensitive information required or alternatively with commercially sensitive information (and declared personal data) removed.

Annual reports and documents containing cost and revenue information (such as MOPs or mining programs attached to annual reports and royalty returns) are generally considered as commercially sensitive and are not published.

Conclusion

In summary, the salient points are as follows.

1) Most Australian jurisdictions use an MOP or equivalent to provide the regulator with required information concerning the characteristics of proposed and actual mining operations. They are generally (but not in all jurisdictions) employed in lieu of a feasibility study for the regulator to determine the suitability.

2) Although used primarily to provide information relating to environmental compliance, and in particular to ensure that sufficient commitment is made by the mine operator to ensure that appropriate planning has been undertaken and funding is available for mine closure and post-mining rehabilitation, the MOP is also a key source of operational information for the regulator (including the mines inspectorate) and government planning authorities.

3) In the Australian and Canadian context, the MOP forms only one of the consents required to commence and continue mining operations. The other principal consents are (a) the mining licence, together with the terms imposed therein; (b) the environmental permit issued by state and / or Federal authorities; (c) the develop consent issued by the local government authority; (d) certification for plans, construction and installation verifying compliance with national or state building, electrical and other codes; and (e) operating permits for specific components of the project (explosives permit, water licence, hazardous goods licences, etc). Where an MOP is not required, in general the operating conditions required by the regulator are imposed through these other authorisations. For example, the local government authority will liaise with the regulator on acceptable industry standards before imposing conditions in a development consent.

4) The MOP is approved at the discretion of the regulator. However, provided that the regulator's operational and environmental criteria are met, the regulator cannot reasonably refuse approval to the MOP. In certain cases, government authorities other than the regulator may refuse consent to proceed on the grounds of public interest.

5) the MOP has a finite life, varying (according to jurisdiction and operational status) from 3 to 7 years. Nevertheless, should the mine operator wish to depart materially from the terms of an approved MOP (including in scale of operation), a revised MOP is required to be submitted for approval.

6) Compliance with the conditions of an approved MOP is in most jurisdictions reported in the annual reports provided to the regulator, irrespective of the alternative document model adopted. In certain jurisdictions where an MOP is not required, the annual reports can be and are used to confirm compliance with imposed conditions of the mining licence.

7) In the author's view, the MOP models most appropriate for consideration in the Mongolian context (where reporting environmental context to the MMHI is not a consideration addressed in this review) are the South Australian and Northern Territory models. These models specify particular data and information to be provided by the applicant, such information capable of being summarised in a checklist and promulgated to industry. In addition, the information can be specifically tailored to the needs of the Mongolian Government.

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