

WWS CCP PROCEDURE

Coagulation, Sedimentation & Filtration – Nebo Rd



Issue Date: 19 May 2016
To be Revised: 19 May 2017

1 Introduction

Mackay Regional Council (MRC) operates three conventional drinking water treatment plants (WTPs); Nebo Road WTP, Sarina WTP and Marian WTP.

Coagulation and flocculation are an essential part of the treatment process, as they bind the impurities and contaminants in water into floc particles to allow effective removal by settling and filtration.

Filtration is an essential part of the treatment process as it is the last physical solids removal step in the treatment train, thus it is important for removing contaminants such as oxidised metals, coagulated organic contaminants and pathogens which are resistant to chlorine such as *Giardia* and *Cryptosporidium* cysts.

1.1 Purpose and Scope

The purpose of this procedure is to outline the management requirements for coagulation, flocculation and filtration at Nebo Rd WTP. It also includes the hazards and controls that must be considered and addressed when carrying out this work.

1.2 References

- National Water Quality Management Strategy, Australian Drinking Water Guidelines, 2011, NHMRC/ NRMCC
- Treatment Plant Operations Manuals
- MRC Monitoring Program
- DWQ Incident Reporting Process

2 Definitions

- Coagulation and flocculation - Chemical dosing of coagulant, and possibly polymer, and mixing energy to create and develop suitably sized floc particles
- Filtration - Process in which particulate matter in water is removed by passage through porous media
- Turbidity breakthrough - The passing of particles through the filter media, indicated by an increase in filtered water turbidity
- Filter ripening - Early stages of a filter run, where filtered water turbidity from an individual filter drops from elevated post-backwash levels to typical levels
- DEWS - Department of Energy and Water Supply (formerly DERM – Department of Environment and Resource Management)
- CCP – Critical Control Point
- MRC – Mackay Regional Council
- HACCP – Hazard Analysis Critical Control Point
- WTP- Water Treatment Plant
- OWSR – Office of the Water Supply Regulator
- QLD Health - Queensland Health Public Health Unit

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3 Responsibilities and Authorities

Position	Responsibilities and Authorities
Operator	<ul style="list-style-type: none"> • Monitor and optimise treatment processes • Respond to alert and critical limit alarms • Record and report information to Supervisor and Treatment Engineer
Supervisor	<ul style="list-style-type: none"> • Organise resources • Make decisions about treatment processes • Record and report information to Treatment Engineer
Treatment Engineer	<ul style="list-style-type: none"> • Assist Supervisor in analysis and decision making • Communicate issues to Manager Treatment and other MRC staff • Make decisions about treatment processes • Assist with follow-up sampling and further investigations
Senior Environmental Officer &/ Environmental Officer	<ul style="list-style-type: none"> • Communicate issues to external stakeholders e.g. DEWS, QLD Health • Complete Incident Reports
Manager Treatment	<ul style="list-style-type: none"> • Ensure correct procedures and protocols have been followed by operational staff • Assist with communication to external stakeholders • Communicate issues to Management Team

4 Monitoring

Monitoring of Nebo Rd WTP coagulation, flocculation and filtration processes is carried out as detailed in the MRC Monitoring Program.

For CCP purposes, the performance of the abovementioned processes is measured in terms of a turbidity analysis on a grab sample of filtered water or from an online turbidity meter.

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4.1 Performance Targets

CCP monitoring, performance targets and the alert and critical limits set for this CCP are shown in Table 4-1.

The validation (background) for the selection of these performance targets is as follows:

- **Target** – Filtered water turbidity of 0.15 NTU and <0.3 NTU is the expected performance of the Nebo Road WTP respectively;
- **Alert Limit** – Poor coagulation and flocculation and failure to meet best practice filtered water turbidity levels;
- **Critical Limit** – Based on Australian Drinking Water Guideline (2011) recommendation that turbidity <1 NTU is 'desirable at the time of disinfection'.

Table 4-1: Filtered Water Turbidity Operational Targets

Scheme/WTP	Location	Frequency	Target Limit	Alert Limit	Critical Limit
Mackay Nebo Road WTP	Filter Outlet	Daily	0.15 NTU	>0.3 NTU In any one sample	>1.0 NTU In any one sample
		Continuous	0.15 NTU	>0.3 NTU For 15 min	>1.0 NTU For 5 minutes

4.2 Corrective Actions

If operational monitoring shows the CCP parameters are in the alert or critical limit range, the corrective actions to be followed are as outlined below:

Table 4-2: Corrective Actions

Step	Actions	Responsibility
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Step	Actions	Responsibility
1. Confirm result	<ul style="list-style-type: none"> • Undertake a follow-up grab sample analysis to confirm the measured level. <ul style="list-style-type: none"> i. If follow-up grab sample analysis confirms the CCP limit range, investigate the cause of the incident (Step 2). If the Critical Limit is confirmed as being breached cease supply to the town and notify the Supervisor and Treatment Engineer immediately. ii. If discrepancy between readings, confirm correct sampling and analysis procedure and check settings and calibration of instrument then re-sample and repeat Step 1. iii. If follow-up grab sample analysis shows turbidity is back within target range, continue to monitor process closely and record and report the incident (Step 5). 	Operator
2. Investigate cause of incident	<ul style="list-style-type: none"> • Check online turbidity trend. • Check sample line and its connections. • Check the WTP flow rate is appropriate for efficient process performance. • Check filter trend and run time. • Check filter headloss. • Check last filter backwash was carried out properly. • Check coagulation/flocculation chemical quality and level in storage/dosing tank. • Check settings and performance of the coagulation/flocculation dosing system. • Check whether coagulation/flocculation dosing system control system is working. • Check raw water pH and alkalinity. • Check for blockages and wear. 	Operator
3. Address cause of incident	<p>Take the appropriate steps to rectify any problems.</p> <p>If, after the actions are undertaken, the turbidity returns to the target level, continue to monitor process closely and record and report the incident (see below)</p>	Operator

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Step	Actions	Responsibility
4. Assess need for shutdown/ Isolation	If the correct turbidity cannot be maintained, assess the need for shutdown and isolation of the WTP.	Operator, Supervisor, Treatment Engineer
5. Report and record incident details	<ul style="list-style-type: none"> Notify the WTP Supervisor and Treatment Engineer of the incident. Record the details of the CCP limit incident in the WTP logbook. 	Operator
	Communicate with other staff as required to organise follow-up sampling and further investigation and rectification of cause of incident.	Supervisor, Treatment Engineer, Manager Treatment
	<p>If a critical limit incident, assess the need to communicate the incident to DEWS.</p> <p>If DEWS notification is required ensure notification occurs within 3 hours and complete an Incident Report Form that is to be submitted to DEWS within 24 hours.</p> <p>If DEWS notification is not required complete an internal incident record in the incident register.</p> <p>Follow the steps outlined in the DWQ Incident Reporting Process.</p>	Treatment Engineer, Manager Treatment, Senior Environmental Officer &/ Environmental Officer

5 Records

General records required to be kept for CCP alert limit or critical limit incidents are:

- Written in the logbook/spreadsheet; and
- Written (email) or verbal (telephone) notification to Supervisor and/or Treatment Engineer.

6 Process Map

A process map for corrective actions outlined in this procedure are included below. Note that each major step shown in a process map corresponds to a step in the corrective actions table shown above.

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Step 1
Confirm results
Responsibility - Operator

Step 2
Investigate cause of incident
Responsibility - Operator

Step 3
Address cause of incident
Responsibility - Operator

Step 4
Address need for shutdown/
isolation
Responsibility – Operator,
Supervisor, Treatment Engineer

Step 5
Report and record incident
details
Responsibility – Operator,
Supervisor, Treatment
Engineer, Manager Treatment,
Senior Environmental Officer,
Environmental Officer

