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MINING SERVICES TECHNOLOGY CENTRE

**GEORGE BOOTH DRIVE
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SAMPLING ANALYSIS REPORT

EPA Licence Compliance

1st January 2022 to

30th March 2022

**WATER TREATMENT PLANT
SEWAGE TREATMENT PLANT
PALMERS CREEK
Wastewater Infrastructure**

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 indicates the installed Ultra Violet treatment system Model 52H –XUV Serial number 23513011 UVX has been in operation in accordance to the manufacturer's recommendations.

3 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 is due servicing and lamp replacement, with total hours at hrs and lamp hours 87246.7 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. The back up pump was tested and found to be operational. UV Lamp No: 01 requires replacement or check for fault failure alarm.

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 with a clarity Index. 99

The Sludge Return Ratio (SRR) as preset has not required alteration however with increased staff return to work on site (re Corona Virus 19) EP Loading) may require adjustment should pollutant levels analysed increase. To date the staff on site EP remains at less than 20% capacity/ability and with the EP and organic/hydraulic loadings at low levels the effluent quality remains high. with no visible or physical adverse impacts to the receiving environment.

On the day of inspection heavy torrential rainfall causing flood 1:6t. 0 years occurred. The plant was designed and built to prevent inundation of the STP and no flood waters entered the treatment plant.

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 good considering the weather conditions with a Clarity Index reading of 60. The effluent pH levels remained in the neutral range at 6.8 – 7.0 range. There were 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 and 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 at 75% capacity.

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 85% capacity. Weed growth in Tank 1 & 2 are subject to a preliminary feasibility assessment program under a pollutant reduction process for NO_x NO₂ NO₃ to improve water quality. This will be on a 12month period to assess the viability and pollutant reduction to any receiving system. Therefore the tanks should be cleared prior to summer period to prevent any further weed growth. A concept design and operation to achieve weed seed being washed down from wash bay has been commissioned into operation with submitted and initial results indicate clearly a significant improvement with some attention required to monitor wind effects on the filter bags.

A simple open mesh type galvanised grate/reo mesh will secure the bag.

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.

The UV system has been completed and commissioned into operation , at the time of scheduled inspection access to RL1and the UV Treatment System was unable to be achieved and assumed operating . Visual inspection from the chain link fence confirmed Poly (plastic) tanks have been installed and are in good order

It is noted that no water meter was 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.

Meter reading last period	Meter reading this period	Water usage (KL /day)
4451033	44597.6	5.5 – 6.0

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 W1 was collected at the V-Notch Weir outlet of the secondary clarifier and W2 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

Due to wet weather sampling was undertaken where flow and ponded sections of the catchment tributaries. upstream and downstream as indicated in the results charts.

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	12	count 100 ml
	Clarity	80	Clarity Index
Sample 2 :	Faecal coliform per 100ml	85	count / 100ml
	Clarity	70	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	12	Not applicable
	Clarity Index	100	80 - 100
Sample 2 Pre UV	Faecal coliform count per 100ml	80	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
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
RL 1	Faecal coliform count per 100ml	nil access	ZERO-nil count
	Clarity Index	100	

4.2. Sewage Treatment Plant – Outlet V Notch Weir – Secondary Clarifier 3 samples collected

Biochemical Oxygen Demand	7 , 6 , & 11- mg/l
Suspended Solids	6, 59 & 78 - mg/l
Ammonia	34 , 33 & 26 mg/l
Total nitrogen	40 , 35 & 30 mg/l
Total dissolved solids	685 , 535 & 505 mg/l [all ww
pH	6.8 – 7.0
Temperature	18° C
Dissolved Oxygen	1.85. mg/l

Faecal coliform count
Clarity

>5 count/100ml
100 Clarity Index

Sewage Treatment Plant : Effluent Analysis Results Summary Table

Mg/l :

Test Item	Result Concentration	Design Standard – discharge to evapotranspiration area	POEO Act – discharge to receiving waters
Biochemical Oxygen Demand	7 6 11	30mg/l	Nil discharge
Suspended Solids	67 59 78mg/l	30mg/l	Nil discharge
Ammonia	7.9 34 26 mg/l	30mg/l	Nil discharge
Total nitrogen	140 35 26	30mg/l	Nil discharge
Total phosphorous	2 mg/l	30mg/l	Nil discharge
Grease (soxhlet)	2 mg/l	20mg/l	Nil discharge
pH	6.8	6.8 to 7.0	Nil discharge
Temperature	18	12-25 cel	Nil discharge
Dissolved solids	685 535 505 mg/l	1.25 to 2.25 mg/l	Nil discharge
Faecal coliform	>200 count	<300 count	Nil discharge
Clarity Index	60	80-100	Nil discharge

Effluent Volume discharge/day to evapotranspiration & landscape areas or effluent storage tanks #1 & #2	Effluent volume discharge per day to receiving waters	Design Standard – discharge to evapotranspiration area.	EPA Licence Limit
5500 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 – PC, 3 & 4 & thru to PC5 & 6 sampling points, as these locations were exhibiting visible flow and small ponding to allow samples to be collection for analysis purposes. Sample site location # 1 to 2 was deemed unsuitable due to no visible/physical evidence of flow or appropriate ponding.

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 3, 4 5, and 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 the day of inspection was a 1:60 year flood and is not representative of the flows normally 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	68 mg/l	N/A	5.8 mg/l	0.7 mg/l	<0.1 mg/l	<0.1 mg/l	N/A
Sample 2	N/A	100 mg/l	2.3 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	N/A
Downstream Samples	Flooded	Flooded	flooded	flooded	Flooded	Flooded	Flooded

Sample 3	98 mg/l	240mg/l	0.7 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	6.6
Sample 4	10 mg/l	5 mg/l	0.7 mg/l	< 0.1 mg/l	0.1 mg/l	< 0.1 g/l	6.7
Sample 5	85 mg/l	3 mg/l	0.7mg/l	< 0. mg/l	<0.1 mg/l	< 0. Mg/l	6.7
Sample 6	245 mg/l	15mg/l	0.6 mg/l	< 0.1 mg/l	<0.1 mg/l	<0.1 mg/l	6.7

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
- RE instate earthen bund wall along north boundary of evapotranspiration area and reposition stop plate at pipe joint inside area
- Replace faulty potable water UV system re alarm failure
- Next sampling period due 30 June 2022 December 2020
- Revised sampling and analysis reporting EPA Licence Site/STP