

Environmental Management System

Lakes Management Operating Procedure

1. Scope

This policy is limited to the lakes contained within The University of Queensland campuses and excludes lakes operated as part of an Environmentally Relevant Activity.

2. Objectives

- To ensure that the lakes are managed in a way that enhances the diversity of flora and fauna in accordance to national and state best practice guidelines for water quality;
- To conserve biodiversity of flora and fauna within the ecosystem;
- To ensure the lakes are aesthetically pleasing; and
- To ensure that water applied to irrigated areas does not impact on the long term sustainability of the soil structure and underground water systems.

3. Environmental Monitoring

There are two goals for environmental monitoring, the first is to protect aquatic ecosystems and human health while maintaining an aesthetically pleasing lake environment and the second is to ensure that the water used for irrigation is an acceptable quality to ensure the long term sustainability of the soil structure and underground water where the water is being irrigated.

3.1 *Monitoring*

Lake Quality

To achieve the first goal, the following guidelines should be used. The tables list the performance indicators and the default trigger values outlined in the Australia and New Zealand Guidelines for Fresh and Marine Water Quality (2000) as well as the recommended sampling frequency.

Table 1 is relevant to fresh water while Table 2 is relevant to effluent water.

Water Quality for Irrigation

Further parameters are required to be sampled where the water in the lakes is used for irrigation purposes and these are outlined in Table 3.

Specific management practices are required when treated effluent is used for irrigation. More detailed information can be found in the Irrigation Operating Procedure and the Irrigation Management Plan.

Table 1.0 Condition and Performance Indicators for Slightly Disturbed Ecosystems – Sampling Parameters for Freshwater Lakes.

Issue	Condition Indicator/target	Performance Indicators	Default value	Trigger	Sampling frequency
Nuisance aquatic plants	Species composition Cell numbers Chlorophyll a conc	TP conc TN conc Chl a conc	0.010 mg/L 0.35 mg/L .005 mg/L		6 monthly
Unnatural change in salinity	Species composition/abundance	EC Effective conductivity	1500 μ s/cm* <1% * DPI 2003		6 monthly
Unnatural change in pH	Species composition/abundance	pH	6.5-8		6 monthly

possibility that other pathogenic (disease causing) organisms may be present.	an indication of faecal material	E-Coli	<1000 org/100ml	6 monthly
Lack of DO	Reduced DO Conc Species composition/abundance	DO Conc	90-110 % saturation >6 mg/L*	6 monthly

ARMCANZ/ANZECC 2000

Default trigger values are the values from which monitoring results are compared. If analysis shows that a value is outside the default trigger value, further action may be necessary to determine the cause and effect.

Table 2.0 Condition and Performance Indicators for Slightly Disturbed Ecosystems – Sampling Parameters for Treated Effluent Lake

Issue	Condition Indicator/target	Performance Indicators	Default Trigger value	Sampling frequency
Unnatural change in pH	Species composition/abundance	pH	6.5-8	monthly
possibility that other pathogenic (disease causing) organisms may be present.	an indication of faecal material	E-Coli	<1000 org/100ml	Monthly/ weekly if a high reading is detected until a return to low level.
Limited light penetration through water, and silting of the benthic (bottom) environment.	Species composition/abundance	SS	≤ 30 mg/L	monthly
Nuisance aquatic plants	Species composition Cell numbers Chlorophyll a conc	TP conc TN conc Chl a conc	0.010 mg/L 0.35 mg/L .005 mg/L	6 monthly
Unnatural change in salinity	Species composition/abundance	EC	1300 µs/cm* <1% * DPI 2003	6 monthly
Poor optical properties	Species composition/abundance	Turbidity Light regime	1-20 NTU	6 monthly
	density and diversity of the periphytes and macrophytes.	FRP	.005 mg/L	6 monthly
		N _{ox}	.010 mg/L	6 monthly
Toxic effects on aquatic organisms and often serves as the secondary source of nitrogen for plant life.	Species composition/abundance	NH ₄ ⁺	.010 mg/L	6 monthly
Can cause the death of fish species	indicator of the organic material present in the sample	BOD		6 monthly

ARMCANZ/ANZECC 2000

Water Quality audits should be conducted in accordance with the Australian Guidelines for Water Quality Monitoring and Reporting (2000) or other equivalent standard. There should be an initial check for the following trace elements Al, As, B, Be, Cd, Co, Cr, Cu, F, Fe, Li, Hg, Mn, Mo, Ni, Pb, Se, V and Zn. If significant levels are detected then annual monitoring should occur.

Table 3.0 Sampling Parameters for Irrigation Waters (Stormwater and Effluent Lakes)

Parameter	Guideline value	Bi-Annually
TDS	2000 mg/L	<input checked="" type="checkbox"/>
SAR	<6	<input checked="" type="checkbox"/>
Residual Alkali	2.5 meq/L	<input checked="" type="checkbox"/>
Na	900 mg/L	<input checked="" type="checkbox"/>
Ca	400 mg/L	<input checked="" type="checkbox"/>
Mg	60 mg/L	<input checked="" type="checkbox"/>

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K	40 mg/L	<input checked="" type="checkbox"/>
Cl	1100 mg/L	<input checked="" type="checkbox"/>
SO ₄	1000 mg/L	<input checked="" type="checkbox"/>
TKN		<input checked="" type="checkbox"/>
oxidised N		<input checked="" type="checkbox"/>

Department of Primary Industries, 2003

http://www.dpi.qld.gov.au/cps/rde/xchg/dpi/hs.xsl/26_4347_ENA_HTML.htm

Extra monitoring of all these parameters should occur if there is a significant change in detention time in a water storage reservoir or if the initial analytical results are outside guideline values.

3.2 Monitoring of Ecosystem

Intermittent monitoring of the vegetation in the lake ecosystems will occur via work done by the Specialist Gardener for the Lakes areas at St Lucia and Gatton and periodically by Schools or Centres within the University.

3.3 Eutrophication Control

Eutrophication is detrimental to the aquatic life and is compounded by large day/night dissolved oxygen concentration changes due to photosynthesis and respiration. Algal blooms tend to occur if the concentration of nutrients such as inorganic nitrogen and phosphorous exceed threshold values.

Preventing runoffs rich in nutrients (ie. phosphates and nitrates) reaching lakes can reduce the likelihood of an algal bloom, however blooms are quite common in open storages and it is therefore important to recognise a bloom and treat it accordingly. Irrigation should be ceased if an algae bloom occurs until the algae can be identified and tested for toxins. Toxins present in algae can cause mild to severe symptoms for those who come into contact with the water or for animals who drink the water. In addition algal blooms can block filters and irrigation networks.

3.4 Pest Control

- Implement controls to reduce likelihood of exotic species becoming established in the existing ecosystem; and
- Control the population of exotic species already present in the ecosystem.

Measures presently in place include a poisoning schedule for certain exotic species, harvesting of weeds on the lakes and removal of Chinese elms (weed) from around the lakes.

3.5 Vegetation Buffer Zones

Vegetation (ie. grass areas) shall be maintained around lakes to comply with the following conservation principles:

- To avoid erosion of soils and lake banks;
- To hold and reduce the nutrient input of possible runoffs into the lakes; and
- To maintain and enhance the biodiversity of the local ecosystem.

4. Enquiries

Any enquiries with respect to lake management shall be addressed to personnel as follows:

Table 3. Contact Personnel at The University of Queensland.

Campus	Department	Contact	Telephone
St Lucia and Gatton	Property and Facilities Division	Senior Supervisor Grounds	(07) 336 <u>52747</u>
Pinjarra Hills Farm Mt Cotton Farm	Various	Farm Managers	

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5. Definitions

5.1 Ecosystem

Ecosystem is defined as “A holistic concept of the plants, the animals habitually associated with them and all the biological, physical and chemical components of the immediate environment or habitat which together form a recognisable self-contained entity.”

5.2 Biodiversity

Biodiversity is defined as “The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.”

5.3 Eutrophication

Eutrophication is defined as “The enrichment of waters with nutrients, primarily phosphorous, causing abundant aquatic plant growth and often leading to seasonal deficiencies in dissolved oxygen.”

6. References

- ANZECC/ARMCANZ 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality
- Environmental Protection Act 1994
- Environmental Protection (Water) Policy 2009
- Environmental Protection Agency- Queensland Water Recycling Guidelines 2005
- Water Act 2000
- Natural Resource Council Ministerial Council and Primary Industries Ministerial Council, Australian Guidelines for Water Quality Monitoring and Reporting 2000

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