

BENEFICIAL USE OF BIOSOLIDS ON AGRICULTURAL LAND IN THE BUNDABERG REGION



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ABSTRACT

Bundaberg Regional Council (BRC) has established a Beneficial Use of Biosolids project where biosolids produced at BRC's Wastewater Treatment Plants (WWTP) are used as a soil conditioner on agricultural land in the Bundaberg region. BRC has taken on all risks and responsibilities for the management of this project including biosolids analysis, soil analysis, calculation of application rates, spreading and incorporation of material into the soil and GPS tracking of application areas.

This paper will outline the key aspects of this project including;

- Previous disposal methods
- BRC's responsibilities
- Details of beneficial use project, and
- Future of the project.

It will also outline BRC's first 2 years of managing this project and where BRC is intending this project to head to in the next 5 years.

1.0 INTRODUCTION

BRC operates 9 WWTP's throughout the region which service a population of approximately 80,000 people. Of the nine (9) WWTP's, six (6) of these WWTP's produce biosolids which require disposal. The solids from the remaining three (3) WWTP's are transported to a nearby WWTP for further processing.

The sustainable disposal of biosolids has been an issue for BRC due to its location and treatment processes. Council has previously investigated a number of disposal options in an attempt to find a sustainable solution. Unfortunately all previous disposal methods proved to be unsustainable for BRC to continue. Due to this, BRC has decided to manage all operations relating to the management of the beneficial reuse of biosolids throughout the Bundaberg Region.

2.0 WHAT ARE BIOSOLIDS

Biosolids are the solid component produced during the biological treatment of wastewater. Biosolids are a mix of water and organic material typically between 10% and 20% dry weight solids. Biosolids have a number of components which have been proven to be beneficial for soil health. These include;

- Organic Carbon
- Macronutrients (Nitrogen, Phosphorous and Potassium) and
- Micronutrients (Copper, Zinc and Calcium).

3.0 BIOSOLIDS PRODUCED BY BUNDABERG REGIONAL COUNCIL

Council uses different technologies throughout the region to treat sewerage generated throughout the various WWTP plant catchments. All WWTP catchments are predominantly made up of residential inputs with minimal inputs from heavy industry. Table 1 details the various processes used in the treatment of sewerage and the production of biosolids by BRC.

Table 1: *Summary of WWTP's where Biosolids are sourced*

Treatment Plant	Treatment Plant Type	Stabilisation Process	Dewatering Process
Bundaberg East	2 x Trickling Filter Plants and 1 x Activated Sludge	Anaerobic Digestion	Drying Beds
Millbank	Activated Sludge Plant	Extended Aeration	Belt Filter Press
Thabeban	Activated Sludge Plant	Lagoon	Lagoons
Bargara	Activated Sludge Plant	Lagoon	Belt Filter Press
Childers	Activated Sludge Plant	Anaerobic Digestion	Drying Beds
Gin Gin	Trickling Filter Plant	Anaerobic Digestion	Drying Beds

4.0 REGULATION OF BIOSOLIDS BENEFICIAL USE IN QUEENSLAND

The beneficial use of biosolids throughout Queensland is regulated by the Department of Heritage Protection (DEHP) under the *Waste Recycling and Reduction Act 2011* and its subordinate legislation. Queensland has adopted the New South Wales Environmental Protection Authority Environmental Guidelines: Use and Disposal of Biosolids Products (2000), to provide guidance in conducting beneficial use projects.

5.0 PREVIOUS DISPOSAL METHODS

Historically, Council has used a number of options to dispose of biosolids including landfill disposal, composting, and soil conditioning (predominantly by third party contractors). These disposal methods continually faced a range of issues regarding different sludge types, disposal locations and regulating how the material was being used.

Previous disposal methods used by BRC have cost in excess of \$200,000 per annum. These methods proved to be financially unviable for council to continue. Subsequently, Council began looking at different options for the disposal of biosolids.

6.0 SUITABILITY OF REGION FOR BIOSOLIDS REUSE

An evaluation of the Bundaberg region was undertaken by BRC to assess the suitability for the reuse of biosolids. The evaluation criteria included;

- Regional landscape
- Cropping types
- Previous industry research and
- Cost effectiveness.

This evaluation determined that the beneficial use of biosolids as a soil conditioner for agricultural and land rehabilitation purposes are a viable option for BRC to pursue. The Bundaberg region's agricultural landscape is suitable for the beneficial use of biosolids.

7.0 DETAILS OF BENEFICIAL USE PROJECT

Once the suitability of the Bundaberg region was determined, BRC began negotiating with various landholders to develop beneficial use agreements for the use of biosolids on selected land. Council entered into an agreement with Bundaberg Sugar to trial the use of biosolids on various properties throughout the region. In addition to the current beneficial use agreement with Bundaberg Sugar, BRC also identified an additional landholder through a tender process. BRC subsequently entered into a beneficial reuse agreement with this landholder at the end of 2012.

Council has a Beneficial Use Approval for the application and incorporation of biosolids onto specified land. This approval was based on various aspects of the project including;

- Suitability of the land for beneficial use
- Development of a Farm Management Plan and
- Biosolids Application Rates (Nitrogen Limited Biosolids Application Rate (NLBAR), Phosphorus Limited Biosolids Application Rate (PLBAR) and Contaminant Limited Biosolids Application Rate (CLBAR)).

7.1 Activities Undertaken by Council

To minimise risk, BRC controls the beneficial use of biosolids from source through to application. These activities include;

- Maintaining Beneficial Use Approval with DEHP
- Development and implementation of procedures and processes
- Identification of on-site control measures
- Soil and biosolids analysis
- Determination of biosolids application rates and
- Spreading an incorporation of biosolids.

In order to conduct the above activities, BRC purchased all necessary equipment to conduct operations including;

- Tractor (Figure 1)
- Manure Spreader (Figure 1) and
- Offset disks.



Figure 1: *BRC's Tractor and Manure Spreader*

7.4 Results of Trials

During the 2012 cane harvesting season the first application block was harvested, which allowed Council to assess any changes in crop production due to biosolids application. These results were compared to a neighbouring block which had not received biosolids prior to the planting of sugar cane. The results showed a 35% increase in tonnage with a minor reduction in Commercial Cane Sugar (CCS). The results are detailed in Table 2.

Table 2: *Results from Sugar Cane Trial*

Block Type	Tonnes of Sugar Cane Per Hectare	Commercial Cane Sugar
Biosolids	87	16.5
Non- Biosolids	64	16.9

Initial discussions with the landholder have indicated that the increase in tonnage can be attributed to an initial release of nitrogen. This allowed the plant cane to produce more shoots subsequently resulting in a higher tonnage. However, there are still a number of variables relating to the initial trial block which may have contributed to these results. As further application blocks are harvested and comparisons are made with non-application blocks, BRC will continue to gain a greater understanding of the benefits of biosolids application to agricultural land.

8.0 CONCLUSION

Throughout the duration of this project BRC and landholders have seen positive results regarding improvements to agricultural land quality and crop yields. During the next five (5) years BRC is planning to continually develop, expand and improve the current beneficial use project. This will be done by;

- Continual engagement with the agricultural community
- Securing sufficient land for beneficial use
- Continue to review results from trials and
- Follow-up services with landholders to identify benefits and issues with biosolids application.

BRC are confident that over the next five (5) years there will be significant improvement in the operations supporting this project.