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R.710. Magnet mine residues after fifty years of weathering.

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The Magnet mine produced a silver-lead concentrate during its working life. A zinciferous tailing was stored in a number of contiguous dams along Magnet Creek below the mill.

In 1975 the Electrolytic Zinc Company began recovering these tailings which were taken to Rosebery for concentration. The material from the dams was trucked to a stockpile near the Corinna Road from where it was reloaded for transport to Rosebery.

As these tailings dams had been exposed to the weather for approximately fifty years, samples were taken to assess the oxidation that had taken place.

#### SAMPLES

The Senior Mining Engineer in Burnie, delivered a small sample of Magnet tailings from the Corinna Road stockpile to the laboratory on 5 November 1975. This was sample 751750.

Subsequently on 18 November 1975 the Chief Chemist and Metallurgist visited the Magnet mine site and sampled the face of the uppermost dam, opposite the mill. This dam was at that time being removed by the Electrolytic Zinc Company.

A water sample (751958) was taken from Magnet Creek opposite the site of the lowest of the residue dams.

#### APPEARANCE OF DAM

The exposed dam face showed three distinct zones, (fig.110). Samples were taken from each zone, the samples from Zones A and B being from vertical channels while that from Zone C was a grab sample from about a metre below the dam surface.

Bands of coarse stones occurred at irregular intervals throughout normal tailings. These coarse bands were about 3 cm wide and were relatively free of the finer normal tailings.

#### Zone A (Sample 751962)

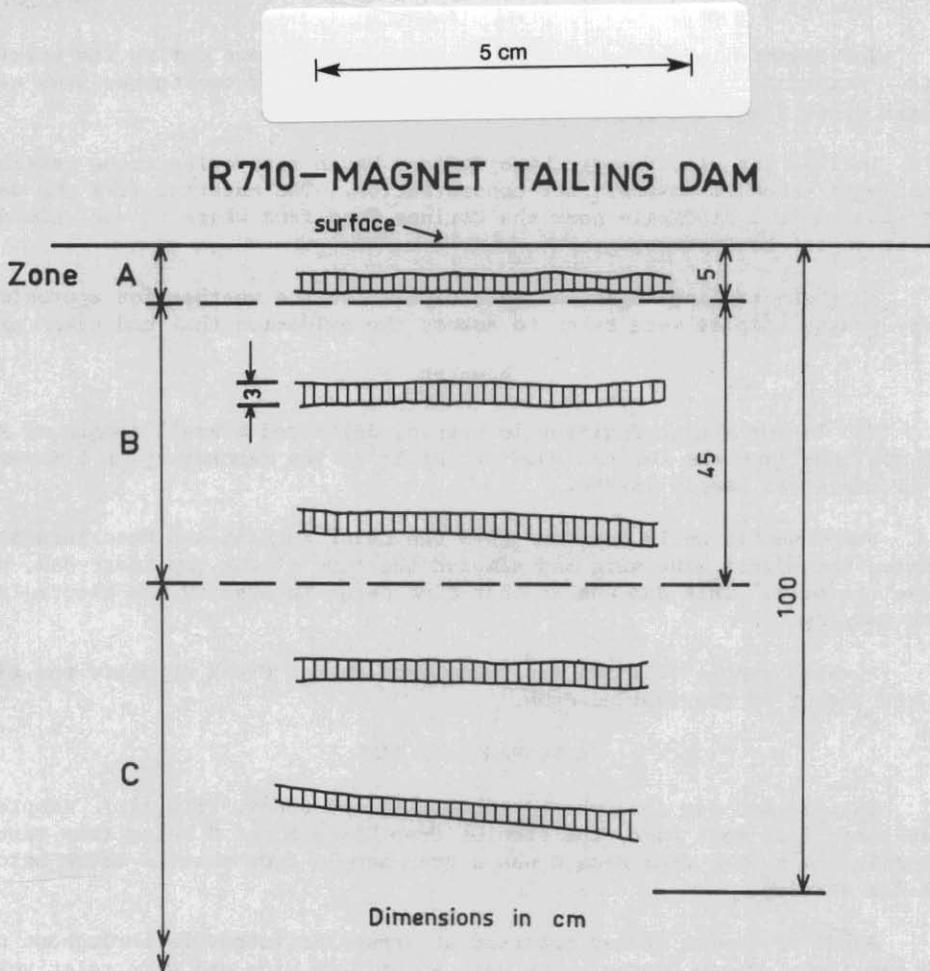
This was a very dark oxidised material extending about 5 cm from the surface. This material had cemented somewhat at the surface to form a crust.

#### Zone B (Sample 751963)

Below Zone A the brownish stain extended for about 45 cm indicating some oxidation had taken place. There was no cementing due to oxidation.

#### Zone C (Sample 751964)

Below 50 cm from the surface there was no brownish staining to indicate oxidation. A grab sample was taken from about a metre down as there was considerable loose material against the face of the floor of the dam. The face was about two metres high at the sampling site.



Cross-section through Magnet Tailing Dam showing:

Zone A—very dark weathered top (5 cm)

Zone B—brownish stained, not as weathered as 'A' down to 50 cm

Zone C—below 50 cm no brown staining which indicates weathering

▣▣▣▣ - bands of coarse stones relatively free of fine material.

These bands were spaced through the normal tailings which were much finer in size.

Figure 110.

RESULTS

Sample 751750 was sized and assayed with the following results:-

Fraction aperture	% Mass	Cum. % Mass
+2.36 mm	1.6	1.6
+1.18 mm	25.4	27.0
+600 $\mu$ m	31.9	58.9
+300 $\mu$ m	17.0	75.9
+150 $\mu$ m	11.8	87.7
+75 $\mu$ m	7.7	95.4
+38 $\mu$ m	3.0	98.4
-38 $\mu$ m	1.6	100.0

Element	Assay (%)	Element	Assay (%)
Zn	11.8	SO <sub>4</sub>	0.027
Pb	1.1	Cu	0.06
Fe	14.5	Cd	0.12
S (total)	5.9	Insoluble	18.2
		CO <sub>3</sub>	present

Results for Zones A, B & C were:-

Element	A (751962)	B (751963)	C (751964)
Zn (%)	9.1	5.4	5.9
Pb (%)	2.3	1.2	0.97
Ag (g/t)	310	190	170
Fe (%)	17.9	17.1	14.6
S (sulphide) (%)	3.9	2.5	2.9
SO <sub>4</sub> (%)	0.54	0.015	0.015

Sample 751964 was sized and the fractions assayed for lead and zinc with the following results:-

Fraction aperture	% Mass	Pb (%)	Zn (%)	% Distribution	
				Pb	Zn
+12.7 mm	22.3	1.4	5.5	21.2	19.3
+9.53 mm	15.4	1.3	4.8	13.6	11.6
+4.76 mm	24.8	1.5	6.7	25.3	26.1
+2.36 mm	10.6	1.7	6.5	12.3	10.8
+1.18 mm	8.6	1.4	7.6	8.2	10.3
+600 $\mu$ m	5.3	1.1	7.4	4.0	6.2
+300 $\mu$ m	3.8	1.0	8.3	2.6	5.0
+150 $\mu$ m	3.1	0.95	8.0	2.0	3.9
+75 $\mu$ m	2.4	1.8	8.3	2.9	3.1
+38 $\mu$ m	1.4	3.1	7.4	3.0	1.6
-38 $\mu$ m	2.3	3.1	5.7	4.9	2.1
Head	100.0	(1.47)	(6.4)	100.0	100.0

The water sample 751958 from Magnet Creek which was in high flow after recent rain had a pH of 7.1 and analysed as follows:

Element	Assay (mg/l)	Element	Assay (mg/l)
Cl	16	Colour	15
Na	6.8	Mn	<0.1
Zn	0.2	SO <sub>4</sub>	<5
Cu	0.04	TDS	100
Pb	<0.01		

#### DISCUSSION

From the assays, the surface zone (A) appears enriched in metals which may have been due to oxidation, although the sulphide sulphur is also high, possibly indicating that a richer material was placed in this top layer. However the sulphate content indicates considerable oxidation compared with the other zones.

Although a brownish stain penetrates into the dump to about 50 cm from the surface, no oxidation was detected chemically, except in the top 5 cm.

As the tailing sample 751964 is quite coarse (85% +1 mm,) it would be quite permeable and hence amenable to oxidation. From a photograph taken about six years ago there was a water channel draining this dam into Magnet Creek hence the lack of oxidation has not been due to the tailings being immersed in static water.

This dam has been oxidised over only the top 5 cm after the long exposure of a relatively coarse permeable material containing 3% sulphide sulphur. The presence of carbonate minerals may explain this, as the acidic products formed by the oxidation of the sulphide have decomposed the carbonates at hand thus preventing the penetration through the dam of low pH solutions.

The water sample shows little dissolved solids (100 mg/l TDS) the 0.2 mg/l of zinc could easily be naturally occurring. The analysis at low flow may be quite different but in view of the limited extent of oxidation in the dams, the stream has probably never carried a heavy zinc content.

#### CONCLUSION

Oxidation has for practical purposes been confined to the top 5 cm of a dam containing a coarse, permeable material containing 3% sulphur. An explanation for this could be the carbonate content of the material.

[22 December 1975]