



StormDMT™ - Stormwater runoff pilot trial

Project

A pilot plant was designed to assist in:

- Demonstrating the performance of GHD's multi barrier stormwater treatment system in regards to:
 - Hydraulics (0-100 L/s)
 - Stormwater runoff heavy metal removal efficiency
 - Influence of heavy metal phase distribution (particulate, dissolved and colloidal)
- Defining operation and maintenance requirements of GHD's multi barrier stormwater treatment system
- Defining the stormwater runoff quality for the Sump D4 catchment area that is considered the most contaminated at the site
- Defining the zinc roof runoff quality
- Utilizing the above information to enable successful completion of the concept design and feasibility study of GHD's multi barrier technology to treat stormwater runoff generated across a large mine site.

The trial was specifically focused on removing the dissolved phase of heavy metals and the system was integrated into an existing sump structure with first flush capacity available.

The trial took place from November 2012 to May 2013 and cost approximately \$700,000.

Performance & Results

GHD's multi barrier stormwater treatment system was able to reduce the zinc from the stormwater runoff by 90%, the copper by 85% and the lead by 80%.

In all cases the copper, zinc and lead concentrations exiting the multi barrier filter were significantly lower than the required discharge limits illustrated in Table 3 (overleaf).

Considering the site relevant runoff rates of copper, zinc and lead, GHD's multi barrier stormwater treatment system has demonstrated a minimum maintenance life of two years.

During construction of the pilot plant, significant difficulties in ground conditions were encountered and the challenging geotechnical conditions significantly increased anticipated construction costs of the pilot plant. An amended version of the multi barrier system was developed that maximised use of the existing sumps across the site to house the filter system. This option has saved the client approximately \$2,000,000.

More details on the quality of water treated and the discharge limits can be viewed overleaf.

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Stormwater composition

As expected, different amounts of heavy metals were washed off the catchment surface area during different rain events, depending on the preceding dry period and the applied operational wash down regime for the specific catchment.

Table 1: Composition of stormwater runoff

Pollutant	Minimum concentration	Maximum concentration	Average concentration	Phase distribution
Zinc	1.1 mg/L	13.8 mg/L	4.1 mg/L	Phase distribution was divided between particulate (44.8%) and dissolved (55.2%). <i>Major pollutant in stormwater runoff for this catchment.</i>
Copper	0.28 mg/L	1.6 mg/L	0.44 mg/L	Phase distribution was 62.1 % particulate and 37.9% dissolved.
Lead	0.19 mg/L	1.7 mg/L	0.54 mg/L	Phase distribution dominated by the particulate phase (79.3%).

Table 2: Composition of roof runoff

Pollutant	Minimum concentration	Maximum concentration	Average concentration	Phase distribution
Zinc	1.5 mg/L	84 mg/L	11.2 mg/L	Phase distribution dominated by the dissolved phase (65.1%) at the beginning of the rain event and almost 94.3% during the remaining rain event. <i>High amounts of zinc were washed off from the zinc roof surface during all rain events</i>
Copper	0.04 mg/L	7.1 mg/L	0.30 mg/L	<i>The copper concentration in roof runoff, mainly originated from dust deposit between rain events</i>
Lead	0.06 mg/L	4.5 mg/L	0.36 mg/L	Phase distribution dominated by the particulate phase at the beginning of the rain event (87.4%) and reduced to almost 62% for the remaining of the rain event. <i>High values of lead are believed to result either from the material used to seal zinc sheets or from lead polluted dust.</i>

These results were significant in that they dictated that, in order to achieve the required discharge limits (Table 3), GHD's proposed multi barrier stormwater treatment system would require sophisticated treatment steps that are able to remove different heavy metals and cope with extreme variability in terms of concentration and phase distribution.

Table 3 Discharge Water Quality Criteria

Parameter	Total Concentration	Dissolved Concentration
Copper (mg/L)	0.1	0.1
Lead (mg/L)	0.1	0.1
Zinc (mg/L)	2.0	0.57
pH	6.0-9.0	
Total Suspended Solids (mg/L)	100	
Arsenic (mg/L)	0.1	0.045
Cadmium (mg/L)	0.05	0.05
Ammonia (mg/L)	0.91	0.91

