Mineral Resources Tasmania

"The Rehabilitation of Abandoned Tin Mines in North Eastern Tasmania"

DAM INSPECTION REPORTS

Prepared By

SEMF

SCIENTISTS
ENGINEERS
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MARCH 1998

PROJECT 13193

MINERAL RESOURCES TASMANIA
NORTH EAST MINES
DAM INSPECTION REPORTS
STAR HILL, MONARCH & LITTLE BLUE LAKE

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MINERAL RESOURCES TASMANIA
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1. INTRODUCTION

SEMF Holdings were engaged by Mineral Resources Tasmania to inspect and report on several dams constructed as part of the mining operations near Gladstone in north eastern Tasmania.

The inspection was in regard to approximate measurement, inspection of condition and report on remedial work indicated. The report does not include hydrologic examination of catchments or detailed analysis of the dam structure. No detailed survey of the dams or of the impoundment has been carried out.

2. SCOPE

Inspection covered five dams associated with the Star Hill mine to the east of Gladstone, and one dam associated with the Monarch mine to the west. In addition two walls were noted in the inspection area which are no longer complete dams. The walls have been breached and the impoundment surrounds the remainder of the wall. No report has been prepared in respect of these walls. On a subsequent visit the dam at the northern end of the Little Blue Lake off the Gladstone Road was inspected and a report is included in this assessment.

2.1 Star Hill

Four of the Star Hill dams are on Hardens Ravine, which flows into the Ringarooma River 500 metres upstream of the road bridge east of Gladstone.

The lower three dams form part of an original series of four in which the outlet from one flowed into the next.

The upper dam is the largest on the Hardens Ravine catchment and is about 400 metres upstream of the lower series.

The fifth Star Hill dam is on the Tamar Creek which flows into the Ringarooma River downstream of the bridge. This dam is the longest of those inspected.

The dams have been numbered in the order in which they were inspected, starting with the upstream one of the series.

2.2 Monarch

The Monarch dam is on Shallamar Creek at the head of the Monarch mine workings. the Shallamar flows eventually to the Boobyalla River.

2.3 Little Blue Lake

The Little Blue Lake dam is on the north western side of the Gladstone Road, about 7 km south of Gladstone. It discharges to a complex of creeks including the Big Valley Creek which then crosses the Gladstone Road and enters the Ringarooma River.

3. EXISTING SITUATION

All the dams are constructed from earth fill, which appears to be local material. Each of the Star Hill dams has some slopes which are steeper than would now be recommended for a small dam, either upstream, downstream or both. Vegetation is holding the walls in place in most cases. Upstream beaches reduce loads on the wall in some cases. In others the pressure on walls has been reduced by lowering the water level. This has been accomplished by deepening the spillway.

The Little Blue Lake dam has a scour pipe built into the wall. There is evidence of leakage along this pipe although no evidence that the valve has been operated in recent times. The spillway for the dam has not been located, and the scour pipe may have been used in the past to relieve pressure on the wall.

A report has been prepared on the visual condition of each dam. These are appended.

3.1 Star Hill 1

This is the upper dam of the series on Hardens Ravine. It is scoured and undercut below a tree but the effect of failure is considered small. The impoundment is small and surrounded by dam 2.

No work is urgently required but scour repair will be necessary in the next year or two if the dam is to be retained.

3.2 Star Hill 2

The second dam in the series collects runoff from both sides of the valley around dam 1. The top water level has been lowered by cutting a deeper spillway near the northern end.

The spillway is scouring and the outlet includes a deep hole with fallen trees serving as energy dissipaters. The wall is scoured in several places.

This dam is collecting runoff and serving as an initial sediment trap. It is recommended that it be retained in the short term and remedial work be carried out on the spillway and wall. The level of the spillway should not be raised.

Star Hill 3 is breached and there is no report.

3.3 Star Hill 4

This is the lowest of the series and the largest. Crest length is about 100 metres and the height about 4 metres.

The northern 55 metres of the wall are vegetated on the downstream side and in good condition, even though steep. The southern section and the spillway are barren and badly scoured in some areas. There is seepage near the area of worst scouring in the wall. The spillway channel is in danger of scouring back into the spillway and thence lowering the impoundment.

The dam holds the major impoundment in the series and should be retained for sediment and runoff control.

Urgent work is recommended to repair the scouring on the face, vegetate the face, and provide an improved outlet channel for the spillway.

3.4 Star Hill 5

This dam is closer to the head of the catchment than is the series, but is the largest dam holding the largest impoundment. It is equal in length to Star Hill 4 and has a slightly higher average height.

The dam is 100 metres long and is up to 5 metres high. The downstream slope is 35 degrees, and the upstream slope 40 to 45 degrees above the water level. There is a beach on the upstream side which reduces pressure on the wall and the slopes may be acceptable providing they can be stabilised.

The spillway is in fair condition but needs to be trimmed and stabilised.

There are two leakage areas on the dam and several scours, one severe on the downstream face near one on the leakages. The scour requires urgent attention, and the leakage should be further investigated.

Work recommended is scour repair, consideration of downstream toe flattening, and vegetation.

3.5 Star Hill 6

This dam on the Tamar Creek is 150 metres long and about 4 metres high.

The downstream slope is 37 degrees and the upstream slope 39 degrees above a flat beach. Most of the dam is vegetated as is the spillway.

The spillway has recently been burnt off but may revegetate.

There are two areas of leakage near the western end, one under or around the end of the structure and the other near a scour.

It is recommended that the scours be repaired and the downstream face be further investigated to determine whether flattening is required.

3.6 Monarch

The Monarch dam is a low flat fill holding water above the Monarch workings. The dam itself appears stable but it is in danger from the scour occurring further down the outlet channel. Work is already documented to arrest this scour.

Some trimming may be required to the spillway and channels once the scour is stabilised. A bridge, or culvert may be considered in the future to allow access across the spillway to the flats. This would reduce the likelihood of damage from recreational vehicles.

3.7 Little Blue Lake

The Little Blue Lake dam is about 70 metres long and estimated to be up to 5 metres high.

Both the upstream and downstream faces slope at about 45º . There is a flatter beach upstream below the current water level.

The wall is only partly vegetated and is severely scoured in several locations where the surface is barren. There is a scour pipe built into the wall and evidence of leakage adjacent to the pipe. No constructed spillway has been located.

It is recommended that a spillway be constructed to keep the water level down to the present position. This will avoid water pressure on the steeper upstream section of the dam. Scours in the wall should be repaired, and barren areas vegetated. The scour pipe needs to be further investigated to determine whether it requires sealing or grouting to prevent failure.

4. RECOMMENDATIONS and PRELIMINARY COSTS

Initially work is recommended on Little Blue Lake dam and on Star Hill 2, 4, 5 and 6 with future work to be considered on all the dams. Preliminary estimates have been prepared for the urgent projects but it is anticipated that actual costs will vary as the work becomes better defined.

The proposal generally is to repair scour using local materials, stabilised if necessary with lime. Establish drops in spillway outfalls where necessary with gabions. Cover barren areas with soil and or "Enviromat" to encourage vegetation. Repaired scour will be compacted and trimmed to match the previous alignment. A spillway for the Little Blue Lake dam will be constructed in concrete or with gabions, and the scour pipe under that dam may require grouting with a cementitious material.

The most urgent work is considered to be that on the Little Blue Lake dam, followed by Star Hill 4 and then Star Hill 5. Work on the other sites is less urgent.

- Star Hill 2

Repair scoured spillway	
Excavator, 8 hours @ $75	600
Roller, 8 hours @ $15	120
Labour 16 hours @ $20	320
Lime, say $150	150
"Enviromat", 40 square metres @ $2.75	110
Repair scour to wall	
Excavator, 4 hours @ $75	300
Roller, 4 hours @ $15	60
Labour 8 hours @ $20	160
Lime, say $300	300
"Enviromat", 100 square metres @ $2.75	275
Miscellaneous materials, say	305
Total for Star Hill 2	**$2,700**

- Star.Hill 4

Repair Scour to wall	
Excavator, 24 hours @ $75	1,800
Roller, 24 hours @ $15	360
Labour 48 hours @ $20	960
Lime, say $450	450
"Enviromat", 250 square metres @ $2.75	670
Miscellaneous materials, say	360
Repair Spillway Channel	
Excavator, 32 hours @ $75	2,400
Roller, 32 hours @ $15	480
Labour 64 hours @ $20	1,280
Lime, say $150	150
"Enviromat", 400 square metres @ $2.75	1,100
Gabions, 16 m^3 @ 18, plus miscellaneous	790
Total for Star Hill 4	**10,800**

- Star Hill 5

Repair Scour to Wall	
Excavator, 40 hours @ $75	3,000
Roller, 40 hours @ $15	600
Labour 80 hours @ $20	1,600
Lime, say $450	450
"Enviromat", 200 square metres @ $2.75	550
Miscellaneous materials	220
Repair Spillway	
Excavator, 4 hours @ $75	300
Roller, 4 hours @ $15	60
Labour 8 hours @ $20	160
Lime, say $150	150
"Enviromat", 40 square metres @ $2.75	110
Miscellaneous materials	100
Total for Star Hill 5	**7,300**

- Star Hill 6

Repair Scour to Wall	
Excavator, 16 hours @ $75	1,200
Roller, 16 hours @ $15	240
Labour 32 hours @ $20	640
Lime, say $150	150
"Enviromat", 100 square metres @ $2.75	275
miscellaneous materials	95
Total for Star Hill 6	**2,600**

- Little Blue Lake

Construct Spillway	
Excavator, 24 hours @ $75	1,800
Roller, 24 hours @ 15	360
Form work, 30 square metres @ $30	900
Reinforcing steel, 1 T @ $2,000	2,000
Concrete, 35 cubic metres @ $150	5,250
Labour, 120 hours @ $20	2,400
Repair Scour	
Excavator, 40 hours @ $75	3,000
Roller, 40 hours @ $15	600
Labour 100 hours @ $20	2,000
Lime, say $450	450
"Enviromat", 350 square metres @ $2.75	965
Miscellaneous materials	475
Repair Scour Pipe	
Set up and grout, say	3,000
Total for Little Blue Lake	**23,200**

Total value of items listed	46,600
Contractors overhead, transport, say	6,900
Site Supervision, say 50%, 84 hours	2,940
Documentation, say	4,800
Engineers site visit, say 3, admin, 50 hrs	4,500
Expenses	1,200
Total cost of work	**$66,940**

Works detailed above are those considered to be urgently required to maintain the structural integrity of the dams. Documentation and site inspection time is based on the work being undertaken at one time and concurrently with other site work. Additional time would be required if work is broken into smaller segments requiring additional documentation and site visits. Ongoing surveillance should be arranged and in particular the downstream toes of steep dams and the leakages should be scheduled for further consideration and work.

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FIGURE 3
STAR HILL MINE (NORTH)

WATER SAMPLING SITES &
REHABILITATION ZONES
(SEMF 1998)

APPENDIX A
DAM INSPECTION REPORTS

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Dam Inspection Report

Name	Star Hill 1	
Locality	1.6 km east of Gladstone, NE Tasmania	
Coordinates, approximately	40° 57.69'	S
	148° 01.58'	E
Report number	13193r02	
Construction material	earth fill	
Crest length	40	m
Maximum height	about 2	m
Upstream slope	not measured	
Downstream slope		
Vegetation	reasonable cover	
Spillway, type	soil	
dimensions		
Likely water depth	less than 2	m
Damage potential if breached	minimal, drains into dam 2	
Abutments	native soil	
Wall condition	some undercutting, trees above	
Spillway condition	fair	
Seepage	none noted	
Other comment	top of a series of four dams. Provides sediment control.	
Date of inspection	13 January 1998	
Date of report	15 January 1998	
Work recommended	none urgent, watch scour if dam to be retained	

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Dam Inspection Report

Name	Star Hill 2	
Locality	1.6 km east of Gladstone, NE Tasmania	
Coordinates, approximately	40° 57.69'	S
	148° 01.58'	E
Report number	13193r03	
Construction material	Earth fill	
Crest length	100	m
Maximum height	2	m
Upstream slope	22.5	°
Downstream slope	20	°
Vegetation	Some vegetation on downstream face and near spillway. Mainly unvegetated	
Spillway, type	narrow cut in wall	
dimensions	1.5 m wide	
Likely water depth	1	m
Damage potential if breached	Minimal. Drains through the area of dam 3 into dam 4.	
Abutments	Native soil	
Wall condition	Some scour in downstream face.	
Spillway condition	Deep scour at outlet. Trees in hole.	
Seepage	None noted. Very little water behind dam.	
Other comment	Second in line of four originally in series. Dam 3 has been breached over a wide area and forms only a sediment plain. There is no report for dam 3. Dam 2 capacity has been lowered at some time by deepening the overflow cut. The dam freeboard is of the order of 1.5 m.	
Date of inspection	13 January 1998	
Date of report	15 January 1998	
Work recommended	Fill scoured spillway but only to present level. Repair scoured face of dam.	

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Dam Inspection Report

Name	Star Hill 4	
Locality	1.5 km east of Gladstone, NE Tasmania	
Coordinates, approximately	40° 57.69'	S
	148° 01.58'	E
Report number	13193r04	
Construction material	Earth fill	
Crest length	100	m
Maximum height	4	m
Upstream slope	23	°
Downstream slope	26.5	°
Vegetation	Eastern 55 m vegetated, western 45 m barren	
Spillway, type	Earth and then earth channel	
dimensions	5 t o7 m wide, narrowing to 1 m & less in scoured channel.	
Likely water depth	2	m
Damage potential if breached	Dam is 450 metres from Ringarooma River and would discharge substantial sediment if breached. Downstream flooding not likely to be serious.	
Abutments	Native soil	
Wall condition	Barren area is subject to scour, severe in one area.	
Spillway condition	Scoured with channel reaching back toward impoundment.	
Seepage	Seepage noted below severe scour.	
Other comment	The dam is the lowest of the series and protects Ringarooma River from storm discharge down the waterway.	
Date of inspection	13 January 1998	
Date of report	15 January 1998	
Work recommended	Repair scour in wall. Establish vegetation on wall. Similar work to spillway. Consider flattening of downstream face.	

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Dam Inspection Report

Name	Star Hill 5	
Locality	2.1 km east of Gladstone, NE Tasmania	
Coordinates, approximately	40° 57.6'	S
	148° 02.06'	E
Report number	13193r05	
Construction material	Earth fill	
Crest length	100	m
Maximum height	4 to 5	m
Upstream slope	41 to 45	°
Downstream slope	35.5	°
Vegetation	Some vegetation on both faces but largely barren	
Spillway, type	Broad soil channel, attempted timber weir.	
dimensions	3 metres wide	
Likely water depth	3 to 3.5	m
Damage potential if breached	Largest volume storage on this water course. Could cause breaching of downstream dams and flooding in the Ringarooma River.	
Abutments	Native soil	
Wall condition	Fair, some scour, some serious scour.	
Spillway condition	Fair, some scour.	
Seepage	Two areas, one under toe, one up face near scour.	
Other comment	Dam walls are extremely steep	
Date of inspection	13 January 1998	
Date of report	5 February 1998	
Work recommended	Repair scour in face and spillway. Consider downstream face flattening, and vegetation.	

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Dam Inspection Report

Name	Star Hill 6	
Locality	2.9 km East of Gladstone, NE Tasmania	
Coordinates, approximately	40º 57.25'	S
	148º 02.6'	E
Report number	13193r06	
Construction material	Earth fill	
Crest length	200	m
Maximum height	4	m
Upstream slope	39	º
Downstream slope	37	º
Vegetation	Mainly vegetated upstream and downstream	
Spillway, type	Earth, vegetated but recently burnt	
dimensions	About 3 m wide	
Likely water depth	3	m
Damage potential if breached	Scouring to Tamar Creek and minor flooding and sediment in Ringarooma River	
Abutments	Native soil	
Wall condition	Very steep, some scouring, upstream beach OK	
Spillway condition	Good providing burnt area revegetates	
Seepage	Two areas at the western end.	
Other comment		
Date of inspection	13 January 1998	
Date of report	5 February 1998	
Work recommended	Repair scour in walls. Consider flattening downstream face, particularly near seepage.	

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Dam Inspection Report

Name	Monarch	
Locality	8 km west of Gladstone, NE Tasmania	
Coordinates, approximately	40° 57.82'	S
	147° 54.76'	E
Report number	13193r07	
Construction material	Earth fill	
Crest length	70	m
Maximum height	1 to 2	m
Upstream slope	not measured	°
Downstream slope	not measured	°
Vegetation	scrub covered	
Spillway, type	wide overflow through scrub, two small discernible channels.	
dimensions		
Likely water depth	uncertain, say 2 to 3	m
Damage potential if breached	small, further scouring down Monarch gully.	
Abutments	Native soil	
Wall condition	Good	
Spillway condition	Good	
Seepage	None noted	
Other comment	The dam is wide and flat at the head of Monarch Gully. It is threatened by scour of the gully which is formed on the spillway outfall, but not itself in immediate danger.	
Date of inspection	13 January 1998	
Date of report	5 February 1998	
Work recommended	None on dam. Stop gully erosion. Outfall may be bridged to improve access t eastern plains.	

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Dam Inspection Report

Name	Little Blue Lake	
Locality	7 km SW of Gladstone	
Coordinates, approximately	41° 00.5'	S
	147° 58.5'	E
Report number	13193r10	
Construction material	Earth Fill	
Crest length	70	m
Maximum height	estimated 5	m
Upstream slope	45	o
Downstream slope	45	o
Vegetation	slight	
Spillway, type	none, pipe under	
dimensions		
Likely water depth		m
Damage potential if breached	can flood road, wash out?	
Abutments	natural	
Wall condition	scouring, some serious	
Spillway condition	none	
Seepage	some at scour pipe	
Other comment	inspection by photograph at 24/2/98.	
Date of inspection		
Date of report	16 March 1998.	
Work recommended	Repair scour, vegetate, construct spillway to keep level low and avoid loading steep part of dam repair or grout scour pipe. Consider lowering downstream slope.	

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APPENDIX B
PHOTOGRAPHS

1. Lower Monarch Pond, no dam

2. Monarch Dam

3. Monarch Dam Spillway

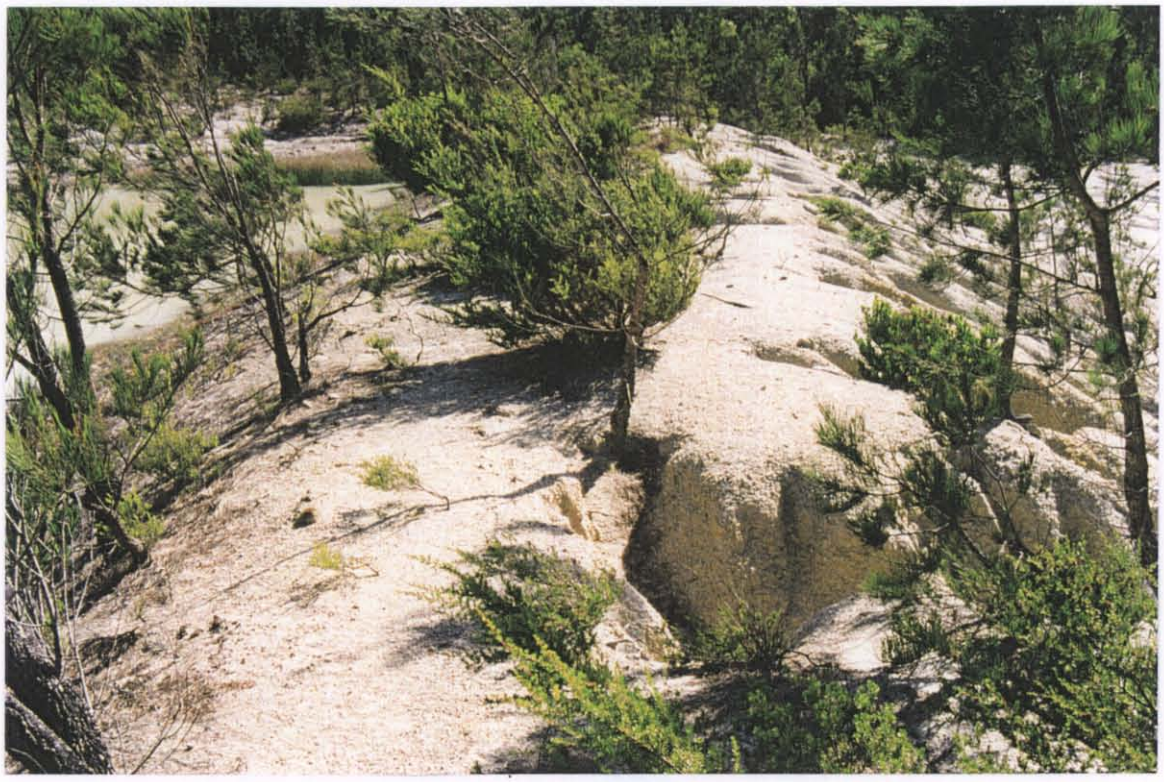
4. Star Hill 1

5. Scour at the inlet to Dam 2

6. Dam 2 Spillway

7. "Dam" 3, no impoundment

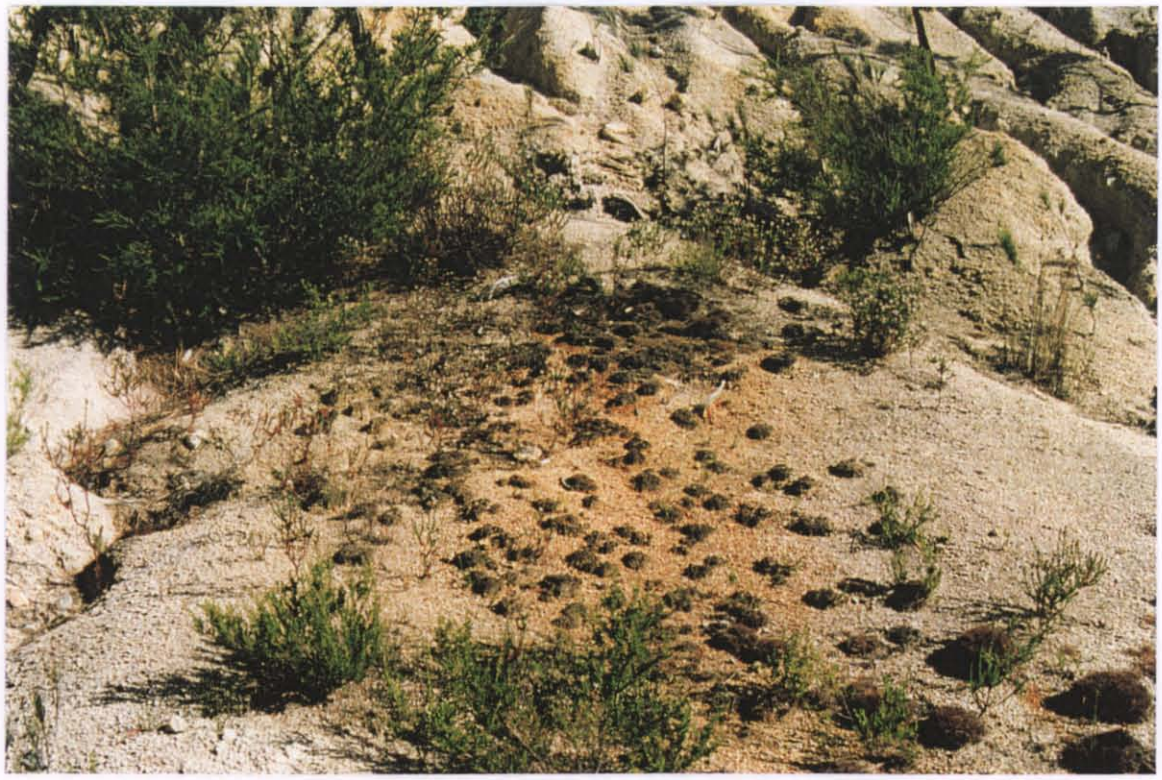
8. Inlet to Dam 4



9. Scour on Dam 4

10. Spillway Channel scour, Dam 4

11. Downstream Face Dam 4



12. Leakage Dam 4

13. Spillway Dam 5

14. Scour, Dam 5

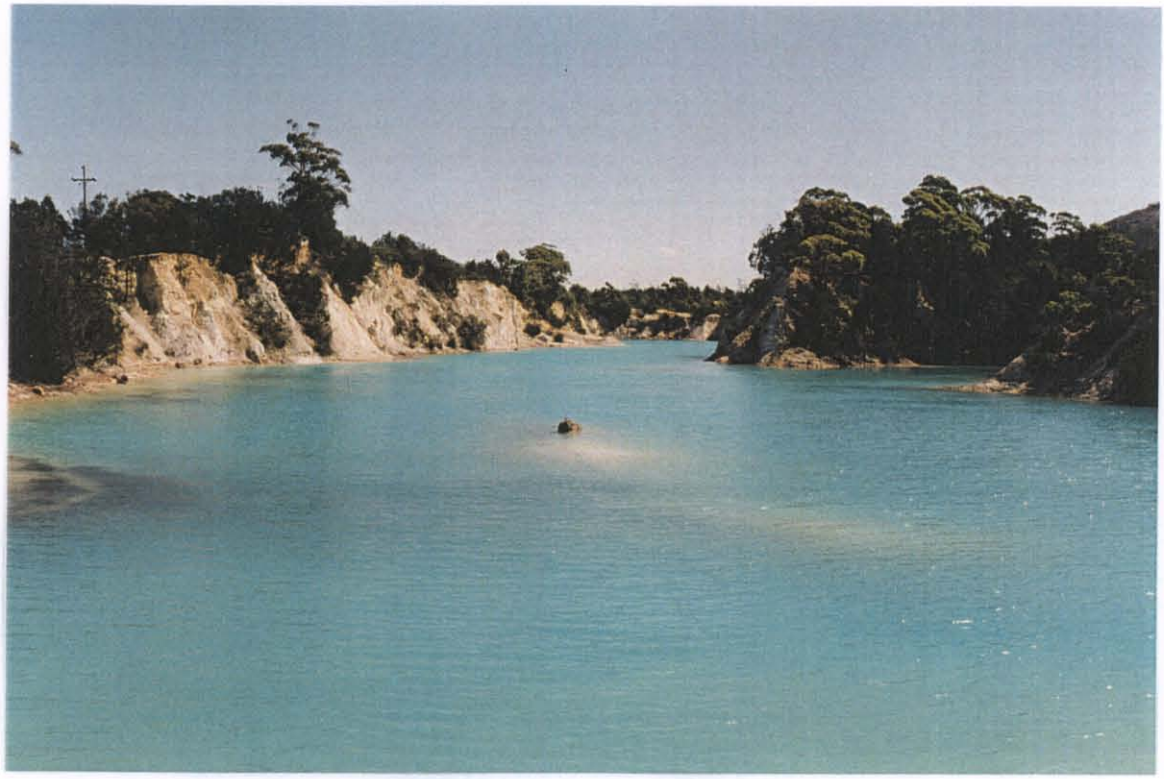
15. Leakage Dam 5

16. Dam 5 Wall

17. Leakage, Dam 6

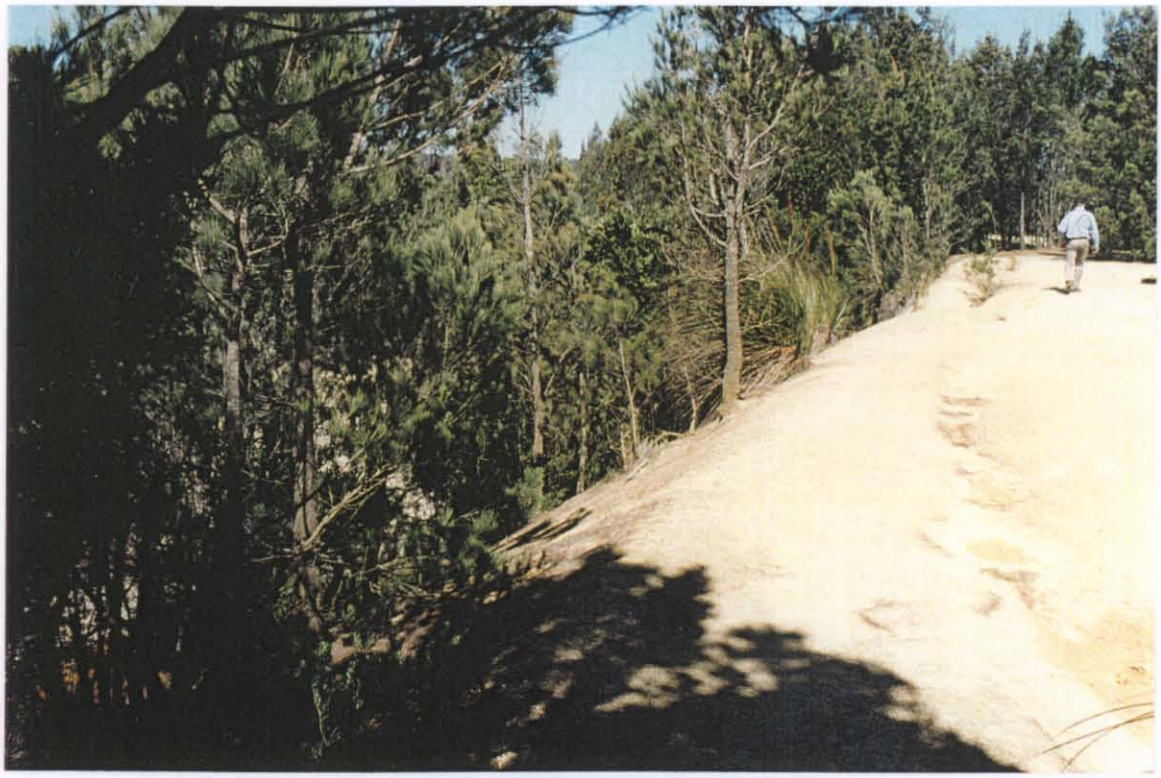
18. Steep Upstream Face and Beach, Dam 6

19. Spillway, Dam 6

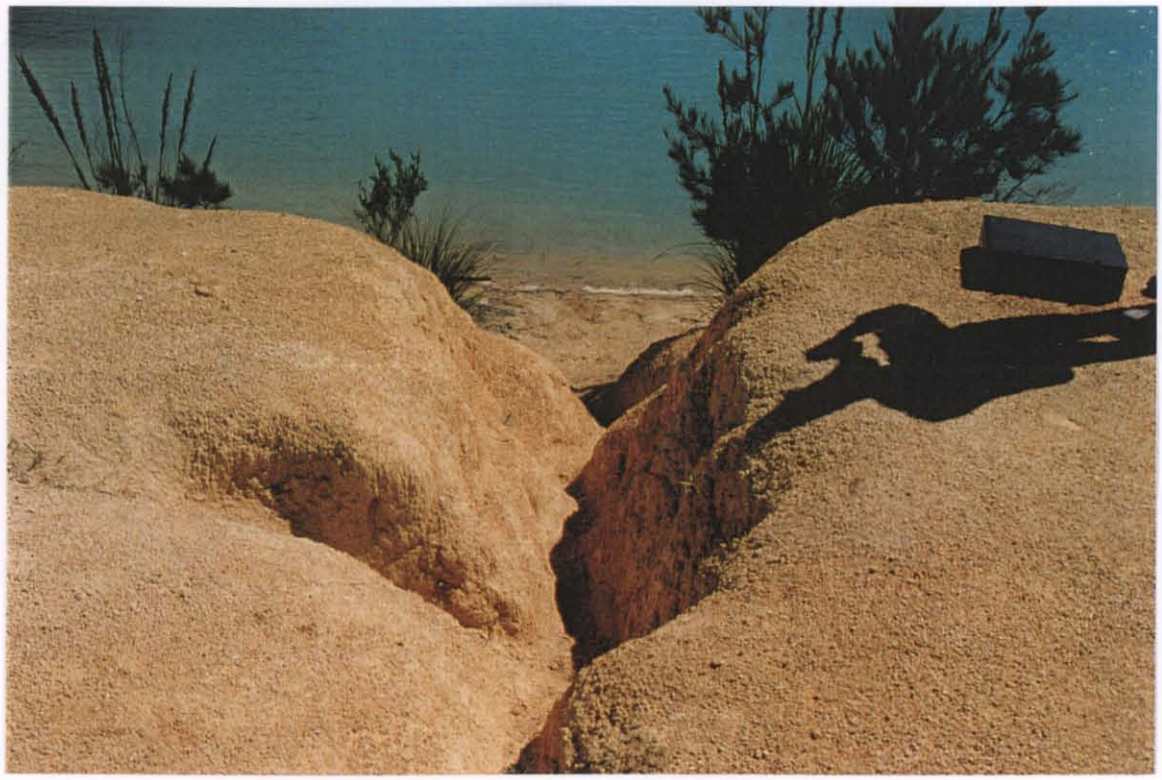


20. Little Blue Lake

21. Upstream Face



22. Downstream Face



23. Upstream Face Scour

24. Downstream Face Scour

25. Scour Pipe Leakage

26. Scour Pipe Valve

27. Little Blue Lake "Beach"

APPENDIX 3
BRIDGE REPORT

MINERAL RESOURCES TASMANIA
NORTH EAST MINES
BRIDGE INSPECTION

1. INTRODUCTION

During the inspection of mine dams carried out in the area around Gladstone by SEMF in January 1998, several bridges on access roads were also inspected. this took the form of visual inspection initially to determine whether it was reasonable to proceed with the vehicle being used for transportation.

All the bridges are of timber construction. Various types of timber have been used in the initial work and for maintenance.

2. BRIDGES CONSIDERED

2.1 Cat Gully

The gully known locally as cat gully is evidentially a man made cut from the mines above the Blue Lake to Ruby Creek.

The abutments of the bridge are solid rock with near vertical sides.

The bridge was formed by laying large logs between abutments, and then building up with successive cross logs and longitudinal logs. The bridge is about 5 metres long.

One of the main support logs has broken away and support is now shared through several smaller logs in the upper layer.

The deck has been repaired with sawn treated pine which is breaking as traffic crosses the bridge.

The bridge is unsafe and requires replacement. As one of the main supports is broken, removal of the entire structure is the easiest way to access the work.

Replacement with a culvert, either box or circular is likely to be the cheapest repair. At this time hydrology of the area is not defined, and further information needs to be obtained to determine the area which drains through this cut.

If a 1200 mm diameter pipe is sufficient, it is likely that a culvert could be constructed with sand bag endwalls for about $10,000 including engineering, providing the work is carried out while other construction is under way. This would allow for a single lane but not include barriers.

2.2 Water Race, Blue Lake

A bridge of about 7 metres span crosses the water race at the western end of Blue Lake.

The bridge comprises four 200 mm diameter poles spanning the length with 125 mm diameter poles at right angles to the bearers. The decking is loose sawn timbers laid on the approximate line of wheel paths. Deck timbers are partly hardwood and partly softwood, in various stages of disrepair.

The bearers and cross members are in reasonable condition for light traffic but the deck is unstable. Redecking and packing to distribute loads on to all cross members is required.

It is estimated that this work could be carried out with sawn green hardwood, 50 mm thick for about $2,000. No documentation has been allowed. No barriers are included.

2.3 Blue Lake to Monarch

All the bridges between Blue Lake and Monarch via the Old Port Road, require attention. A detailed assessment was not conducted but users of this road appear to make running repairs to the crossings as required. This varies from using stumps and logs to temporarily fill holes, to providing a piece of deck running strip to span an opening.

These bridges should be assessed and repaired or replaced with culverts.

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BRIDGE PHOTOGRAPHS

A1. Cat Gully Deck

A2. Cat Gully Bearers

A3. Blue Lake Deck

A4. Blue Lake Supports