

**Contaminated Extraction Pit treated to allow dewatering for continuation of mining works**

<b>Name</b>	Customer name withheld
<b>Site Location</b>	South East Queensland
<b>Site Problem</b>	pH, Acidity and Dissolved Metals
<b>Water Volume</b>	368 Megalitres
<b>Water pH</b>	pH 2.73 to 3.34
<b>Acidity</b>	270 to 1290 Mg/L
<b>Suspended Solids</b>	moderate
<b>Treatment Objective</b>	License quality requirements
<b>What is causing the problem</b>	Rainfall and leachate from highly pyritic material
<b>Length of water body</b>	340metres
<b>Width of Water body</b>	150 metres
<b>Water Depth</b>	Up to 9.5 metres
<b>Bottom Type</b>	Irregular/snags
<b>Aquatic Flora</b>	Nil
<b>Vehicle Access and Flora</b>	Limited Access
<b>Environmental Sensitivity</b>	Contained and controlled
<b>Aquatic Life</b>	Nil
<b>Drains or Streams nearby</b>	Yes
<b>Regulatory requirements</b>	Mine License
<b>Urgency level</b>	Extremely urgent



## 1 INTRODUCTION

*Acid Solutions* was requested to treat approximately 368 megalitres of contaminated water to neutralise pH and Acidity and reduce metals prior to dewatering and release. The water body is approximately 340 metres long by 150 metres wide and up to 9.5 Metres deep. The pit showed heavy stratification with high Ferrous Iron content in the deeper areas.

## 2 OVERVIEW

It is estimated that approximately 368 Megalitres is contained in a pit approximately 180 metres by 140 Metres and up to 9.2 meters deep. Water was treated to neutralise pH and acidity and reduce dissolved metal concentrations as well as suspended solids.

Contamination and acidification of the water body has been caused by oxidised sulphide bearing material surrounding the pit and catchment areas. This pit and water quality was inspected on the 30<sup>th</sup> of July 2008.



### 3 SITE SURVEY AND PRE TREATMENT WATER QUALITY

The pit was surveyed and depth variations from 1.5 metres to 9.5 metres were recorded. The bottom was irregularly shaped and several sumps and obstructions were found. The pit stratification showed uneven pH and acidities with high Ferrous Iron and a mild smell of hydrogen sulphide in the deeper water when raised to the surface.

The following contaminant levels were recorded before treatment on 30/10/08.

30/10/08		Depth Surface	Depth 4.5 M	Depth 9.5 M
pH	TPA	2.73	2.87	3.34
Acidity	Mg/L	270	560	1290
Conductivity	ms/cm	2.85	2.99	3.43
NH3	Mg/L	1.5 - 2.0	1.8 - 2.2	3.5 - 5.0

### 4 WATER QUALITY OBJECTIVES

The objective of the treatment was to improve water quality to neutralise Acidity, raise pH to between 7.5 and 9.5 and reduce contaminants to meet release requirements. The main pit was to be raised to a slightly higher pH than releasable to assist maintaining an acceptable water quality during aeration and dewatering.

It was proposed that the water quality be improved to neutralise Acidity, raise pH to release standards and reduce contamination to the following levels.

The acidity was measured at 285 Mg/l with a pH of 2.80 and contaminant levels as follows:

Contaminant - all results in Mg/L unless stated	Pre Treatment Quality	Treatment Results	Release requirements in Red
pH	2.8 pH	7.2 pH	6.0 – 9.0 pH
Acidity TAA	280	<10	NA
Acidity TPA	285	<10	NA
Electrical Conductivity	2429 us/cm	1936 us/cm	1700-2000us/cm
Total Dissolved Solids	1506	1324	NA
Suspended Solids	6.0	3.3	50Mg/L
Nitrogen - Total	2.78	2.73	5.0
Ammonia – NH3	1.74	0.68	1.0Mg/L (NH4 as N)
PO4 as Phosphorus	<0.05	<0.05	0.2
Aluminium	17	0.08	2.0Mg/L
Dissolved Oxygen	9.3	9.2	>4
Arsenic	<0.01	<0.01	0.05
Beryllium	<0.01	<0.01	NA
Cadmium	<0.001	<0.001	NA
Calcium	212	323	NA
Chloride	140	120	NA
Chromium	<0.01	<0.01	NA
Cobalt	0.29	0.04	NA
Copper	0.01	<0.001	0.005
Iron	19	0.24	NA
Lead	0.02	<0.005	0.005
Magnesium	132	128	NA
Manganese	11.0	5.8	NA
Mercury (ICP)	<0.001	<0.001	0.0001
Molybdenum	<0.01	<0.01	NA
Nickel	<0.01	<0.01	NA
Sodium	140	138	NA
SO4 Sulphate	1395	1394	NA
Zinc	<0.01	<0.01	0.5 Mg/L

## 5 TREATMENT METHODS USED

The pit was treated insitu using Acid Solutions Patented Treatment system called the C.R.A.B. and 3 types of specialized applicators.

**C.R.A.B.** Calibrated Reagent Applying Blender. [www.ACIDSolutions.com](http://www.ACIDSolutions.com)

Initially reagent was applied evenly to the surface to provide a blanketing effect to initiate precipitation of Ferric Hydroxides and Oxy-Hydroxides.

Then the reagents were applied to the mid and lower depth range. Our processes improve the speed of treatment and ensure accurate neutralization without wastage through oversaturation.

## 6 TREATMENT REAGENTS

The Treatment Reagents used were Calcium Hydroxide (Ca(OH)<sub>2</sub>) supplied in Bulk 500 Kg Bags. The accurate application of this reagent provides neutralization of pH and Acidity with very good metal and other contaminant reduction.

## 7 TREATMENT

The first day of setup and treatment supplied a reagent application of 3 Tonnes for that day. The following days provided good outputs with even application.

Reagent (Calcium Hydroxide) was applied at controlled rates of between 750 and 2200 kilograms per hour depending on the applicator used, depth and area treated.

## 8 DAILY REAGENT APPLICATION

30/10	31/10	1/11	2/11	3/11	4/11	5/11
3 Tonne	9 Tonne	14 Tonne	14.5 Tonne	13.5 Tonne	15 Tonne	8 Tonne

Initial Reagent application of 77 Tonnes was accurately applied in 7 Days.

## 9 FERROUS IRON

During initial site analysis it was established that high Ferrous (un-oxidized) Iron existed in the deeper areas of the pit.

Ferrous Iron and Acidity remaining in the lower depths were further dealt with as the water level was lowered.

## 10 FERROUS IRON, ALUMINIUM AND RESISTANCE TO TREATMENT

The treatment progressed very well with alkalinity penetrating the entire water body as expected. The pre treated water body pH was 2.73 with stratification and contained high levels of Ferrous Iron and other metals.

On the second day of treatment we found no pH level below 3.49 at any depth.

This showed reagent penetration with resistance from unoxidised metals as expected.

We continued applying reagent and found resistance breaking the 4.20pH to 5.20pH level.

After each application, pH was gradually increasing as Acidity was decreasing. This shows the Ferric Iron reacted quickly as expected.

## 11 POST TREATMENT WATER ANALYSIS

The Pit was tested at specific levels on the 6/11/08 to ensure Acidities and pH were neutralised enough to allow dewatering till a top up treatment could be conducted. Sampling was conducted at 3 sites over the pit at various depths to gain an average.

Site	Depth	pH	Conductivity	Acidity
Middle	Surface	9.25	2.65	0
	3 M	9.65	2.86	0
	7.5 M	6.04	3.28	150 Mg/L
West End	Surface	9.25	2.65	0
	3 M	9.34	2.74	0
	9.0 M	6.34	3.83	110Mg/L
Pump	Surface	9.15	2.66	0
	3 M	9.41	2.93	0
	5 M	6.25	3.87	105 mg/L

## 12 BENEFITS

**Benefits of this treatment system include, but are not limited to:**

- It has an extremely fast installation time.
- It is very cost effective in comparison to other treatment methods.
- It requires less infrastructure than other treatment methods.
- It remains flexible in regard to site location required.
- **The portability of the mobile CRAB™ Treatment system provides fast setup and dismantling.** Leaving no permanent infrastructure to dispose of.

## 13 CONCLUSION

Treatment of this site revealed several of its difficulties which were dealt with as water levels were lowered.

This site was treated several times over 3 months due to high rainfall, slow pumping rates and the high Ferrous Iron and acidity held in the submerged stockpiles.



***Acid Solutions***<sup>®</sup>

***Contaminated Water Treatment Services***

Website - [www.ACIDSolutions.com](http://www.ACIDSolutions.com) - email [pH@ACIDSolutions.com](mailto:pH@ACIDSolutions.com)  
phone : +61 7 55 22 1789 - freecall : 1800 11 ACID