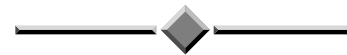


**BUNDABERG FLOODS NOW THE MUD HAS DRIED –
FLOOD RECOVERY AT MILLBANK WWTP**



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ABSTRACT

In December - January of 2010/11, Bundaberg experienced its worst floods in 60 years with floodwaters from the Burnett River inundating hundreds of homes.

The floods had major impacts on the capability of the six (6) Bundaberg Regional Council (BRC) coastal wastewater treatment plants (WWTPs) consisting of – (Bargara, Coral Cove, East, North, Thabeban & Millbank). Average Dry Weather Flow for each respective WWTP is shown in Table 1. This paper focuses on the Millbank Wastewater Treatment (WWTP) as it was the most affected and provides an overview of the impacts, the recovery process, costs and improvements.

Table 1: *Average Dry Weather Flow for Coastal WWTPs*

BARGARA WWTP	CORAL COVE WWTP	EAST WWTP	NORTH WWTP	THABEBAN WWTP	MILLBANK WWTP
ADWF (ML/d)	ADWF (ML/d)	ADWF (ML/d)	ADWF (ML/d)	ADWF (ML/d)	ADWF (ML/d)
1.9	0.2	7.0	0.3	0.8	4.0

1.0 INTRODUCTION

The City of Bundaberg with a population of 48,000 is the centre of the Local Government Area of Bundaberg Regional Council (BRC) being the major centre within the broader Wide Bay-Burnett geographical region. The city lies on the Burnett River, approximately 380 km north of Brisbane and 15 km inland from the coast. Bundaberg is located in the heart of a rich sugar and horticultural belt supported by a growing manufacturing sector.

The Burnett River catchment area covers approximately 33,000 km². The river rises close to Mount Gaeta, east of Monto, flowing in a general southerly direction past Eidsvold and Mundubbera. Downstream of Mundubbera, the river swings east, going through the townships of Gayndah and Wallaville before entering the city of Bundaberg. The river flows into the ocean at Burnett Heads, roughly 20 km from Bundaberg.

Paradise Dam, also known as Burnett Dam, is located on the Burnett River. The dam is situated approximately 80 km south-west of Bundaberg. The Paradise Dam scheme supplies water for the Bundaberg Irrigation areas on the lower Burnett.

The Millbank Wastewater Treatment Plant (WWTP) is located on Duffy St south of Bundaberg. Treated effluent from this plant is discharged via gravity into the Burnett River. The Millbank WWTP is an extended aeration plant with an average dry weather

flow (ADWF) of 4 ML per day. The old biological trickling system was decommissioned in April 2005.

All biosolids produced from the Millbank WWTP are beneficially used on agricultural land for soil conditioning under a beneficial use authority. The ADWF for the Millbank WWTP just prior and preceding the 2010/2011 flood is shown in Table 2.

Table 2: *Millbank WWTP ADWF – July 2010 to Jun 2011*

Flow (ML)	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Total Flow	109	116	115	112	108	292	189	101	137	111	106	95
Max Day	4.6	6.8	9.5	4.8	4.3	36.4	13.1	4.1	11.9	6.2	4.2	3.4
Min Day	3.1	3.3	2.9	2.8	3.3	3.7	3.7	2.8	3.1	3.0	3.0	2.8

2.0 BEFORE THE FLOODS

Emergency counter disaster planning commenced when the Burnett River height data from the Bureau of Meteorology activated the Bundaberg Emergency Disaster Group. Initial counter disaster planning meetings were held with treatment plant staff, trade services and management to discuss actions and priorities. The first actions were based on the removal of equipment from the low lying areas where flood waters would affect those parts of the Millbank WWTP. Strategies were put in place such as the removal of electrical motors on Return Activated Sludge (RAS) pumps and all pump motors at the chlorination chamber.

Initial flood warning modelling information suggested that only the low lying areas of the Millbank WWTP would be affected. Initial removal actions were completed on the 24/12/2010 just prior to first minor inundation. The Millbank WWTP electrical supply and associated electrical equipment was isolated. The 920kg chlorine drums were isolated and chained down as at that time the peak of the flood was only going to affect that area of the plant. The final effluent coliform counts were high during this time of no chlorination however all other final effluent quality parameters were compliant to the authority release limits.

Little did anybody know at this time, what were we in-store for? What height the flood waters would peak? Or what damage to infrastructure would occur?

Due to these events occurring right on the Christmas break along with the expected flood peak to be a lot higher there was concern in relation to having adequate staff available. Contact was made with all BRC treatment & trade services staff to nominate their availability to be on standby, ready to come back to work when and if required. Response was so outstanding to the callback request that Council concerns in relation to having available staff were totally allayed.

Then the perfect storm hit with heavy rainfall throughout most of waterlogged Burnett catchment where over 300 mm was recorded in some parts between 9am on 26/12/2010 and 9am on 29/12/2010. The southern part of the Burnett catchment later received further heavy rains between 9am on 07/01/2011 and 9am on 13/01/2011 causing a second flood

peak resulting with inundation of the chlorination chamber area. Millbank WWTP locality is shown in Figure 1.



Figure 1: Millbank WWTP Site

3.0 FLOOD HISTORY

Major floods have been recorded in Bundaberg since 1875 with the most recent event in December 2010 when the river rose to 7.92 metres which is about 5.7 metres above the Highest Astronomical Tide level. Major flooding in the Burnett River is relatively rare but as we experienced, can occur under favourable meteorological conditions from tropical low pressure systems resulting in heavy rain throughout the catchment area. Bundaberg flood peaks as recorded are shown in Figure 2.

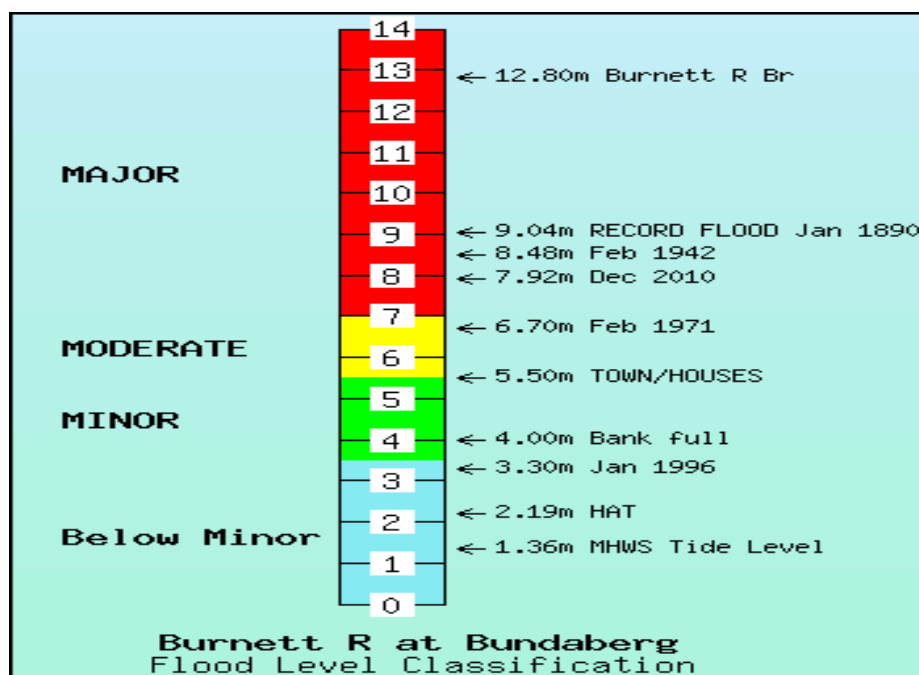


Figure 2: Bundaberg Flood Peaks

4.0 DURING THE FLOODS

By 28/12/2010 flood waters had cut-off vehicle access to the Millbank WWTP. As a result, the removal of further equipment and assets could not be undertaken. The main sub-board that was located on higher ground at the plant was turned off at this time. On 29/12/2010, Council received revised estimates for the flood peak estimated to reach between 7.0 to 7.5 metres. At this time it was decided to have Ergon disconnect the main power supply to Millbank WWTP and the Duffy St Sewerage Pumping Station (SPS). The Duffy St (SPS) is located on the access road to the Millbank WWTP.

The Millbank WWTP catchment sewerage pumping stations were all experiencing large inflows with associated high inflow to the Millbank WWTP. It was considered that there was capacity to catch gross solids at the Millbank WWTP as well as to limit sewerage overflows in Bundaberg suburbs. On 30/12/2010, the Parks & Gardens boat was used to undertake visual inspections and take photos where possible of the Millbank WWTP. During the floods the approximate flows were around 37ML per day. By this time the river had peaked at 7.92 metres. The Millbank WWTP during this flood peak is shown in Figure 3.



Figure 3: Millbank WWTP at Flood Peak

5.0 AFTER THE FLOODS

As soon as the flood waters had receded enough to allow vehicle access the treatment plant, clean-up started. All the assets affected by the floods were accessed and all work was prioritised. The prioritisation was captured on a decision matrix to assist the process. The prioritisation matrix is shown in Table 3.

As expected, the main flood damage was to the electrical switchboards and electrical motors that could not be removed prior to the flood. Clean up, inspections of assets along with cost estimation for emergent repairs and overall cost of repairs was undertaken. Emergent repairs to get the plant back on-line included:- replacement of relays, contactors, circuit breakers, momentum I/O blocks, hour meters, timers, protection

equipment, reinstating electrical motors, repacking bearings and replacing oil in gear boxes.

The emergent repairs effectively had the plant operating the main process equipment such as aerators and pumps. BRC's Trade Services electrical and metal trades section performed all the repairs. Treatment plant operations staff assisted in the repairs and all the clean-up of the mud and debris on the site as well as the secondary sedimentation tank, chlorine tanks, buildings and around the grounds of the plant.

Table 3: Millbank WWTP Emergent Work Prioritisation Table

Priority List					
Coastal Group	Priority			1=	Immediate
Millbank WWTP				2 =	High
Aerators	1			3 =	Medium
Sec Sed Tanks	1			4 =	Low
RAS Pumps	1				
Wash Water Pumps	2				
Recirc Pumps	2				
Cl2 Dosing	2				
Millbank WWTP - Oxygen Injection	3				

After the initial emergency work was completed and the treatment plant was operating, the next stage was the restoration work that was needed such as flow meters, replacement of panel equipment, transmitters, on-line chlorine dosing equipment and replacement of damaged fencing to secure the treatment plant site. Improvements works are still ongoing as these items are budgetary such as complete replacement of switchboards and relocating to the top of the aeration basin, raising switchboards and relocating the RAS - VSD's so they are above flood levels.

The overall cost of emergent repairs to electrical equipment only was approximately \$180,000, replacement of fencing \$30,000, labour cost for clean up approximately \$24,000. The overall flood damage bill for the Bundaberg area was approximately \$60M.

6.0 CONCLUSION

Considering the devastation the floods had caused and the timeframe to have the Millbank WWTP up and working again in such a short time, whilst also attending to other infrastructure in the Bundaberg Region has demonstrated that having well trained dedicated staff and equipment in place made the recovery after the floods a lot easier. It also highlighted where improvements can be made in the planning of a disaster such as -: carrying essential spares and where possible, installing equipment such as electrical items above flood levels. The devastating floods in December 2010 and January 2011 and the subsequent cost of repairs has placed a strain on Councils resources. These repair costs will continue due to shortened asset life of many passive and active assets resulting in unexpected and increased costs for many years.

7.0 ACKNOWLEDGEMENTS

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