

**POLLUTION SOLUTIONS PTY LTD
P.O. BOX 108 MIRANDA NSW 2228
A.B.N. 84 051 153 603
M : 0410983628**

ORICA (Aust.) Limited

MINING SERVICES TECHNOLOGY CENTRE

**GEORGE BOOTH DRIVE
KURRI KURRI N.S.W.**

SAMPLING ANALYSIS REPORT 3rd Quarter

**1st July 2022 to
30th September 2022**

**WATER TREATMENT PLANT
SEWAGE TREATMENT PLANT
Wastewater Infrastructure
Palmers Creek catchment
EPA License Compliance**

CONTENTS :

- 1.0 PLANT OPERATION**
- 2.0 ANALYSIS**
- 3.0 ANALYSIS TEST METHODS**
- 4.0 ANALYSIS RESULTS**
- 5.0 ODOUR**
- 6.0 RECOMMENDATIONS**
- 7.0 CERTIFICATES OF ANALYSIS**

1.0 PLANT OPERATION

1.1. Water Treatment Plant

The Water Treatment Plant (WTP) remains operational on a 24hour 7 day continuous basis. The Ultra violet (UV) disinfection system unit is in continuous operation and is performing to the required design criteria and water quality parameters necessary for a potable water supply system.

Inspection of the unit indicated the installed Ultra Violet treatment system Model 52H –XUV Serial number 23513011 UVX has removed and replaced by a new unit which has been placed in operation in accordance to the manufacturer's recommendations.

All lamps fitted were found to be in operation at the time of inspection. Transmissivity of the UV rays is high and achieving required disinfection performance. Analysis results confirm performance with a zero faecal coliform count recorded from all post UV treatment system samples taken and analysed.

The UV disinfection system has undergone servicing and lamp replacement, with current lamp hours at ZERO 0.2 hrs. General maintenance has been undertaken on the WTP system and there was no visual or physical evidence of any fault/s or system failures when inspected. Two new delivery supply pumps have been installed in compliance to the Orica Maintenance Program.

1.2. Sewage Treatment Plant

The Sewage Treatment Plant (STP) has been in continuous operation from commissioning and subject to various hydraulic and organic loadings. The biomass in the Rotating Biological Contactors (RBC) has a thin cover on all disc media in the first and second units. The STP is producing a high quality effluent with no evidence of pin point flocs, nitrified sludge, visible gross or suspended solids. The secondary clarifier effluent discharge from the V-Notch Weir outlet is of high quality.

The Sludge Return Ratio (SRR) as preset has not required alteration however with increased staff (EP Loading) may require adjustment should pollutant levels analysed increase.

Float level control switches were tested manually and all were found to be operational at the time of inspection. Visual alarm functions were not in operational mode due to damage of support structure (rusted square metal frame). Replacement of the visual alarm is currently scheduled for repair or replacement in the maintenance program schedule.

The RBC bearings were inspected and there was no visible indication of bearing problems, failure or misalignment. All bearings should be re-greased with an adequate covering of grease to maintain appropriate lubrication. Oil bath levels in both units were within required limits.

The Clarifiers were inspected along with the V-Notch Weir outlet from the secondary clarifier. The effluent quality was high with a Clarity Index reading of 100. The effluent pH levels remained in the neutral range at 6.8 – 7.0 range. There were very small pockets of nitrified bio mass in the discharge chamber of the 2nd clarifier that may be an indication of increased solids organic bio mass and denitrification of the sludge accumulated. An adjustment of the sludge return volume (quantity / flow rate /FM ratio) will be initiated if an increase of nitrified bio mass is observed at the next inspection.

There has been no treated effluent discharge to any environmental receiving systems. All effluent discharges are directed to on site irrigation & landscaping areas and/or the evapotranspiration area or held in storage in the 2 Effluent Retention Tanks.

Electrical Control Panels were inspected and found to all operational with no indications of faults or damage. Isolating switchgear and remote control switches were inspected, tested and found to be operational at the time of inspection.

The Effluent Retention Tanks (ERT) were subject to scheduled maintenance and accumulated organic and foreign matter in tanks 1 & 2 removed. Inspection of the tanks confirmed all infrastructure condition and structural integrity satisfactory. Treated effluent held in the tanks at approximately 60% capacity. Weed growth in Tank 1& 2 should be cleared prior to summer period to prevent weed inundation. It is recommended that a “filter sox” be installed at the treated effluent outlet located on the wall of Retention Tank 2 , to minimise weed and grass seed proliferation and or mechanical seizure

1.3 Research Laboratory [RL 1] Potable Water Treatment Plant

RL1 has an Ultra Violet (UV) treatment system augmented to the existing stormwater collection and storage tanks water supply system to provide a reliable potable quality disinfected water reticulated service to the RL1 complex.

It is noted that a water meter for potable water consumption was not installed and therefore there is no current data collection on water quantity consumed or used at this location.

2.0 ANALYSIS

2.1. Water Treatment Plant

Analysis of potable water samples was carried out for the determination of faecal coliforms per 100ml sample.

Samples were taken pre UV system and at one of three locations post UV system. Pre UV sample was taken from the outlet valve prior to the UV lamps.

Post UV samples are taken alternately from the Maintenance Building Kitchen/ lunchroom and Reception Admin kitchenette . Clarity tests were also carried out to determine turbidity from dissolved and or suspended solids or particulates.

Samples were collected in Millipore Sampler Units and stored in a refrigerated capsule until return to laboratory. The Millipore Sampler Units were then placed in an incubator for a period of 24 hours and 48 hours at 30°C constant. A coliform count was conducted after each period to determine the water quality.

A water sample was taken from the office sink water tap in RL 1 building, tested for faecal coliforms and results included in quarterly reports.

Meter reading last period	Meter reading this period	Water usage (KL /day)
41405899	41772745	4.5 - 5.2

2.2 Sewage Treatment Plant (STP)

Analysis of sewage effluent was carried out for the determination of pollutant levels as per STP design standard criteria, Protection of Environment Operations Act and the New South Wales Conservation and Environment (Environment Protection Authority) Pollution Control Approval Licence applicable and held by Orica Explosives Technical Centre, George Booth Drive Kurri Kurri.

Pollutants listed and tested as follows;

- Biochemical Oxygen Demand
- Suspended Solids
- Total Nitrogen
- Total Phosphorous

pH
Ammonia
Faecal Coliform count at STP discharge outlet
Temperature
Oil and grease (C16-C18)
Clarity

Sample S1 was collected at the V-Notch Weir outlet of the secondary clarifier and S2 was collected from the outlet of the second retention storage tank to the evapotranspiration area.

2.3 Sample collection and transportation:

All samples collected were taken during plant operation in clean sealed plastic HDPE containers.

All samples collected were placed in a refrigerated unit at $<4^{\circ}\text{C}$ and transported to the laboratory for analysis.

2.4 Palmers Creek Sampling

Water samples were collected from Palmers Creek catchment upstream of the evapotranspiration area of the STP, and downstream of the evapotranspiration area with moderate flow conditions at the time of sampling. There was no visible evidence of any waste materials, debris, plastics, refuse or rubbish associated to the Orica Technology Centre operations in the creek where inspected.

Due to recent wet weather sampling was partially enabled to collect representative samples at location 5 & 6. Location 1 & 2 were dry with damp solid sediment only visible. Location 3 & 4 was sampled moderate flow..

2.5 Wastewater Infrastructure – Truck Washbay Facility

The maintenance building and storage area includes heavy vehicle wash bay with all polluted waters subject to an oily water separator and filter that services the washing of trucks and equipment from various sites. The increased use and addition of grass seeds in the trucks wheel and tyres, cabin and general occurring equipment is resulting in an increase into the sewerage reticulation system that may, pending further investigation and analysis, lead to blockages or chokes within the STP. It is evident that the grass seed is foreign to the Orica Site and the surface of the Effluent Storage Tanks is substantial. Orica

management has requested a concept design addressing the “seed” problem. This has been submitted with initial parameters and capacities of the oily water separator and associated mechanical/electrical components. It has been recommended that a ‘trial’ process evaluation be undertaken at the next On Site quarterly inspection.

The facility was inspected in operation and to achieve the end objective it is recommended to retain the Oily Water Separation Unit and install “ Silt Soxs” on the outlet of the discharge pipe at Retention Tank 1 & 2. Service life of the silt sox is proportionate to usage and deemed to be an operational cost. The used “waste” material can either be disposed on site (to be confirmed) or disposed off site via contractor. This option is the most cost effective process and requires minimal manual handling.

3.0 ANALYSIS TEST METHODS

All samples collected were tested in accordance to the Standard Methods of Examinations of Water and Wastewater 21st Edition APHA, AWWA, WPCF or to a method as approved and accredited by the National Association of Testing Authorities (N.A.T.A.) . The Sydney Analytical Laboratory is a NATA Accredited Laboratory for compliance with ISO/IEC 17025.

4.0. ANALYSIS RESULTS

4.1 . Potable Water Supply systems – WTP Plant & RL1

Pre Ultra Violet Unit WTP

Sample 1 :	Faecal coliform per 100ml	7 count	100 ml
	Clarity	99-100	Clarity Index
Sample 2 :	Faecal coliform per 100ml	10 count	/ 100ml
	Clarity	100	Clarity Index

Post Ultra Violet Units

Sample 1 : Reception Kitchenette

Faecal coliform per 100ml

zero count / 100ml

Clarity

100 Clarity Index

Sample 2 : Maintenance Building Kitchen

Faecal coliform per 100ml

zero count / 100ml

Clarity

100 Clarity Index

Potable Water Supply System : Results Summary Table

Sample Location	Analysis Test	Result	Standard / World Best Practice
Sample 1 Pre UV	Faecal coliform count per 100ml	7	Not applicable
	Clarity Index	100	80 - 100
Sample 2 Pre UV	Faecal coliform count per 100ml	10	Not applicable
	Clarity Index	100	80 - 100
Ultra Violet Treated Water Samples			
WTP Wash Basin	Faecal coliform count per 100ml	ZERO – nil count	ZERO-nil count
	Clarity Index	100	100
Maintenance Kitchen	Faecal coliform count per 100ml	ZERO – nil count	ZERO–nil count
	Clarity Index	100	100
Administration Building Kitchen	Faecal coliform count per 100ml	ZERO – nil count	
	Clarity Index	100	100
Wash Basin – Reception	Faecal coliform count per 100ml	ZERO – nil count	
	Clarity Index	100	100

4.2. Sewage Treatment Plant – Outlet V Notch Weir – Secondary Clarifier

Biochemical Oxygen Demand	22 mg/l
Suspended Solids	82 mg/l
Ammonia	<0.1m/l
Total nitrogen	<0.1mg/l
Total phosphorous	30 mg/l
Grease (soxhlet)	2 mg/l
pH	6.8- 7.0
Temperature	16° C
Dissolved Oxygen	1. 35 mg/l
Faecal coliform count	>200 count/100ml
Clarity	100 Clarity Index

Sewage Treatment Plant : Effluent Analysis Results Summary Table

Test Item	Result Concentration	Design Standard – discharge to evapotranspiration area	POEO Act – discharge to receiving waters
Biochemical Oxygen Demand	22 mg/l	30mg/l	Nil discharge
Suspended Solids	82 mg/l	30mg/l	Nil discharge
Ammonia	<0.1mg/l	30mg/l	Nil discharge
Total nitrogen	0.1 mg/l	30mg/l	Nil discharge
Total phosphorous	30 mg/l	30mg/l	Nil discharge
Grease (soxhlet)	9 mg/l	20mg/l	Nil discharge
pH	6.8 – 7.0	6.8 to 7.2	Nil discharge
Temperature	16.	12-25 celcius	Nil discharge
Dissolved oxygen	1.35 mg/l	1.25 to 2.25 mg/l	Nil discharge
Faecal coliform	>200 count	<300 count	Nil discharge
Clarity Index	100	80-100	Nil discharge

Effluent Volume discharge/day to	Effluent volume	Design Standard – discharge to	EPA Licence Limit
----------------------------------	-----------------	--------------------------------	-------------------

evapotranspiration & landscape areas or effluent storage tanks #1 & #2	discharge per day to receiving waters	evapotranspiration area	
4500-7500 L/day (avg)	NIL DISCHARGE	18000 litres per day	16800 litres day

4.3. Palmers Creek

Due to wet weather Palmers Creek catchment within the boundaries of the location resulted in ponding and minor flow conditions.. Samples were collected from locations – PC1 & 2 , 3 & thru to PC5 & 6 sampling points, as these locations were exhibiting visible flow and small pondings to allow samples to be collection for analysis purposes. Sample site location #4 was deemed unsuitable due to native animal disturbance and waste droppings

In accordance to the directive of the EPA, a revised pollutant sample analysis regime has been implemented. The pollutants analysis regime is :

- Total Dissolved Solids
- Suspended Solids
- Total Nitrogen [Kjeldahl]
- Ammonia NH₄
- Nitrite NO₂
- Nitrate NO₃

Although not stipulated by the EPA, sampling and analysis for pH was conducted at all sample points 1 & 2 , 3 & 5 & 6 of the tributary of Palmers Creek within the Orica property.

The water quality sampling & testing in the portion of Palmers Creek to which potential impacts may occur from the Orica operations is subject to significant variations due to weather conditions and flow rates within the Palmers Creek actual and catchment areas, upstream and downstream of the STP. Over many years variations have been observed where substantial lengthy dry weather conditions creates Nil Flows or Trickle Flow rates, through to intense wet weather conditions and high flow rates and stormwater runoff from within the catchment area. Accordingly, variations as to water quality can be expected and should be considered in context of the analysis results.

4.3.1 Palmers Creek Water Quality Result Summary Table :

Upstream Samples	Total Dissolved Solids	Suspended Solids	Total Nitrogen	Ammonia NH4	Nitrate NO3	Nitrite NO2	pH
Sample 1	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Sample 2	600 mg/l	DRY	DRY	DRY	DRY	DRY	DRY
Downstream Samples							
Sample 3	125 mg/l	9mg	36mg/l	4mg/l	<0.1	<0.1 mg/l	DRY
Sample 4	n/s	0.4mg/l	n/s	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	6.9
Sample 5	72 mg/l	7 mg/l	2.7 mg/l	< 0. mg/l	<0.1 mg/l	0.1 mg/l	6.7
Sample 6	98 mg/l	<2 mg/l	0.9 mg/l	< 0.1 mg/l	0.1 mg/l	0.1 mg/l	6.6

5.0. ODOUR

At the time of inspection there were no noticeable odours uncharacteristic to an aerated sewage treatment process plant. There were no odours detected at the evapotranspiration area or the effluent retention tanks at the time of inspection.

There were no odours detected from the potable water storage tank or post UV outlets at the time of inspection and sampling. There was no odour detected from any potable water samples taken.

6.0. RECOMMENDATIONS

The following recommendations are made;

- Regular inspection of Flow Meter Chamber and adjacent manhole chamber in reticulation system for blockages
- Regular inspection of Tarada submersible sludge return pump re electrical failure/seal failure
- Conduct ground vegetation clearing and defined walk tracks to sampling points (prevent snake confrontation next summer season)
- Feasibility assessment and civil work component for Silt Sox process
- Silt Soxes fitted at STP Retention tank outlets from truck wash
- Next sampling period due October - December 2022