



Acid Solutions®

Contaminated Water Treatment Services

FIXING THE ENVIRONMENT

685 Megalitre abandoned mine treated with 140 TONNES of reagent for Department of Mines and Energy to provide environmental protection before wet season rains.

Customer Name	- Department of Mines and Energy
Site Location	- Croydon North Queensland
Site Problem	- pH, acidity and dissolved metals
Water Volume	- 687 megalitres & 6 Megalitres
Water pH	- 3.08 & 2.85
Acidity	- 289mg/l & 940mg/l
Suspended Solids	- Low
Treatment Objective	- Remediation treatment for environmental protection.
What is causing the problem	- Highly acidic waste rock dump nearby contaminating site.
Dams/Pits	- 2
Length of water body	- 240 metres & 90 metres
Width of Water body	- 140 metres & 50 metres
Water Depth	- Up to 34 metres & up to 1.7 metres
Bottom Type	- Old open cut mine pit
Aquatic Flora	- Nil
Veheical Access and Flora	- Road access
Environmental Sensitivity	- Contained and controlled until wet season
Aquatic Life	- None
Drains or Streams nearby	- Yes – environmental risk
Regulatory requirements	- Yes – protection of downstream environment
Treatment urgency	- Yes – urgent



Contaminated Dams holding 687 megalitres

PROBLEM

Acid Solutions was requested to treat an abandoned mine, 14 KM from Croydon in North Queensland. The site was treated between the dates of 12/11/07 to 23/11/07.

The treatment area consists of two sites bordering each other. The Main Pit is a full open cut pit and the other is a catchment dam constructed to help contain leachate water from the waste rock dump and overflow from the main pit. The main pit site is approximately 240metres by 140 metres by 35 metres deep.

The estimated water volume prior to treatment in the Main Pit is 687 Megalitres.

The Catchment Dam is approximately 90 Metres by 50 Metres by 1.7 metres deep with a maximum holding depth of approximately 4-5 metres. The estimated water volume prior to treatment in the Catchment Dam is approximately 3-4 Megalitres.

TREATMENT OBJECTIVE AND WATER QUALITY

The primary aim was to treat the presently contained and contaminated water to livestock quality or better in preparation for the wet season rains. The wet season rains would potentially over fill the pit and allow contaminated water to enter the downstream creeks and dams used by Cattle.

The main pit water pre treatment had a 3.08 pH with a maximum acidity of 289mg/l.

The water in the Catchment Dam has a pH of around 2.85 and an acidity of 940 mg/l.

The treatment objective of both sites was to raise pH to slightly above the upper limits of environmental release levels to allow for buffering of acidic water entering the site before overflow.

The reagent used was Hydrated Lime (Calcium Hydroxide).

THE TREATMENT

The first day of setup and treatment supplied a reagent application of 4 Tonnes using our specially designed surface and subsurface applicators.

The following days provided good reagent outputs with minimal problems. We had several delays due to the unloading of 280 half tonne bulk bags. Extremely high temperatures (to 47 degrees), humidity and long days required to complete the treatment before wet season rains also proved challenging. Total Reagent application of 140 Tonnes was applied in 11 Days.



Site photos towards the end of treatment.

Note the water clarity



CATCHMENT DAM TREATMENT

The catchment dam was treated to a high pH to counter acidic runoff entering the site before overflow. The water contained in the dam was treated with excess reagent and the surrounding dry holding area was sprayed with concentrated slurry to help neutralize possible inflow of acidic water entering the site.

PRE & POST WATER TREATMENT QUALITY OF MAIN PIT

All units MG/L	PRE Treat 13/11/07	POST Treat 23/11/07	Livestock limits
Depth	6 Metres	Surface	
Acidity TAA	289	0	Pass
Aluminium	41	0.22	5.0
Arsenic	<0.005	<0.005	0.5
Cadmium	0.123	<0.001	0.01
Calcium	29	198	1000
Chromium	<0.01	<0.01	1.0
Copper	1.93	<0.01	1.0
Iron	0.55	<0.010	NA
Lead	0.11	<0.01	0.1
Magnesium	13	0.1	2000
Manganese	2.18	<0.01	NA
Molybdenum	<0.01	<0.01	0.15
Nickel	0.06	<0.01	1.0
Sodium	8.1	7.9	NA
Sulphate	397	364	1000
Zinc	4.65	0.03	20

The post treatment surface samples show very good metal reduction results.

PRE & POST WATER TREATMENT QUALITY OF CATCHMENT DAM

All units MG/L	PRE Treat 17/11/07	POST Treat 23/11/07	Livestock limits Relative to Surface sample
Acidity TAA	940	0	Pass
Aluminium	133	3.32	5.0
Arsenic	0.010	<0.005	0.5
Cadmium	0.476	<0.001	0.01
Calcium	61	457	1000
Chromium	<0.01	<0.01	1.0
Copper	5.36	0.01	1.0
Iron	5.37	0.020	NA
Lead	0.03	<0.01	0.1
Magnesium	34	0.1	2000
Manganese	8.06	<0.01	NA
Molybdenum	<0.01	<0.01	0.15
Nickel	0.29	<0.01	1.0
Sodium	12	12	NA
Sulphate	1139	1102	1000
Zinc	15	<0.01	20

It can be seen from the pH and calcium levels that the Catchment Dam was treated to a very high Alkalinity to help neutralize the inflow of acidic runoff after rainfall. The results show a very good reduction in metal contaminants.

LIME APPLICATION TO ROCK SURFACES

Acid Solutions applied a concentrated reagent slurry of approximately 1 Kilogram to 5.5 litres of water to the pit surrounding areas. This was done to neutralize the acidity held crystallized on the rock surfaces and to help neutralize acidic water flowing over the treated rock.



The rock faces surrounding the Main Pit were treated with 3500 Kilograms of reagent. This area equates to approximately 9000 square metres. Application rate equates to approximately 330 Grams per square metre.



Catchment Dam



Catchment Dam after application.

The Catchment Dam, inflow drains, overflow and up to approximately 80 Meters downstream in the dry creek bed was also treated with a concentrated Reagent slurry. This area equates to over 15,000 square metres and was treated at a rate of 250 to 300 Grams per square metre.

This surface application was very successful with drying and bonding of reagents to the rock surfaces. A small treated rock was placed into a bottle with acidic Catchment dam water several hours after coating and shaken vigorously. The alkaline coating maintained its attachment to the rock surface and seemed to slowly reduce in thickness from acidic etching. This indicated rainfall would not remove the coating, only acidic water, which would then be reduced in acidity.



Close up of reagent coverage



Rock removed to show efficiency of coverage

AFTER RAIN ACIDITY AND PH

Rainfall was encountered on the morning of the 17/11/08. The acidities of the nearby waste rock dump runoff was checked approximately 4 hours after rainfall. The runoff was measured at 2.92pH and 420Mg/L acidity. This shows the highly contaminated runoff which drains into the pits that has caused the contaminated in the first place.

CONCLUSION

Treatment of this site revealed several of its mysteries, which now allow ongoing remediation to be more efficient and cost effective.

In the mean time we believe a cost effective application of reagent to the Waste Rock Dump will greatly minimize acidity formed. Sealing of the Catchment Dam will minimize downstream contamination and a top up treatment of the Main Pit and Catchment Dam will provide water bodies safer for the environment.



Water after treatment (7 Metre depth to visible bench)



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