

7. Exploration

Water is an important component in exploration activities and therefore careful management is necessary as in any other aspect of mining and mineral processing.

A lack of water for process, potable and fire protection requirements or an excess of water (eg. high groundwater table, large aquifers, flood risks) can determine the subsequent economic viability of a mining project. Therefore serious consideration must be given to water constraints during the early exploration phases of a project. This should include data gathering of both surface water and groundwater resources as well as initial flood studies.

The environmental significance and sensitivity of watercourses and other waterbodies (surface or ground) will determine the extent of exploration and subsequent mineral extraction allowed in any area. This will be dictated by the relevant legislative body (ie. Mining, Environmental and Water Resources departments) at both State and Commonwealth level.

Water will also play a role as a resource and/or hindrance to the actual exploration efforts. Rivers, streams, rainfall runoff and groundwater all need to be managed to avoid or minimise damage during exploration.

Many exploration activities could be considered as miniature minesite operations; hence all sections of this handbook will be applicable, albeit at a modified level.

7.1 *Surface Water*

Most exploration activities in Australia will be in areas where minimal knowledge of ground and surface water behaviour exists. Therefore the collection of all possible information that may be relevant is encouraged. At the same time, care of the existing environment is required.

7.1.1 SURFACE WATER DATA COLLECTION

The lack of water or the possibility of serious flooding may seriously impact the extent or timing of an exploration program. Information on rainfall, evaporation and stream flows in the project area is often inadequate, and important decisions are usually made using data extrapolated from many kilometres away. Exploration teams can provide important data to reduce the risk associated with these decisions.

Records should be kept of local surface water conditions. This can include evidence of previous flood heights through the location of debris and local knowledge, conditions of watercourses (ie. flowing regime, photographs), signs of erosion, and quality of water. Monitoring water quality will also provide valuable background information, which may form an important part of future license conditions.

If a new deposit has high potential and continuing exploration is likely, a remote weather station network as well as stream gauges in all major watercourses should be established. These installations should measure rainfall, temperature, wind speed and direction, evaporation and stream flows. A few years of local climatic data between

the time of initial exploration and the stage of feasibility decisions will provide invaluable assistance in the design of water supply dams, tailings dams, evaporation ponds and any flood mitigation or mine drainage works required (refer to Sections 5.4 and 5.5, and also Fact Sheet Nos 3 and 10).

7.1.2 ACCESS TRACKS

Exploration projects which cover a large area with many drill holes in different locations will often result in a “spider web” of access tracks linking the different sites. The clearing and constant traffic associated with such drill lines and access tracks can lead to serious erosion and sediment problems if precautions are not taken to minimise their impact. The construction and rehabilitation of access roads is dealt with in Section 6.8 of AMIC (1990), while the following points provide guidelines for reducing the impact of tracks on surface water.

- Minimise the area of disturbance by reducing the number of tracks and using the same routes (even if the journey takes slightly longer). It is also very important that four wheel drive vehicles remain on existing tracks whenever possible.
- When locating tracks:
 - every effort should be made to minimise clearing and other disturbance to vegetation, especially in well vegetated areas with easily eroded soils (eg. wet tropical areas). Tracks should deviate around large trees; where this is impractical, use the timber to stabilise edges and low points;
 - avoid using gullies as convenient locations for tracks;
 - locate creek crossings in naturally rocky locations, or line sensitive or erodible crossings with rocks;
 - avoid permanently wet and boggy areas;
 - install silt fences or hay bales across watercourses where sediment from
- disturbed areas will impact the undisturbed drainage line; and
- keep tracks a reasonable distance away from watercourses to ensure a vegetation strip is maintained.
- When constructing tracks:
 - avoid using heavy earth moving equipment to construct temporary tracks, as this will destroy root stock;
 - culverts are recommended for creeks and streams on more permanent tracks. These will reduce mud and keep tracks passable in most weather. For guidelines on the design of culverts, refer to Fact Sheet No.6;
 - runoff should not be allowed to concentrate on tracks. Flow should be shed off the road as quickly as possible by using reasonable crossfall (say 3%) side drains with regular take-offs and by allowing sheet runoff to flow uninterrupted across the track. Where road access cuts across steep hillsides, road stability may necessitate sloping the cross fall into the hill slope and into a side drain, which then discharges via a constructed drain built at a low point under the road or across an armoured road crossing;
 - if it is necessary to cut roads greater than 2 m wide into the natural surface, then small v-type interception drains should be used to divert water from the batter slopes. Generally batter slopes should be no steeper than 2H:1V (0.75H:1V in rock); and
 - any discharge points for culverts or table drains must be protected against erosion.
- Ensure all tracks to be used are located on field maps and that all personnel are instructed to use only those marked tracks. This will reduce people’s desire to create their own tracks and hence minimise disturbance.

7.1.3 EXPLORATION SITES

On any given project, the area physically disturbed will be reasonably small and control of erosion, runoff and discharges from these areas is relatively straight forward. Guidelines for minimising impacts on water include:

- a buffer zone should be kept between the exploration activities and environmentally sensitive areas. The width of this zone will depend on the sensitivity of the area and may range from 10 m for a non-sensitive bank of a watercourse up to 3 000 m or greater for an environmental conservation zone;
- as with access tracks, the area and degree of clearing should be kept to a minimum;
- the discharge of wastes into watercourses must be avoided. Various waste can be handled as follows:
 - fuel and oil storage tanks and dispensing areas must be bunded and sealed. Oil absorbent booms should be used across storm water drainage points away from these areas;
 - sewage should be treated to recognised levels using septic systems or commercially available package treatment plants or contained and removed from site;
 - toxic and saline wastewater must be stored in ponds either permanently or until treated or degraded to safe levels; and
 - sludges and silt resulting from drilling or processing operations must pass through sumps to settle or filter out fines before the water is discharged;
- the downstream or lower side of any cleared area should be arranged so as to intercept and contain sediment washed down by surface runoff or concentrated discharges. This is easily achieved by the use of interception drains and silt fences, hay bales, silt traps or filter dams, as described in Fact Sheet No.8; and
- dams or diversions to watercourses should be thoroughly investigated to ensure any adverse effects are minimal. They should also be designed, constructed and maintained to ensure good water management (Fact Sheet No.5). It is important to advise the relevant Water Resources department in any State before undertaking such works. Dams which retain large volumes or which could risk life and property in the event of failure will often require licensing and much stricter design standards.

Exploration within a watercourse or riparian zone has the potential to severely damage the surrounding environment and hence will require more rigorous control than described above.