

Transitional Environmental Program

EPPR03383115 (SPCE05672613) Lorim Pt Sewerage
Treatment Plant

Completion Report May 2017

DEHP Reference: MAN19460, CR68203, 101/0008737

Introduction – TEP MAN19460

1 Background of the TEP for Lorim Point STP

The Lorim Point Sewage Treatment Plant (LP STP) entered into a Transitional Environmental Program (TEP) in November 2015 (MAN19460), which was issued under s330(c) of the *Environmental Protection Act 1994* to transition to compliance with a condition of an Environmental Authority (EA), EPPR03383115. The relevant conditions of the EA which required a program to transition to compliance were:

(C3) *Treated sewage wastewater released from the Lorim Point Sewage Treatment Plant outfall pipe identified in Schedule G – Figure 2 (Sewage Rising Main) and Figure 3 (section details) must be monitored at the monitoring point (outfall pipeline) for the relevant quality characteristics and at the frequencies identified in Table 1 – Surface Water release limits, for all sewage effluent inflows to the treatment plant up to a flow rate of 23l/s.*

(C4) *The only contaminants to be released to surface waters are treated sewage waste waters in accordance with Table 1 – Surface Water Release Limits and the associated requirements.*

Schedule C - Table 1 (Surface water release Limits) includes a release limit of 1000CFU/100ml for Faecal Coliforms (FC):

Monitoring Point	Quality Characteristic (units)	Minimum	Short term 80 th percentile	Maximum	Monitoring Frequency
Outfall pipeline	BOD (mg/L)	-	20	45	Weekly
	TSS (Mg/L)	-	30	60	
	Ammonia (mg/L as N)	-	3	5	
	pH	6	-	8.5	
	Dissolved oxygen (mg/L)	2	-	-	
	Total Residual Chlorine (mg/L)	-	-	0.55	
	Temperature	-	-	<2% increase	
	Faecal Coliforms (CFU/100mL)	-	-	1000	Monthly

This condition of a release limit for Faecal Coliforms was first incorporated into the EA in September 2013, prior to this there was no release limit enforced by the Department of Environment and Heritage Protection (EHP). It was also recognised prior to the imposition of the release limit for FC that the LP STP was not designed for microbiological disinfection and was unable to achieve the proposed FC limit.

As a result and in an attempt to achieve compliance with the new release limit, Rio Tinto Weipa installed an ozone disinfection system prior to the 1st of June 2015. However, despite this

modification, water quality samples of the effluent released from the plant were not able to consistently achieve the FC release limit in the EA (1000CFU/100ml). This then triggered the requirement for a TEP to allow Rio Tinto Weipa time to complete the required works to achieve compliance with condition C3, specifically Schedule C – Table 1 of the LP EA.

2 Program of Works

The Lorim Point STP TEP required RT Weipa to implement a program of works to reduce releases of Thermotolerant coliforms to the new EA license level of 1000CFU/100ml. This program of works was proposed to progress in three stages. A copy of the program of works is provided later in this report in Table 1.

Following the completion of each stage, a monitoring and review period allowed RT Weipa to understand how the modifications had affected the plants ability to achieve the FC limit and if it was necessary to progress to the next stage. In summary it was identified in stage 1 and stage 2 review and reporting that additional work was required, therefore the program commenced stage 3 in late 2016 with initial planning for the stage in earlier 2016.

3 Purpose of this Report

This report is provided to satisfy the requirements of the TEP in regards to completion reporting. Stage 3 of the TEP Program of works (Table 1), outlines that a final report will be submitted to EHP by 31 May 2017 to allow for final assessment and close out of the TEP. This report serves this purpose.

Final Reporting

4 TEP Completion Assessment

4.1 Review of Previous Reporting

In reviewing the completion of the TEP, Rio Tinto Weipa has reviewed the reporting requirements outlined in the program of works and confirms that these have been met. The following documents are provided in the appendices of this report for your reference:

1. Stage 1 Assessment Report – Submitted July 2016
2. Stage 2 Assessment Report – Submitted December 2016

4.2 Stage 3 – Final Assessment

Stage 3 of the TEP program was “upgrade plant with selected option”. This stage included the following key steps:

- Purchase and installation of an additional disinfection treatment system
- Assess effectiveness of Stage 3 modifications

Investigation works into alternative disinfection options progressed quickly and a new membrane treatment system was selected. Based on the investigation undertaken this system was considered to be the most suitable system for Lorim Point STP and would be the most effective option available to achieve the EA limit for faecal coliforms. The membrane treatment system was purchased in early 2016; however, there was a 24 week delivery timeframe.

On receipt of the new membrane treatment system, civil works for the installation began in October 2016. This included the installation of a concrete slab to house the membrane system. The sand filter was temporarily relocated to allow continued operations of the plant while the membrane system was installed. The civil works were completed and treatment of sewage via the membrane system commenced in December 2016.

Following the installation of the membrane plant the in December 2016, Rio Tinto Weipa has noticed a significant improvement in the treatment process and the quality of effluent being released to the receiving environment of the Embley River. The Thermotolerant Coliforms in effluent results taken during stage 3 of the TEP declined significantly when compared to stage 3 of the TEP. This is a direct result of the new membrane plant.

Effluent monitoring results taken from the Lorim Point STP outfall pipe during the entire term of the TEP have been reviewed and are graphed in Figure 1 below.

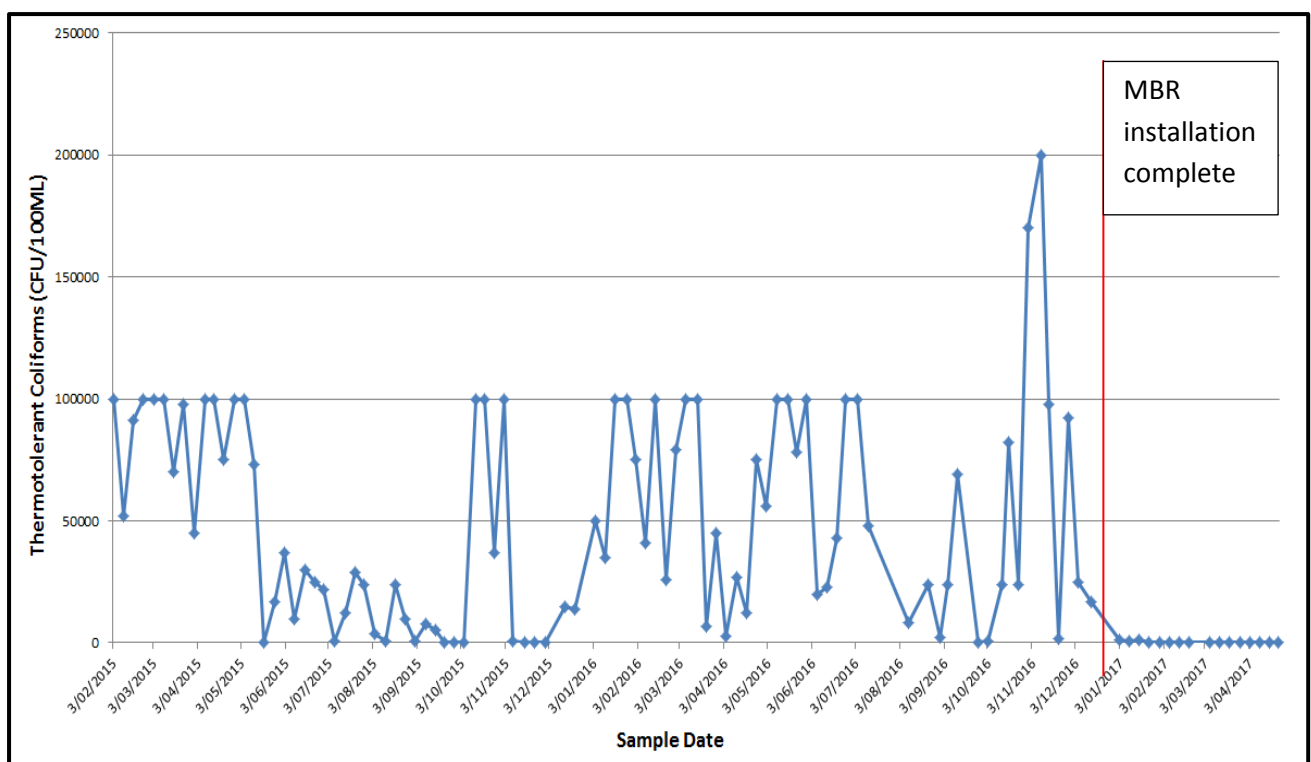


Figure 1 Thermotolerant Coliforms results from effluent testing at Lorim Pt outflow.

Figure 1 shows that the level of thermotolerant coliforms in sampling conducted since January 2017 has decreased significantly below the EA limit of 1000CFU/100ML. These low levels of thermotolerant coliforms have remained during each sample event from January to date. This indicates that the completion of stage 3 under the TEP and the installation of the new membrane

plant has been successful in achieving compliance with the EA limit for thermotolerant coliforms and thus compliance with the TEP.

4.3 Assessment against TEP Conditions

The TEP (MAN19460) decision notice included a number of conditions which were required to be met as part of the program. Table 1 outlines each of these conditions as per the notice and provides justification for how Rio Tinto has achieved compliance with these conditions.

Table 1: TEP Condition Assessment

No.	Condition	Compliance Justification						
1	Where there is any conflict with this decision notice and the Environmental Authority, the conditions in the decision notice and approved transitional environmental program prevail.	Noted. Rio Tinto Weipa has monitored compliance with the TEP conditions. The compliance justifications for each condition are provided in this table.						
2	This decision notice does not affect the obligations of the holder of the decision notice to comply with all conditions of the Environmental Authority which do not conflict with the conditions of this decision notice and the approved transitional environmental program.	Noted. Rio Tinto acknowledges that the TEP did not exempt them from maintaining compliance with other conditions of the EA (not relevant to the TEP).						
3	The holder of this decision notice must report in writing to the administering authority in accordance with the implementation timeframes of the approved transitional environmental program, including performance indicators, completion dates, monitoring results over the period of the transitional environmental program and planned future works.	Rio Tinto Weipa has provided the following reports to EHP in accordance with the approved program of works: 1. Stage 1 Assessment Report – Submitted July 2016 2. Stage 2 Assessment Report – Submitted December 2016 3. Stage 3 and Final Completion Report – Submitted herein.						
4	The holder of this decision notice must submit an updated Site Based Management Plan at the end of the transitional environmental program.	The updated SBMP is included in the appendices of this report.						
5	This decision notice does not affect the obligation of the holder of the decision notice to comply with the Quality Characteristics listed in Condition C4 of the Environmental Authority (apart from Faecal Coliforms).	Noted. Rio Tinto Weipa has continued to monitor in accordance with the EA for Lorim Point and has reviewed all results against the EA accordingly.						
6	Releases from the Lorim Point Sewage Treatment Plant, LP STP must not cause the level of faecal coliforms in the receiving environment of the Embley River to exceed 1,000 CFU/100ml.	Rio Tinto Weipa has reviewed monitoring results collected from surface water sites MID3, MID3A and MID3B located in the receiving environment during the TEP Period. The results of this monitoring are presented in section 4.5 of this report.						
7	Monitoring of the level of faecal coliforms must be carried out at the locations and minimum frequencies specified in the table below: <table border="1"> <tr> <th>Monitoring Location</th><th>Location Description</th><th>Minimum Monitoring Frequency</th></tr> <tr> <td> </td><td> </td><td> </td></tr> </table>	Monitoring Location	Location Description	Minimum Monitoring Frequency				This Lorim Point STP disinfection system remained on for the duration of the TEP period therefore requiring a monitoring frequency of monthly in accordance with this condition.
Monitoring Location	Location Description	Minimum Monitoring Frequency						

	SW/EMB/MID3*	In the receiving environment, midstream in the Embley River and downstream of the outfall pipeline.	When disinfection of the LP STP effluent has not been occurring for a period of 12 hrs or more, a sample must be obtained within 24 hrs and thereafter weekly while disinfection is not occurring. At all other times monthly.	During the TEP period monitoring was undertaken at the locations in the receiving environment of the Embley River on a monthly basis (see section 4.5). Monitoring at the sewage outfall pipeline was conducted as per the weekly compliance monitoring basis and the results of this effluent sampling are outlined earlier in this report (section 4.2).
	SW/EMB/MID3A*	In the receiving environment, midstream in the Embley River and upstream of the outfall pipeline.		
	SW/EMB/MID3B*	In the receiving environment, midstream in the Embley River and parallel to the outfall pipeline.		
	Outfall Pipeline*	For information purposes only, discharge point of the Lorim Point STP outfall pipeline.		
	*Monitoring locations are shown in the attachments.			

4.4 Receiving Environment Assessment – Condition 6

During the TEP period monitoring was conducted at receiving environment locations EMB/MID3, EMB/MID3A and EMB/MID3B as defined in condition 7 of the approved TEP and as presented in the below map (Figure 2).

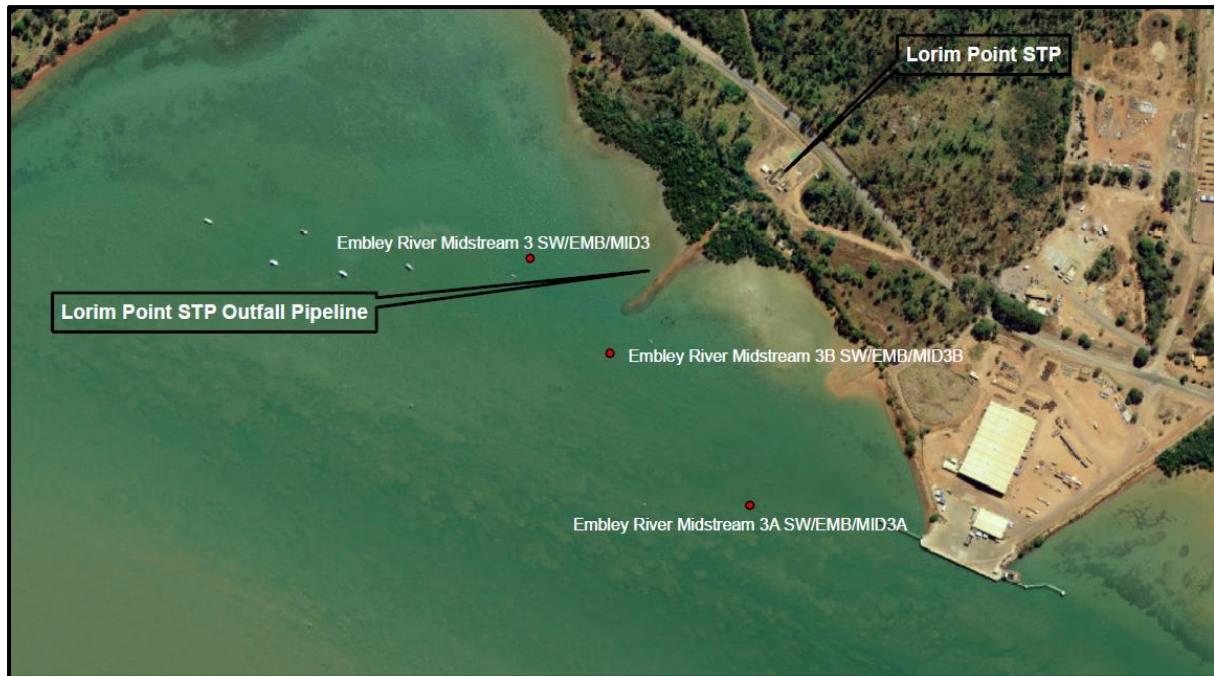


Figure 2: Map of Receiving Environment Monitoring Locations, Embley River.

The receiving environment monitoring at these locations throughout the TEP period was conducted on a monthly basis as part Rio Tinto Weipa's routine REMP by boat sampling trip. As per condition 7 of the approved TEP, monitoring was not triggered as being required on a more frequent basis (weekly) as the disinfection system was on and remained operational for the duration of the program. As such monitoring was carried out monthly on the following dates:

- **2015:** 4/11/2015, 26/11/2015, 14/12/2015
- **2016:** 4/01/2016, 8/02/2016, 7/03/2016, 4/04/2016, 16/05/2016, 9/06/2016, 18/07/2016, 4/08/2016, 5/09/2016, 24/10/2016, 15/11/2016, 19/12/2016
- **2017:** 23/01/2017, 27/02/2017, 16/03/2017, 26/04/2017

The samples collected at these locations and on these dates were analysed at SGS Laboratories (NATA Accredited) for Faecal Coliforms to assess compliance with condition 6 of the approved TEP. The results of this analysis have been reviewed as part of the TEP final review and are presented in Figure 3 below.

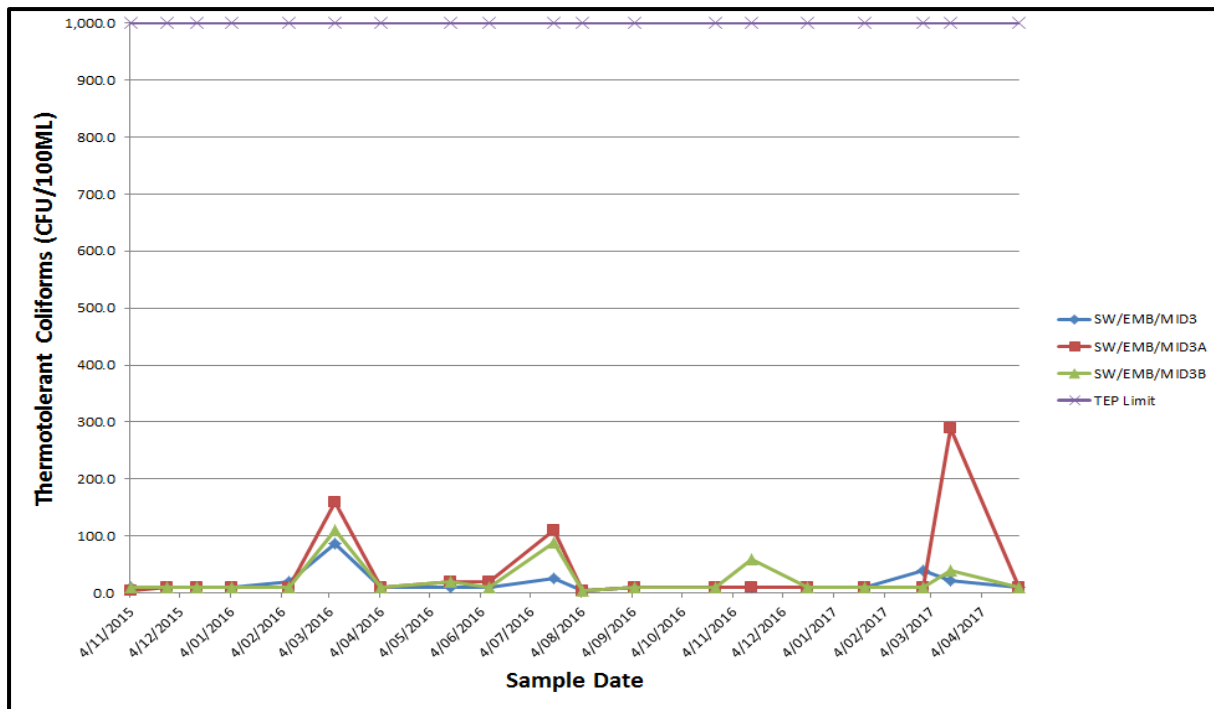


Figure 3: Thermotolerant Coliforms at Embley River Monitoring Locations, against the TEP Receiving Environment Limit.

It can be seen from Figure 3 that the Thermotolerant Faecal Coliforms in samples from the Embley River monitoring locations remained well below the limit imposed by condition 6 of the TEP for the duration of the TEP program.

4.5 Assessment Against TEP Objectives

As per the TEP application form it is acknowledged that as part of the TEP completion report, Rio Tinto is required to detail how the objectives of the TEP have been met. The objectives of the Lorim Point TEP were defined as:

1. Biologically optimise the plant through equipment changes and operational changes, to increase its ability to treat influent sufficiently.
2. (If required) Modify the plant through functional design changes to enable large influx and improve anoxic treatment phase and nutrient removal.
3. (If required) Upgrade plant disinfection system.

Details regarding how Rio Tinto Weipa has met each of these objectives are provided in Table 1 where each of the performance indicators linked to the objectives of the program of works are assessed.

4.6 Assessment against approved Program of Works and Performance Indicators

The program of works was amended in December 2016 to reflect RT Weipa's decision to install a Membrane Treatment System and also involved shorter timeframes and an earlier TEP completion than the original program of works. This amended program of works is provided in Table 1 of this report (below). An assessment against each of the nominated performance indicators is provided along with justification for Rio Tinto Weipa's compliance with the TEP program of works.

Table 1. TEP Completion of Program of Works

Stage	Objective of Stage	How the Stage will Reduce Faecal Coliforms	Actions	Dates	Performance Indicators	Status	SAP Action ID	Assessment against performance indicators and objective
1. Biological Optimisation	Biologically optimise the plant through equipment changes and operational changes, to increase its ability to treat influent sufficiently	Modifications will include the installation of an inlet filter screen to assist in the removal of objects such as rags, plastics, and metals to prevent damage and clogging of plant equipment. This will additionally assist in decreasing the desludging times	Construct a 5m x 3m concrete slab with a perimeter bund (with a ramp at one end) for the screen to be placed on. The concrete slab will also feature a concrete channel that drains into the adjacent sludge holding tank.	To be completed by November 30 th 2015	Concrete slab and channel constructed.	Complete	100863522	Concrete slab and perimeter bund constructed and operational.
			Install one (1) in-tank screen extractor with a 5mm screen including discharge chute, bagging unit, control panel, and manual internal bypass screen	To be completed by December 31st 2015	In-tank screen extractor installed.	Complete	100863523	Inlet screen installed.
		Modification will direct the screened wastewater into the bioreactor at a location away from the weir. This modification will also allow the volumes of screened waste water to be recorded.	Redirect the waste water inflow lines to the new screen and installing a new flow meter on the inlet to the screen	To be completed by 31 st December 2015	Waste water inflow lines redirected New flow meter installed on inlet to screen.	Complete	100863525	Pipework to the filter screen completed and flow meter calibrated. Flow meter readings added to daily monitoring checks.
			Install all pipework, valves and fittings for the screen to bioreactor outflow line and the storm water bypass line.	To be completed by 31 st December 2015	All pipework, valves and fittings for screen installed.	Complete	100863526	Earthworks completed and pipework installed. Commissioning procedure undertaken and finalised.
			Install all electrical and control panel components	To be completed by 31 st December 2015	All electrical and control panel components installed.	Complete	100863527	Electrical and controls installed and function tested.
			Remove redundant valve pit, distribution box, and flow meter from old inlet line	To be completed by 31 st January 2016.	Redundant valve pit, distribution box and flow meter removed.	Complete	100863528	All redundant distribution system items were decommissioned and removed from site.
		Modifications will increase the Mixed Liquor Suspended Solids (MLSS) and the sludge age, which will increase the biomass in the bioreactor to effectively treat inflow	Pass existing Bioreactor volume through filter screen.	To be completed by 31 st January 2016	Existing bioreactor volume passed through filter screen.	Complete	100864010	Bioreactor drained. All material sent to Awonga STP for screening and treatment. This was completed in order to clean the bioreactor and undertake an integrity assessment of the bioreactor structure. During refill, nutrients were re-established using screened effluent transported from Awonga STP.
			Implement an operating strategy to increase the sludge age to optimal or recommended range in a staged approach: - 7 Days - 9.5 Days - 12.2 Days - 15.6 Days	To be completed by : January 31st 2016 February 29th 2016 March 31st 2016 April 30th 2016	Implement the operating strategy. F:M ratio within recommended range of 0.04 to 0.10 Sludge age increased in line with identified stage approach	Complete	100864011, 100864012, 100864013, 100864014	Changes were completed by operators under supervision of sewage treatment consultant.
		Assess effectiveness of Stage 1 modifications	Conduct water quality testing to assess the effectiveness of the Stage 1 modifications and detail in a report submitted to the Administering Authority.	Weekly monitoring to be conducted from the 11 th December 2015 until June 30 th 2016.	Weekly monitoring completed	Complete	100864016, 100864017	Report was provided to EHP. See Appendix 1.
				Report to be submitted by July 31st 2016	Report to administering authority submitted			

Stage	Objective of Stage	How the Stage will Reduce Faecal Coliforms	Actions	Dates	Performance Indicators	Status	SAP Action ID	Assessment against performance indicators and objective
			If Stage 1 modifications are effective in transitioning to compliance to Faecal Coliform release limits in accordance with Condition C4 of Development Approval EHP Permit number SPCE05672613, as required by Environmental Authority EHP Permit number EPPR03383115, no further action under this TEP is required, and a final TEP report will be provided within one month of Stage 1 being completed. If Stage 1 modifications are not effective in transitioning to compliance to Faecal Coliform release limits, RT Weipa will proceed with Stage 2.			Completed	100864018	Complete
2. Function Design Changes	Modify the plant to improve nutrient removal and include an anoxic treatment phase into the plant cycle	Modifications of pipework will redirect screened waste water into a holding tank to avoid short circuiting and hold peak volumes during high rainfall events. This will improve nutrient removal in the bioreactor.	Clean out sludge lagoon	To be completed by August 31 st 2016	Clean out of sludge lagoon complete.	Complete	100864020	Sludge lagoon cleaned using high pressure water in order to inspect the condition of the concrete structure. Deemed to be in good condition and no further work required.
			Install balance tank pump	If required, to be completed by 30th November 2016	Balance tank pump installed.	Complete	100864021	Balance tank pump installed and housed on a concrete slab.
			Modify pipework to accommodate additional operational changes	To be completed December 31 st 2016	Pipework modified	Complete	100864023	Pipework modified and balance tank operational.
		Modifications will include the installation of mixers in the bioreactor. This will reduce nitrate levels.	Modify coding of plant to incorporate changes and new plant operation cycles.	To be completed by December 31 st 2016	Coding of plant modified.	Complete	100864026	The nitrate levels needed to be reduced in order for the ozone system to function as desired and treat the faecal coliforms. The membrane treatment system implemented has the capability to treat the faecal coliforms as well as decrease the nitrate levels. It was deemed that the existing aeration system was sufficient and no additional mixers required.
		Assess effectiveness of Stage 2 modifications	Conduct water quality testing to assess the effectiveness of the Stage 2 modifications and detail in a report submitted to the Administering Authority.	Weekly monitoring to be conducted from August 1st 2016 to November 30th 2016 Report to be submitted by 31st December 2016	Weekly monitoring completed Report to administering authority submitted	Complete	100864028, 100864029	Report was provided to EHP. See Appendix 2.

Stage	Objective of Stage	How the Stage will Reduce Faecal Coliforms	Actions	Dates	Performance Indicators	Status	SAP Action ID	Assessment against performance indicators and objective
			If Stage 2 modifications are effective in transitioning to compliance to Faecal Coliform release limits in accordance with Condition C4 of Development Approval EHP Permit number SPCE05672613, as required by Environmental Authority EHP Permit number EPPR03383115, no further action under this TEP is required, and a final TEP report will be provided within one month of Stage 2 being completed. If Stage 2 modifications are not effective in transitioning to compliance to Faecal Coliform release limits, RT Weipa will proceed with Stage 3.			Complete	100864050	Complete
3. Upgrade Plant with Selected Option	Install an additional disinfection treatment system that will achieve compliance to Faecal Coliform release limit	Purchase and installation of an additional disinfection treatment system	Identify, scope and order suitable upgrade option	To be completed by December 31 st 2016.	Selected Option purchased.	Complete	100864053	Investigation works into alternative disinfection options progressed quickly with a modular Membrane Treatment System selected as the most suitable system to be installed. A system specified to achieve the faecal coliform limit was ordered in early 2016 due to 24 week delivery timeframe.
			Install selected option	To be completed by March 31st 2017	Selected option installed.	Complete	100864054	Civil works for the installation began in October 2016. Concrete slab installed to house the membrane system. The sand filter was temporary relocated to allow continued operations of the plant while the membrane was installed. Membrane treatment system commissioned in December 2016.
		Assess effectiveness of Stage 3 modifications	Conduct water quality testing of key parameters to measure the performance of key equipment within the plant. Complete Final TEP close out report	Weekly monitoring to be conducted from- December 1st 2016 to 31st April 2017 To be completed 31st May 2017	Weekly monitoring completed Achieve compliance to Faecal Coliform release limits in accordance with Condition C4 of Development Approval EHP Permit number SPCE05672613 as required by Environmental Authority EHP Permit number EPPR03383115	Complete	100864055, 100864056	This report satisfies the requirements of this step.

Appendices

- 1. Stage 1 Assessment Report – Submitted July 2016**
- 2. Stage 2 Assessment Report – Submitted December 2016**
- 3. Updated Site Based Management Plan for Lorim Point Sewage Treatment Plant**