THE SUCCESSFUL USE OF GEOTUBES FOR EMERGENCY SOLIDS HANDLING

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ABSTRACT

The Lowood Water Treatment Plant is located in South East Queensland and sources its raw water from the mid Brisbane River. Leading up to the January 2011 flood, the area received a large amount of rainfall. This impacted sludge handling by restricting the ability to get sufficient drying time for the 10 drying beds, which hold approximately 40m^3 of wet sludge each. During normal dry conditions, the drying beds are an efficient method of sludge handling at the plant, with two beds being on duty at a time. It would take approximately two weeks for the beds to fill (depending on raw water quality and production rates), then it would take approximately three weeks to dry during summer and four to six weeks to dry during winter.

1.0 INTRODUCTION

Following months of wet weather and a number of floods, the amount of sludge being produced from the plant dramatically increased due to the highly turbid water, which at one point reached as high as approximately 4,000 NTU in 2011 and 9,000 + in 2013. The introduction of the geotubes was a more cost effective way of dealing with the sludge handling compared to using liquid waste trucks to empty the drying beds or that of the cost of a environmental breach. A pair of drying beds filled in a matter of days, when they would usually take two to three weeks to fill, and the lack of dry weather really slowed down the drying process and increased the time needed for the beds to dry out. Something had to be done and it was decided to investigate the option of using geotubes.

2.0 DISCUSSION

On 10 March 2011, the first geotube was installed at Lowood WTP. The geotube provided some relief to the operators at the plant, but it quickly became apparent that this was not enough. Due to the small size of the geotube, the operators were only able to use it for two to three days at a time before having to switch back to the drying beds. The geotube would reach its maximum expansion within three days and would have to be turned off to allow the water to pass through safely. It was noticed that if the geotube was left on for too long, that sludge would start to pass through the geotube.

Prior to sludge entering the geotubes, a small amount of polymer is added to help the sludge bond together and separate itself from the water. When the geotube first came online, the operators noticed a small amount of sludge escaping the geotubes. It was discovered that they take a couple of days before conditioning and working to their full effect. The geotube began holding all visible sludge, allowing a clear effluent to pass through and drain back to the recovery tank for recycling through the plant.

On 10 May, a second geotube was added. Along with geotube number 1, sludge flow was diverted through both geotubes, allowing the operator to leave them on for up to two weeks before they expanded to their maximum. On 11 October a third, larger geotube was installed and was able to handle the volume of sludge on its own with no difficulty. The geotubes have been a saviour for the sludge handling and the operators definitely acknowledge the great workload they had been saved from undertaking.

The geotubes were then used on and off for up to for up to six months during more favourable weather conditions, giving the drying beds a chance to dry out and the solids to be taken away.

Figure 1: ***Photo showing geotube cut open for disposal***

As part of a Flood Resilience Scheme adopted by Seqwater, a project to implement a solids handling upgrade on site was planned, requiring the existing 3 geotubes to be removed. On 3 May 2013, the geotubes that were installed two years prior were taken offline, and on 24 May they were cut open to help with the drying process. Two months later, approximately 400m^3 of dried sludge from the geotubes was trucked off site to landfill.

On 28 May 2013, a project to construct a more permanent bunding and geotube system began. Whilst the upgrade was in progress, bobcat access to enter the drying beds to clear the dried sludge was blocked, and again we had a sludge handling issue. The issue was managed with the help of liquid waste removal trucks and we were able to remove the wet sludge from the drying beds before they had a chance to dry. During this time, an estimated 900kL was removed from the closest beds, away from the earthworks so we did not to hinder the progress of the contractors.

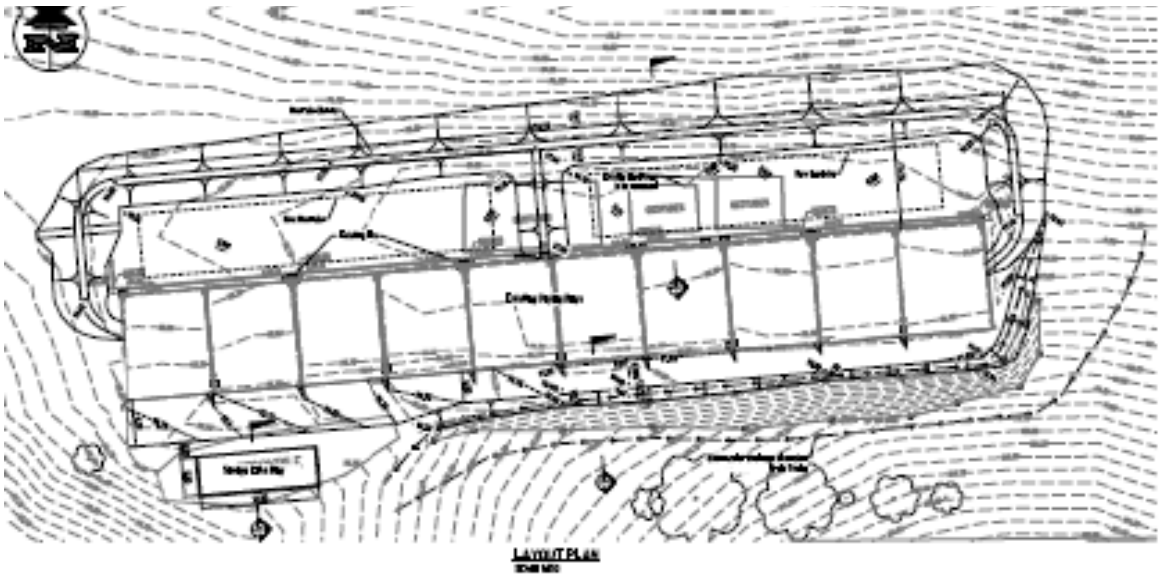

Figure 2: ***Overview of sludge beds and geotubes***

The project for the interim sludge upgrade included the following:

- installing two 45m long additional geotubes to provide for 1300 m^3 sludge storage capacity
- bunding around the geotubes.
- concreted sludge cake bay to allow for storage of dried sludge
- upgrading the access track to the sludge drying and handling area; and
- contouring the area surrounding the sludge drying and handling areas to minimise stormwater runoff into the sludge drying beds, geotubes and sludge cake bay.

The geotubes are supported on an earth base that is lined with a polymer membrane and a top layer of 100mm of gravel. The bund walls were constructed from excavated soil, combined with imported clay to act as a natural sealer.

During the time of geotube installation the weather also was not very favourable, with three weeks of rain hindering the project and delaying the earth works. With the first of the two geotubes installed and completed, we began to commission the system. To pump the sludge to the geotube, we used the existing sludge pumps that feed the sludge drying beds. These are two submersibles that pump between 7-12 L/sec with valves used to divert the flow between the geotube and drying beds. Using a similar process to the first 3 geotubes, polymer was dosed to help separate the water from the solids. Polymer LT25 was added at a dose rate of 0.25 mg/L. A ripening period was also needed with the big geotube, which took approximately one week before clean effluent passed through, leaving the sludge behind.

Figure 3: ***New geotube being commissioned***

3.0 CONCLUSION

After a hectic couple of years of dealing with adverse conditions with solids handling, staff can only say that without the help of these geotubes there would have been environmental issues and a huge operational cost to cart mud offsite. The geotubes also ensured the continued operation of the WTP when mud production was high.