



Water Quality
Protection
Guidelines
No. 11

Mining and Mineral
Processing

Mine dewatering

2000



1. Introduction

Dewatering is a commonly used method of coping with groundwater seepage, mine excavations intersecting aquifers or excessive rainfall on mining operations. Dewatering can affect the natural biota and significantly alter the state of the receiving waterbody.³ Discharge water containing high solids load or a high concentration of contaminants, or differing substantially in nature from the receiving waterbody, can affect regional water quality. A change in the volume of water in a receiving waterbody may also impact on its normal ecosystem function. This may lead to a number of detrimental environmental effects including deoxygenation of water, toxicity to biota and reduced light penetration. It may also impact on downstream uses such as agricultural pursuits and farmstead and industrial water supplies. If discharge of water can be avoided or if it can be used on site, environmental impact may be minimised. The use of discharge water on site also minimises demands on other resources.

2. Purpose

These guidelines are designed to be used to manage the impact of minesite dewatering on the quality of the region's water resources.

3. Scope

These guidelines apply to the discharge of water pumped as part of mining or mineral processing operations.

4. Regulatory requirements

There are provisions under the *Environmental Protection Act 1986* (the EP Act) that control discharge of water from mine sites. Under the Environmental Protection Regulations 1987 (as amended) a proponent must gain prior approval from the Department of Environmental Protection (DEP) before discharging minewater, where the total annual volume is 50 000 tonnes or more. For quantities less than this, advice should be sought from the Department of Minerals and Energy (DME). The DEP and DME may seek advice from the Commission if it considers discharge water may impact on water resources.

An abstraction (water allocation) licence is also required under Part III of the *Rights in Water and Irrigation Act 1914* (RIWI Act) in declared groundwater areas (which cover most of the State). Information on groundwater areas and licences is available from the Commission.

5. Guidelines

5.1 Assessment of impacts

- a. The impact of dewatering must be assessed as part of the mine project feasibility study and within proposal applications to the DEP and DME. The proponents/operators need to understand the environment they are working in and to evaluate potential impacts of dewatering discharge. The proponent or operator is required to ensure that appropriate measures are taken to prevent pollution or degradation of the receiving waterbody.
- b. To determine the potential impact of dewatering, the proponent/operator is required to provide:
 - a hydrogeological⁷ and hydrological⁸ assessment of the project area to estimate quantity and quality of water to be discharged;
 - verification that the quality of discharge water will comply with the receiving water criteria set out in Table 1;
 - duration and frequency of the discharge;
 - seasonal variability of the receiving water quality;
 - assessment of the viability of treating or recycling the wastewater;
 - a water audit, which should be carried out by or endorsed by a suitably trained auditor;
 - baseline assessment of the existing environment (e.g. fauna, water quality) that will receive the discharge;
 - a strategy for monitoring and managing any impacts during the life and after the closure of the project.

- c. Discharge water should **not** be allowed to:
- enter poorly defined channels, as water may leave the channel and inundate vegetation;
 - enter any surface water (e.g. ephemeral stream, creek or river), or groundwater where the physical, chemical or biological nature of the discharge will affect the beneficial use of the receiving waterbody;
 - cause or contribute to soil erosion;
 - have a detrimental impact on flora and fauna downstream of the discharge point. Further advice on the protection of flora and fauna should be sought from the Department of Conservation and Land Management (CALM).
- d. Dewatering that may lower the watertable near a coastal or estuarine environment should be assessed for potential saltwater intrusion of the aquifer.
- e. The operator should control dewatering to ensure there is no significant change in water quality or change in the natural watertable or flow regime of surface water.
- f. An assessment of the impact on local vegetation, springs, wetlands and groundwater bores used by others in the vicinity of the project should be made prior to dewatering. Where assessment indicates potential reduction in watertable or quality of groundwater, the operator should either design the dewatering system to overcome this threat or provide an acceptable alternative water supply to affected parties.
- g. Evaluation criteria to assess the impacts of dewatering will be developed in consultation with the mining industry.

5.2 Dewatering management

5.2.1 Treatment

- a. Where discharge water from a dewatering operation contains a high concentration of suspended solids, is of variable quality or may cause turbidity in receiving water, the proponent should install and operate a sedimentation basin to facilitate settling prior to release. A minimum

of four hours' storage capacity at peak discharge is recommended. For water containing very fine sediment a longer detention period may be necessary.

- b. Water containing excessive levels of colour, odour- producing substances or toxins will require pretreatment to match the nature of the receiving environment.

5.2.2 Disposal options

- a. Regulatory and management authorities (e.g. DEP, DME, WRC and CALM) need to be consulted and the relevant approvals obtained prior to disposal of any minewater.

- b. Suitable options for disposal of minewater are discussed below:

- **Recycling** is the preferred option, as it encourages the reuse of water in mining and processing activities such as dust control, process circuit water, cooling water systems and washdown water. This is consistent with the philosophy of achieving zero discharge from a site where it is cost-effective. Operators should consider the water quality requirements to support these uses; e.g. water of a lower quality may be used for dust suppression but relatively higher quality water is required for cooling systems.
- **Using water for local groundwater recharge** may be acceptable provided:
 - there is sufficient area to recharge.
 - silt or clay will not clog the recharge area.
 - it will not degrade water quality, e.g. lead to salinisation.
 - it will not lead to local flooding or land subsidence.
- **Entering into a written agreement** to provide wastewater to a neighbouring site for reuse may be possible in some circumstances.
- **Direct discharge to nearby wetlands, rivers, drains or drainage lines** is acceptable provided:



- the environmental values and beneficial uses of receiving waters are not compromised;
 - the receiving water quality criteria, as outlined in Table 1 of these guidelines, can be met;
 - the discharge of effluent to receiving waters is consistent with the provisions of an (applicable) Environmental Protection Policy.
- **Irrigation** may be acceptable provided water quality meets the criteria set in Table 1 of these guidelines, and consideration has been given to the rate of evaporation, the quantity of water involved and the effects on the proposed discharge area.
 - **Storing water** in a secure impoundment for disposal by evaporation is a further possibility.
- c. For all these options, a comprehensive assessment of possible impacts should be performed prior to implementation to identify environmental issues and to develop management strategies. All proponents should seek advice from the Commission before commencing any dewatering operation.

5.3 Receiving water quality criteria

Water quality criteria will be set to protect the beneficial use of the receiving waterbody. For licensed premises, the DEP will set appropriate discharge criteria. For non-licensed premises, the Commission will recommend criteria based on Table 1, giving consideration to the natural variability in quality of water resources, the beneficial uses given to water resources and the need to preserve their value.

6. Monitoring

The operator should develop and maintain a program that monitors, records and reports on the effects of dewatering. The program should include:

- a record of the quantity of water discharged;
- regular visual inspection of the dewatering system to confirm its integrity and note impacts at the point of release;

- suitable monitoring facilities, e.g. bores to record the effects of pumping on the water table;
- relevant water quality analysis of the water discharged and the receiving environment;
- periodic investigations of the impacts on vegetation and water resources. Photographic records of vegetation and other sensitive parameters should be included, as appropriate.

Further advice on monitoring is available in the Commission's *Water Quality Protection Guidelines No. 5 – Minesite water quality monitoring*.

7. Useful references

Some components of these guidelines have been based on work already undertaken and reported in the following publications:

1. Australian and New Zealand Environment and Conservation Council (1992). *Australian Water Quality Guidelines for Fresh and Marine Waters*, ANZECC.
2. Driscoll, F.G. (1986). *Groundwater and Wells*, Johnson Filtration Systems Inc., St Paul, Minnesota.
3. National Health and Medical Research Council (NHMRC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (1996). *Australian Drinking Water Guidelines*, Commonwealth of Australia, Canberra.
4. Swan River Trust (1994). *Guidelines for Dewatering Activities in the Swan Coastal Plain – Waterways Guidelines No.7*, SRT, Perth.
5. Water Authority of WA (1992). *Environmental Focus No.13 – Dewatering*, WAWA, Perth.
6. Water and Rivers Commission (1997). *Draft Policy and Principles – Protection of Water from Pollution in Western Australia – WRP 27*, WRC, Perth.

Table 1 - Receiving Water Quality Criteria

Indicator	Criterion
pH	Discharge water should not cause the seasonal background pH of the receiving waterbody to vary by more than ± 0.5 units.
Total dissolved solids (TDS)	Discharge water should not cause the seasonal background TDS of the receiving waterbody to vary by more than 10%.
Dissolved oxygen (DO)	Discharge water DO concentration should not cause the seasonal background DO concentration ¹³ of the receiving waterbody to decrease by more than 10%.
Suspended solids/turbidity	Discharge water should not cause the suspended solids/turbidity seasonal background concentration of the receiving waterbody to increase by more than 10%.
Floatable matter	Discharge water should not be the cause of visible floating oil, foam, grease, scum, litter or other objectionable matter being present in the receiving waterbody.
Settleable matter	Discharge water should not cause the deposition of settleable matter that may adversely affect the visual, recreational and ecological values of the receiving waterbody.
Odours and colours	Discharge water should not produce discernible variation in odour or colour in the receiving waterbody.
Temperature	Discharge water should not cause the receiving water temperature to vary by more than 2°C from its seasonal background temperature.
Toxicants	The level of toxicants discharged (e.g. cyanide, heavy metals) should not cause the seasonal background concentration of toxicants in the receiving waterbody to increase by more than 10%.
Radionuclides	Radionuclides in the discharge water should not cause the receiving waterbody's seasonal background radionuclide concentration to increase by more than 10%.
Nutrients	Discharge water should not add nutrient substances or other growth stimulants (e.g. phosphorus, nitrogen) in quantities sufficient to cause excessive or nuisance algal growth in the receiving waterbody.

Sources: ANZECC (1992). *Australian Water Quality Guidelines for Fresh and Marine Waters*.

Swan River Trust (1994). *Guidelines for Dewatering Activities in the Swan Coastal Plain*.



Glossary and Abbreviations

1. Aquifer A geological formation or group of formations able to receive, store and transmit significant quantities of water.
2. Beneficial use Existing or proposed use of any portion of the environment which is:
 - (a) conducive to the benefit, convenience, welfare, amenity, safety, health or aesthetic enjoyment of the public and which requires protection;
 - (b) so declared under an approved policy.
3. Biota The living organisms in a natural environment.
4. Contaminant Material that causes a change in water quality and produces an observable or detectable change in its characteristics.
5. Deoxygenation The process of removing dissolved oxygen from a solution.
6. Ecosystem Any system in which there is an interdependence and interaction between living organisms and their immediate physical, chemical and biological environment.
7. Ephemeral stream A stream that flows only after heavy rainfall in a hot desert region.
8. Hydrogeology The geological science associated with the occurrence, distribution, movement and quality of groundwater.
9. Hydrology The scientific study of the occurrence, movement, properties and use of water on or under the earth's surface.
10. Radionuclide The nucleus of a radioactive atom.
11. Receiving water bodies All water e.g. saline lake, wetland, creek, stream, river, groundwater to which wastewater, runoff or excess water is added.
12. Recharge A process in which water in an aquifer is replenished by the inflow of surface water or by artificial means.
13. Salinisation The increase in salinity due to precipitation of soluble salts in the soil and build up of chloride in solution.
14. Seasonal background concentration The natural background concentration of a parameter, e.g. TDS, at a particular time of the year for that waterbody measured immediately upstream of any water release point. (It is not intended, however, that an inferior quality natural background concentration be set where an adverse upstream impact is occurring due to, for example, the discharge of contaminated wastewater. Under these circumstances release criteria should be based on the historical background concentration for the water resource.)
15. Toxicant An agent or material capable of producing an adverse effect in a biological system which seriously injures the structure or function or results in the death of organisms in that system.



Further enquiries

Any project where the proponent/operator is unable to comply with these guidelines, or where site conditions prevent the application of these guidelines, should be submitted to the Commission as early as possible in the development of the proposal so that the matter may be resolved.

Any queries relating to the **content of these guidelines** should be directed to:

Program Manager Assessment and Advice
Water Quality Protection Branch
Water and Rivers Commission
Level 2, Hyatt Centre
3 Plain Street
EAST PERTH, WA 6004
Phone (08) 9278 0300
Fax (08) 9278 0585

For further enquiries on any matter relating to the **management of water resources**, please contact the Water and Rivers Commission's regional offices.

Swan-Goldfields-Agricultural Regional Office

849 Albany Highway
VICTORIA PARK WA 6100 Phone (08) 9362 0555 Fax (08) 9362 0500

Or
254 Fitzgerald St
NORTHAM WA 6401 Phone (08) 9690 2821 Fax (08) 9622 7155

North West Regional Office

Chiratta Road
KARRATHA WA 6714 Phone (08) 9144 2000 Fax (08) 9144 2610

South West Regional Office

U2 Leschenault Quays,
Austral Parade
BUNBURY WA 6230 Phone (08) 9721 0666 Fax (08) 9721 0600

Or
'Sholl House'
21 Sholl St
MANDURAH WA 6210 Phone (08) 9535 3411 Fax (08) 9581 4560

Mid-West Gascoyne Regional Office

Pass Street
Geraldton WA 6530 Phone (08) 9964 5978 Fax (08) 9964 5983

South Coast Regional Office

5 Bevan Street
ALBANY WA 6330 Phone (08) 9842 5760 Fax (08) 9842 1204

These guidelines are also available from the Water and Rivers Commission's web page at:

<http://www.wrc.wa.gov.au/protect/policy/>



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