Independent Monitor
COMMUNITY REPORT

McARTHUR RIVER MINE

November 2015

ERIAS GROUP

The detailed McArthur River Mine Environmental Performance Annual Report for 2014 can be accessed on the Independent Monitor website:

www.mrmindependentmonitor.com.au

Environmental Performance 2014

Introduction

The Independent Monitor (IM) has prepared this community report to summarise the findings of the IM review of the McArthur River Mine environmental performance for the 2014 Operational Period (from October 2013 to September 2014).

Improvements noted during this period include:

- Continued work in revegetating the McArthur River diversion channel, and adding habitat.
- Less water in the tailings storage facility.
- Investigations and planning to improve waste rock management, as well as new methods to stop combustion and reduce water inflow.
- Expanded environmental monitoring programs including those for groundwater, dust, soil, marine and aquatic environments.

A number of areas for improvement have been identified which are detailed in this report.

The Key Issues in this Operational Period

Waste Rock	The biggest issue at the mine is the potential for acid, saline and metalliferous drainage. This issue is currently being addressed as part of the Overburden Management Project Environmental Impact Statement
Tailings Storage Facility	Ongoing seepage issues, though water levels have improved
Barney Creek Haul Road Bridge	Runoff and dust have caused contamination of streambed sediment. Runoff/sediment control measures have been upgraded
McArthur River Diversion	Erosion of the diversion channel, despite good efforts of planting and adding more large woody debris
Dust at Bing Bong Port	Dust controls were not operational at the time of the site visit, although dust monitoring continued
Long-Term Closure Strategy	The mine will require development of rigorous closure strategies for long-term sustainability of the open pit, waste rock and tailings storage
DME Performance	Time to provide audit reports, communication and efficiency of approach could be improved

Scope of this Report

The role of the IM is to assess the environmental performance of the McArthur River Mine by reviewing environmental assessments, monitoring and audits undertaken by McArthur River Mining (MRM) and by the Department of Mines and Energy (DME).

Issues relating to mine safety, community and social issues, and mine administration matters are not included in the assessment.

The scope of the assessment includes the mine itself and Bing Bong Port.

Waste Rock

The management of waste rock remains the single largest issue for environmental performance of the mine site. MRM are undertaking an Environmental Impact Statement to address many of these issues.

What is Acid Rock Drainage?

Acid rock drainage, also called acid and metalliferous drainage, is the outflow of acidic water from rock. A related process is the drainage of saline water from rocks.

'Potentially acid-forming' (PAF) rocks occur naturally in the environment and are harmless when below the groundwater table or deep below the ground surface where oxygen levels are low. When PAF rocks are exposed to air, they can break down, causing acidity.

Similarly, salt and metals are a natural part of rocks and soil, which can leach out when some types of rocks break down in response to air and water. Following rainfall, water containing salt, acid and/or metals can run off into creeks or leach into groundwater.

Acid rock drainage and saline drainage may be controlled by covering rocks with a 'cap' of clay and rock, protecting them from air and water. In some locations, the rock is placed under water, which excludes air and prevents the breakdown of rock.

The 2014 review has confirmed that the potential for acid, saline and metalliferous drainage from waste rock is the most significant issue at the mine.

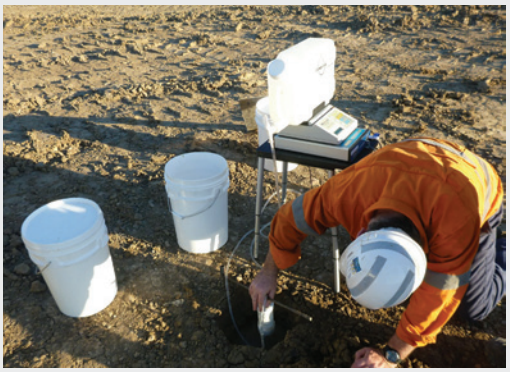
Overburden Management Project

In late 2013, MRM reported a change in the types of waste rock as a result of test work completed during 2013. The change resulted in the identification of material that was saline and/or metalliferous that would require management.

The NT EPA advised that an Environmental Impact Statement (EIS) would be required for MRM's Overburden Management Project. MRM is currently working on this and the IM understands the EIS will be completed in 2016.

The EIS will address a number of the IM's recommendations from 2012-13, including:

- Designing an appropriate cover for the waste rock.
- Designing a landform shape for the waste rock pile that will be physically stable.
- Demonstrating that any impacts to the environment can be managed in the long term.



Testing whether the clay covering waste rock is watertight

Improvements

The IM has noted the following improvements regarding waste rock management in 2014:

- Successfully controlling combustion of waste rock by excavating, rolling and covering.
- New groundwater monitoring bores installed to collect data around the NOEF.
- Assessment of salinity along Surprise Creek to determine impacts from different sources.
- Placement of a compacted clay liner over potentially acid-forming rock at the NOEF prior to the 2014/15 wet season.
- Various trials to inform waste rock management, including erosion trials and leaching tests.

The Northern Overburden Emplacement Facility viewed from the Carpentaria Highway

Recommendations

While further actions will arise pending the outcomes of the Overburden Management Project EIS, the IM recommends that MRM undertake the following actions:

- Continue the new method of spreading and rolling waste rock and expand this program to other types of rock.
- Expand check testing to ensure different types of rocks are put in the correct locations.
- Review stability of the interim clay capping layers during the wet season.
- Make allowance for monitoring and ongoing maintenance of the waste rock cover system after the mine is closed.

Challenges

Further progress has been achieved in understanding the geochemical properties of waste rock and materials on site at the mine. The challenge remaining for MRM is to propose a strategy which can demonstrate that the waste rock can be rehabilitated with minimal long-term impact.

Waste rock with interim clay capping

Rock capped with a layer of clay to protect it during the wet season

Cover erosion and runoff trials

Leaching trials

Tailings Storage Facility (TSF)

Operation of the TSF has been substantially improved since 2013, in terms of monitoring, water management, and tailings deposition.

The key issue going forward is management of seepage.

Water Management in TSF Cell 2

In previous years, the large volume of water stored on the surface of TSF Cell 2 was a concern, with water ponding against embankments, resulting in an increased risk of bank failure, seepage and/or overtopping.

The IM notes that in 2014, MRM have ceased using the TSF as a water storage facility. As per the photos below, this practice – along with a below-average wet season – has allowed the tailings to dry out and form a 'beach'.

Dry tailings are denser and stronger, allowing less seepage to escape and putting less pressure on the embankment. This will make the TSF safer.

Seepage from TSF Cell 2

In early 2014, seepage from Cell 2 was identified at its southwestern corner, and to a lesser extent, from the southeast perimeter and the spillway. This seepage was potentially affecting the stability of the storage facility.

Since that time, seepage has been controlled by:

- The improved water management described above.
- Moving the decant system to the centre of the cell.
- Installation of seepage recovery systems and filter buttresses.

The small amount of continuing seepage in the southwest corner of Cell 2 is being managed by the recovery systems in place.

What are tailings? How does the TSF work?

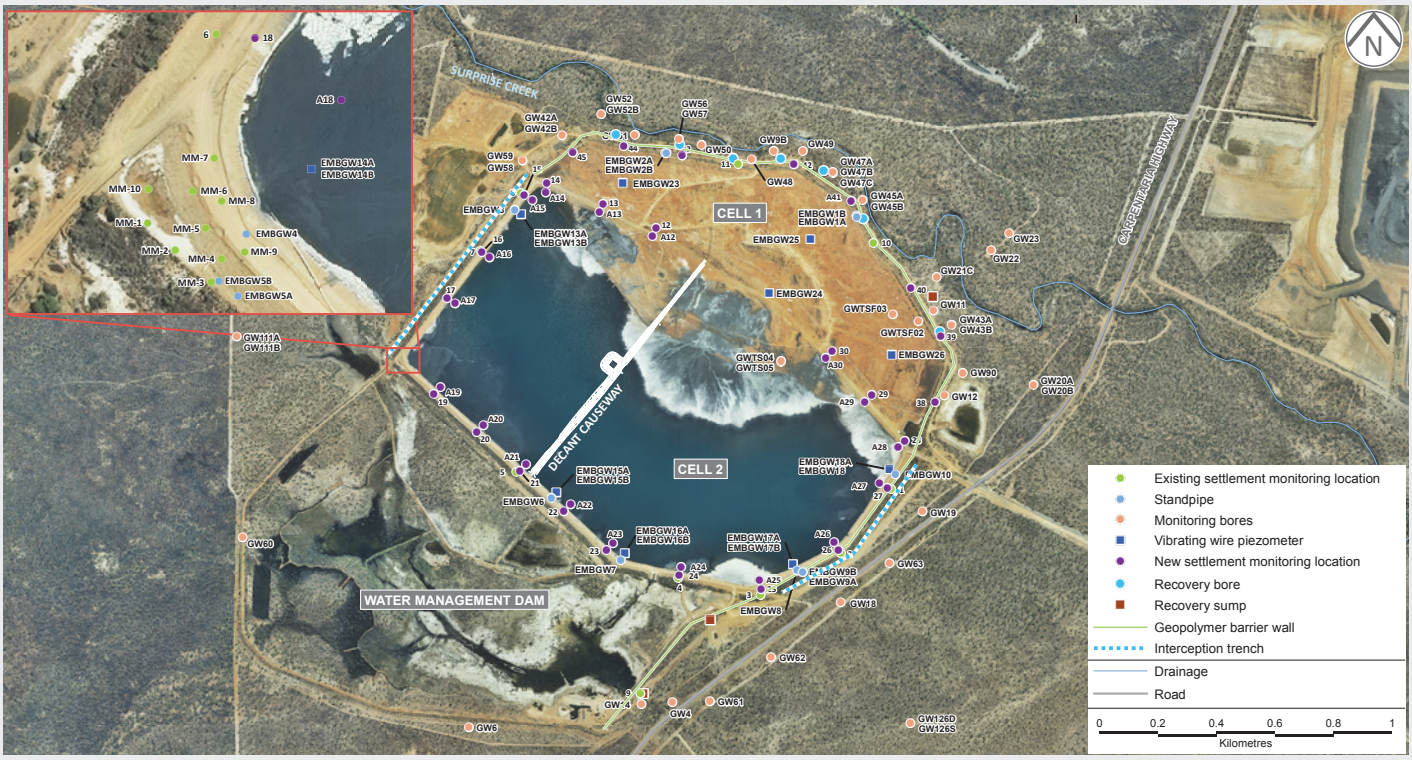
Tailings are the ground-up rock remaining after extracting metal from the ore.

The tailings are piped from the mine's processing plant and deposited around the perimeter of the TSF. Here, the ground rock settles out, while wastewater flows to the centre of the TSF and is recycled.

The tailings are deposited in thin layers which allows them to dry out and consolidate, increasing the strength of the TSF.

View across TSF Cell 2 in early 2014

View from the same location in mid-2015



Aerial view of TSF, showing monitoring points and management features
(Note: The amount of water shown in Cell 2 in this image does not ref ect its current state.)

What is the problem with seepage?

Seepage of water from a tailings facility can impact on groundwater quality, for example, making water and soils saltier. There is also potential for release of acidic seepage. This in turn can affect aquatic and terrestrial ecosystems where groundwater is discharged to creeks or the surface.

Seepage from TSF Cell 1

Seepage of saline tailings water from the northern side of TSF Cell 1 into Surprise Creek has been reported by the IM each year since 2007. This was observed to be continuing in 2015, despite the presence of a geopolymer barrier wall and recovery bores.

MRM increased their monitoring near Cell 1 in 2014, including installation of additional groundwater monitoring bores, and assessment of Surprise Creek salinity.

Further to this, the IM recommends:

- Monitoring of vegetation north of Cell 1 to assess any impacts of the seepage.
- More comprehensive reporting of Cell 1 water management design and operation within the annual mine site water balance report.
- Ongoing review of water quality monitoring to better manage impacts and required actions.

Closure

Further progress has been achieved in managing the tailings storage facility. The challenge remaining for MRM is development of a strategy that demonstrates the long-term containment of tailings and management of seepage.

Seepage at Surprise Creek

Seepage from TSF Cell 1

Barney Creek Haul Road Bridge

Monitoring has found ongoing issues of contaminated water, soils and fish near Barney Creek haul road bridge. MRM have undertaken work to address this, but there is more to be done.

Results

All monitoring results in the vicinity of Barney Creek haul road bridge show that pollution is present and entering the creek at this location:

Dust and surface soil
A new dust monitoring site installed adjacent to the bridge showed high levels of wind-blown dust, which is likely to be due to transporting waste rock from the mine to the NOEF and the large areas of disturbed ground around the bridge.

A new surface soil monitoring site at the same location showed high levels of lead in soil (more than double the national guidelines' health investigation level for industrial sites), as well as elevated arsenic and zinc (both below the health investigation levels, but well above the ecological investigation levels).

Water and sediment quality
Water sampled adjacent to the bridge contained more lead and zinc than other locations within the mine site, including three lead results exceeding the mine's hardness-modified trigger value.

Streambed sediment collected at this location also contained more metals than other Barney Creek sites, including lead and zinc results 8 and 11 times the Australian soil quality guidelines, respectively.

Satellite image of Barney Creek haul road bridge
Source: Google Earth.

Fish
As in 2012-2013, fish (5 out of 5 bony bream, 4 of 5 rainbowfish and 1 of 1 spangled perch) caught at the Barney Creek haul road bridge were found to contain lead from mine ore at levels above the maximum permitted under Australian food standards. However, results have improved, with average concentrations in rainbowfish and perch less than half of that in the previous year.

Lead exceedances were also recorded in 2 out of 12 fish caught upstream of the mine site, reflecting the high mineral content in the natural environment. Further information is provided on page 10.

Barney Creek showing haul road bridge and dewatering pump in temporary dam

Sediment settlement basin to the southeast of Barney Creek haul road bridge

Sources of Pollution

Potential sources of pollution at this location include:

- Dust from trucks carrying waste rock along the haul road and over the bridge.
- Runoff from adjacent slopes.

The exact source/s are currently unclear and require further investigation.

Current Actions

MRM has undertaken further works during 2014 to manage sediment runoff near Barney Creek bridge. Management undertaken or in place includes:

- Ongoing monitoring, with a new dust and soil monitoring site adjacent to the bridge.
- Sediment traps on all four corners of the bridge, including substantially improved settlement basins to the northwest and southeast, and minor silt traps to the northeast and southwest. These aim to capture runoff and reduce contaminated sediment inflow to the creek.
- Removal of streambed sediment from below the bridge during the dry season.
- Installation of a temporary dam in the creek, and pumping out contaminated water.

Future Steps

Despite MRM's efforts to manage pollution near the bridge, the issue is ongoing.

Further work is needed, firstly to better understand the problem, and then to implement additional management measures.

Management options may include:

- Additional dust monitoring sites to identify the main sources of dust and where contamination may be coming from.
- Continue to monitor the effectiveness of existing sediment controls.
- Improved dust management relating to trucks and road use.
- Improved control of runoff and sediment from slopes.

Silt traps in the lower part of the post-settlement runoff channel

Post-settlement runoff channel

Fish and Shellfish

While fish outside of the mine site were found to contain metals above guideline levels, results show that this is likely to be from natural sources rather than mine operations.

Sooty grunter
Source: Thorburn, 2014b.

Bony Bream
Source: Thorburn, 2014b.

Catfish
Source: Fisheries of Australia, 2015.

As well as sampling bony bream, chequered rainbowfish, spangled perch and prawns as in previous years, the 2014 assessment of metals in fish included shovelnose catfish, barramundi and sooty grunter, as recreational fishers are known to target these species.

Lead
Further to the previous page regarding lead in fish at Barney Creek haul road bridge, lead at levels above the maximum permitted under Australian food standards was also found in 2 out of 12 fish upstream of the mine – 1 of 8 sooty grunters caught at Eight Mile Waterhole, well upstream of the mine site, and 1 of 4 bony bream caught just upstream of the McArthur River diversion. The lead found in these two fish was analysed and found unlikely to be mine-derived. I.e., it reflects background levels in the natural environment.

Lead above guideline levels was not found in any fish or shellfish downstream of the mine.

Zinc
Zinc above the permitted food standard levels was found in 3 out of 3 catfish caught at Upper Crossing just south of Borroloola. However, in these fish, lead levels were low and the lead that was present was not mine-derived. As such, the zinc is also unlikely to be mine-derived.

Catfish are long-lived bottom-dwellers, consuming organic matter and some sediment from the riverbed. This may contribute to the elevated zinc levels.

Zinc above guideline levels was not found in fish or shellfish at any other sites in the McArthur River.

Cadmium
One out of 3 catfish and 2 of 4 bony bream caught at Upper Crossing, as well as 1 out of 5 barramundi caught within the McArthur River diversion channel contained cadmium above the food standard levels. There is no evidence to suggest these levels are as a result of mine operations.

Arsenic
Two out of 5 freshwater mussels and 1 of 4 bony bream at Upper Crossing were found to contain arsenic above the permitted food standard levels, as was 1 out of 2 mussels from Top Crossing, upstream of the mine.

Due to the locations of these exceedances well upstream and downstream of the mine site, it is very unlikely that they are due to MRM's operations.

Lead in Cattle

Despite the efforts of MRM to exclude cattle and other animals from the mine lease area, they have at times accessed the site.

Grazing animals within the mine site may be exposed to metals where these are present on or in grasses due to airborne dust.

Tissue samples were taken from five cattle found in the vicinity of the mine in mid-2014, with results showing that one of the five had lead content in its kidneys above the maximum level allowable for human consumption (as per Australian food standards).

The IM notes that MRM have repeatedly repaired cattle exclusion fencing around the mine perimeter. Cattle that access the mine site are removed by MRM. Mustering of cattle was conducted inside the fenced area during 2014, and cattle that could not be mustered were culled. Further mustering was conducted in early 2015.

An ongoing challenge relates to maintenance of fences in flood-prone areas.

Cattle
Source: ABC, 2015.

McArthur River Diversion Channel

Erosion of the diversion channel during wet seasons continues to be an issue, which MRM are addressing by planting trees and installing large woody debris. MRM will shortly undertake a full condition assessment and erosion mitigation strategy.

Erosion of Banks

Erosion of soil from the banks of the McArthur River diversion channel has been an issue since it was first constructed, as wet season flooding can move large amounts of soil when it is not held in place by vegetation.

In turn, the absence of topsoil makes it more difficult to get plants to establish, and small young plants can be washed away in large floods.

From 2013 to 2014, an average of half a metre depth of soil was eroded from sections of the right bank of the diversion channel.

During 2014, MRM commenced an improved erosion assessment program in its revegetation plots. MRM is undertaking a full landform condition assessment and erosion mitigation strategy for the McArthur River diversion channel, due to be finalised in February 2016.

Revegetation

MRM have again increased the scale of mine site revegetation in 2014, primarily along the McArthur River diversion channel. Most planting during the operational year has been along batters and the waterline in the upstream end of the channel.

While channel rehabilitation is a slow process, and revegetation is still hampered by soil loss, floods and grazing, there has been some reduction in bare ground and increased survival of saplings during the past year. MRM has also added two new sites to its revegetation monitoring program during 2014.

The IM commends MRM for increasing the proportion of plants grown in the on-site nursery to 85% in 2014 (instead of sourcing from off-site).

Lower section of the McArthur River diversion channel

Bank erosion in the middle section of the McArthur River diversion channel

McArthur River Mine plant nursery in June 2015

What is large woody debris?

In a natural watercourse, large woody debris (LWD) consists of logs and branches that have fallen into the river and/or have been washed downstream.

In an artificial channel like the diversion, LWD is missing, but it can be added back in.

What does it do?

LWD is important to river ecology. It provides in-stream habitat and protection for fish and water bugs.

LWD can also improve channel stability by slowing river flow, reducing erosion, and in some cases, protecting revegetation from floods.

Large Woody Debris

MRM have added a significant amount of large woody debris (LWD) to the diversion channel in 2014. In places, LWD has been partially buried to make sure it survives future floods.

Aquatic surveys identified that LWD installation has had an almost immediate positive effect, with many more fish using these sites as opposed to areas with bare banks. Recent revegetation has included planting within the sediment trapped behind LWD piles.

Advanced revegetation in the upper part of the McArthur River diversion channel, with large woody debris in the foreground.

Large woody debris in the McArthur River diversion channel: providing fish habitat, protecting new revegetation, stabilising banks and reducing erosion.

Dust at Bing Bong Port

The key issue at Bing Bong Port is management of dust resulting from MRM's activities. Some of the dust control methods used at the port were not functioning in 2014 and require repair.

Successes

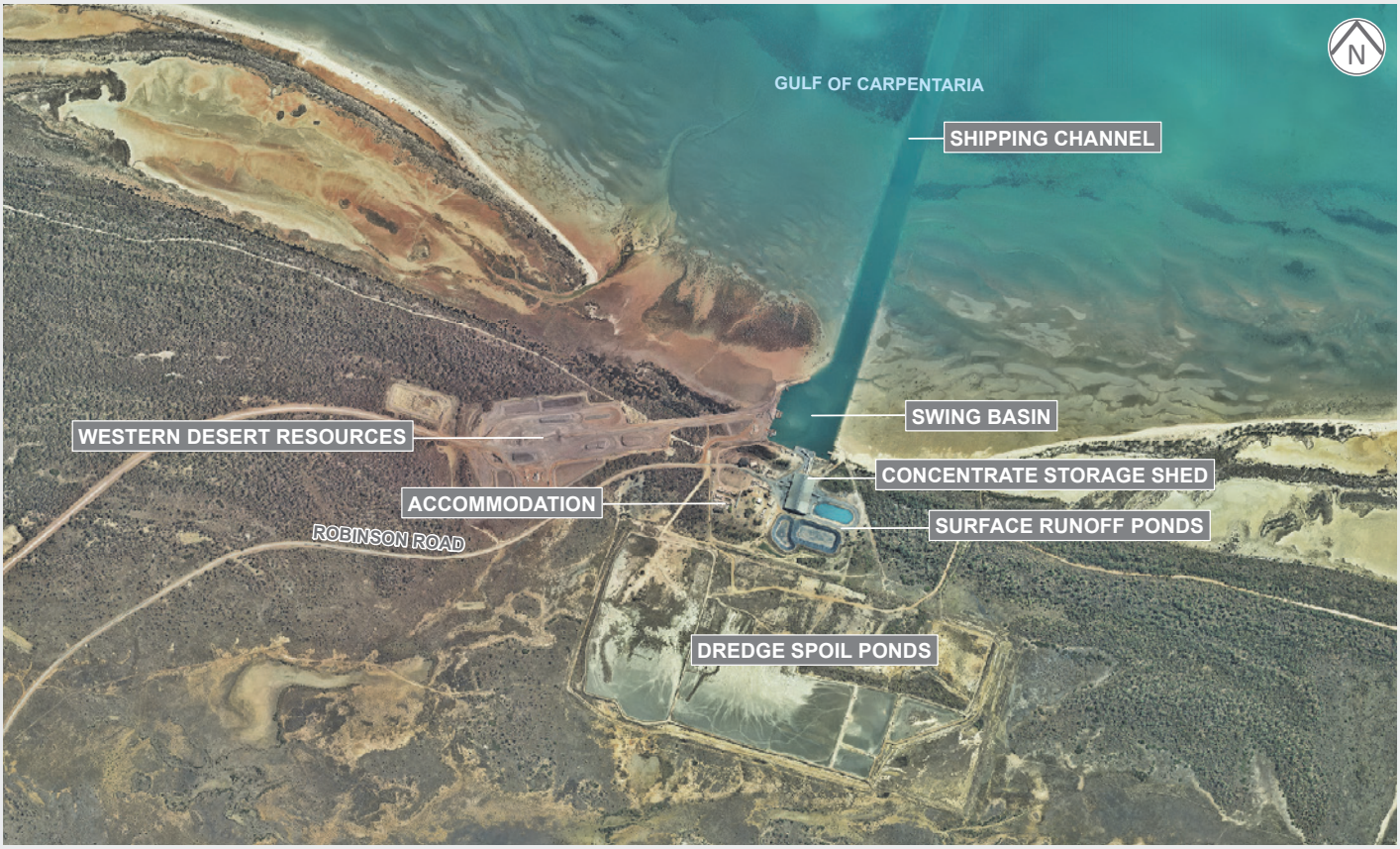
During 2014, MRM improved their on-site monitoring and assessment of dust by using a more advanced type of air sampler, and commencing use of more appropriate air quality standards to assess both the amount of dust, and the amount of metals contained within that dust.

Results showed that at Bing Bong Port, there were no high results for metals (lead or zinc) in dust during 2014.

MRM did not undertake any dredging of the shipping channel during the 2014 operational year, and as such, potential risks to the environment related to the dredge spoil ponds were reduced.

View to the north from Bing Bong Port

Inside the concentrate shed



Satellite image of the area surrounding Bing Bong Port in 2014

Where is the red dust from, to the west of the port?

During 2014, a large amount of red dust (from iron ore) was blown across the area to the west of Bing Bong Port. This dust is from the operations of Western Desert Resources (WDR, a separate company to MRM), which involved stockpiling and loading of iron ore onto barges in the port. WDR stopped operating in September 2014.

Red dust at Western Desert Resources' loading facility, with MRM's concentrate shed visible to the left.
Source: AFANT, 2014.

Opportunities for Improvement

During the IM's 2015 visit to Bing Bong Port, it was noted that some of the usual controls were not operational. Doors on the concentrate shed could not be closed and the dust extraction system was not working.

More dust was observed around the site than in the previous year, however this may have been due to the timing of the visit in June (dry season) as opposed to April (end of the wet season).

The IM recommends the following to reduce dust at Bing Bong Port:

- The doors of the concentrate shed should be repaired so that they can be closed.
- The dust extractor system in the concentrate shed should be repaired.
- The bitumen surface surrounding the loading facility should be repaired to avoid future soils, water and/or dust management issues

As well as monitoring dust on land surrounding Bing Bong Port, MRM has monitored water quality in the swing basin and shipping channel, which can be impacted by dust. Due to a change in methods, in 2014 the twice-yearly marine sediment sampling program in the swing basin and shipping channel was not undertaken. The IM recommends that this program should be reinstated in 2015.

Doors of concentrate shed not able to be closed

The bitumen surface around the loading facility requires repair

Spillage of dust from concentrate shed

Review of DME Performance

As well as assessing the environmental performance of McArthur River Mine, it is also the IM's responsibility to review the performance of the Northern Territory Department of Mines and Energy (DME) in regulating and monitoring the mine.

Successes

The IM notes that:

- DME have developed a draft action plan to address IM recommendations, along with a system of reminders.
- The DME has formally requested that MRM's mining management plan (MMP) commitments be specific, measurable, realistic, relevant and time-based.
- MMPs are now being prepared to cover several years (instead of annually).

Opportunities for Improvements

The IM believes there are opportunities for the DME to improve in the following areas:

- The timeliness to issue compliance audit and site inspection reports – the IM recommends that audit and site inspection reports be written within six weeks of a DME site visit to give MRM time to rectify issues before the next audit.
- Review of MMP commitments should ensure that they are reduced and collated into a single list within the document.
- The current MMP review process should be revised to be more efficient.
- Communication between the DME, EPA and MRM should be improved to avoid confusion or unnecessary work.

About the Independent Monitor (IM)

At the end of 2013, the DME engaged ERIAS Group Pty Ltd to assess the environmental performance of the McArthur River Mine for a five-year period.

2015 is the second year that ERIAS Group has prepared the environmental performance report, as well as this community report.

The IM is supported by a team of specialists that brings together the required skills and experience to fulfil the role, including:

- ERIAS Group (environmental impact assessment, risk and management, water quality, soils and closure planning).
- Water Technology (diversion channel, surface hydrology and site water management).
- Pells Sullivan Meynink (geotechnical engineering and TSF operating strategies).
- Groundwater Resource Management (groundwater modelling and monitoring).
- Environmental Geochemistry International (geochemistry, TSF and waste rock cover design).
- Low Ecological Services (terrestrial, aquatic and marine ecology).

For more information, go to the IM website:
www.mrmindependentmonitor.com.au

www.eriasgroup.com

ERIAS GROUP