RioTinto

Area Procedure Manual
HSE Department

Document Type: Area Procedure

Document Title: WDL Adaptive Management Plan

Document Number: AMP-EHS-008

KEY POINTS

- This Plan outlines the adaptive management process for monitoring of impacts to the receiving environment from discharge from the functional areas of the refinery.
- The plan includes a series of alerts that trigger an action response for the management of water discharge.

This procedure to be read in conjunction with the Gove EBA if applicable.

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Rev No	Date	Document Owner	Reviewer 1	Authorised by

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WDL ADAPTIVE MANAGEMENT PLAN

1 PURPOSE

This Adaptive Management Plan (AMP) has been prepared for RTA Gove Pty Ltd (RTAG) to provide a framework for the systematic improvement in the management of discharge waters from the functional refinery area.

The framework outlines evidence-based management actions that are based on historical knowledge of site operations and informed through monitoring and adaption of management actions to monitoring outcomes.

The AMP is linked to the Gove Operations Water Management Plan (GPM-EHS-100) which establishes the overall rationale for monitoring plans for surface water, groundwater, and marine aspects. Marine monitoring of the Gove Operations marine domain is undertaken through the MHMP (APM-EHS-039).

2 SCOPE

This AMP has been prepared in accordance with the NT EPA *Guidance on Adaptive Management* (NT EPA, 2018). This AMP has also been prepared to fulfil the requirement of RTAG's Waste Discharge Licence (WDL) 171 - 11. This AMP is applicable to the RTAG site described in Section 2.1.

2.1 Site Setting

The RTAG site (herein referred to as the 'site') is located at 1 Melville Bay Road, Nhulunbuy, NT 0880. The site is situated on the Gove Peninsula in North East Arnhem land in the Northern Territory (NT), 650km east of Darwin.

RTAG commenced in the 1970s to supply bauxite to the alumina refinery and the export market. Site operations include mining and transport of ore via a conveyor to stockpiles at the refinery and port at Gove Harbour.

Based on the functional status, location, and closure planning, the operations can be considered as four functional areas:

- Mine – currently active mining of bauxite ore reserves.
- Refinery – curtailed alumina refinery.
- Residue disposal area (RDA) – storage of mineral processing waste.
- Marine – receiving environment.

Each functional area resides in different surface water catchments within the site and therefore surface water captured within each functional area is managed under separate surface water management strategies. Relevant to this AMP area and covered by the WDL are the functional areas of the refinery and marine receiving environment.

Sources of discharge water from the refinery functional area are shown in Appendix 1, on Figure 1 of the WDL171-11 and comprise:

- Treated wastewater from the wastewater neutralisation plant (WWNP) which discharges via the seawater channel;

- Treated sewage from the Sewage Treatment Plant (STP) which is discharged via the seawater channel;
- Stormwater captured within bunded areas at Refinery Light Fuel Tank Farm (LFTF) which houses an oil water separator, and Refinery Tank Farm. Discharges from bunded areas are made direct from bunded areas via gravity.

2.2 Environmental Setting

The Gove peninsula extends into the southern end of Melville Bay. This region has distinct wet and dry seasons with tropical cyclones potentially occurring during the wet season. The coastal areas comprise mainly sandy beaches and mangrove-lined estuaries. Within Melville Bay are several small islands: Strath Island, Granite Island, and West Woody Island.

Protected species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 including turtles, dugongs, crocodiles, and dolphins have been identified within Melville Bay (NT OEH, 2004). The subtidal marine habitat comprises basin silts, shallow sandy seafloor, sea grass meadows and coral reefs while supporting a variety of benthic fauna and providing feeding grounds for turtles and dugongs (NT OEH, 2004). The mangroves which line the estuaries support a range of widely distributed fauna typically associated with tropical mangrove habitat, including crocodiles.

2.3 Cultural Setting

The Gove Peninsula in the Nhulunbuy region is situated in Arnhem Land located in the north-east of the Northern Territory. Arnhem Land is a large area of Aboriginal-owned land and is one of Australia's most significant areas of traditional Aboriginal culture (NT OEH, 2004).

East Arnhem Land accommodates approximately 14,000 people. The Aboriginal people of East Arnhem Land call themselves Yolngu. Within north-east Arnhem Land live approximately 1,700 indigenous people of numerous clans with the five main clans being Gumatj, Rirratjingu, Djapu, Madarrpa, and Dhalwangu.

Prior to European settlement, coastal resources were a major part of the Yolngu economy (NT OEH, 2004).

2.4 Waste Discharge Licence (WDL)

Waste Discharge Licence (WDL) 171 - 11 is the overarching licence, granted and regulated by the Department of Environment, Parks and Water Security (DEPWS) that relates to water discharge from the site to the marine receiving environment. This allows RTAG to discharge treated wastewater and surface water from specific discharge points to Gove Harbour under controlled conditions.

WDL specified discharge points are referred to in the WDL and this AMP as authorised discharge points. The WDL provides contaminant trigger values and limits for Contaminants of Potential Concern (COPCs) and Stressors for the authorised discharge points. Water quality monitoring locations with WDL trigger values are referred to in the WDL and this AMP as compliance points. Water quality monitoring locations without WDL trigger values and limits are referred to in the WDL and this AMP as authorised monitoring points.

The WDL conditions require monitoring of discharges, marine sediments, and biota. The WDL provided specific criteria for the sampling frequency and contaminant analysis of wastewater and surface water discharges such as contaminant trigger values and limits for COPCs.

2.5 Marine Health Monitoring Programme- Baseline Conditions and Background Sites

Monitoring of the marine environment is undertaken in accordance with the MHMP (APM-EHS-039). The MHMP involves monitoring of seawater, marine sediment and oysters and has been completed to establish baseline conditions and background conditions in the receiving environment since 2004. Data from this historical monitoring is tabulated within a database and forms the basis of background and baseline conditions referenced in this AMP.

2.6 Objectives

Discharges from the functional refinery area occurs via point source discharge to the Gove Harbour and have the potential to impact on Gove Harbour (a moderately disturbed ecosystem) and Melville Bay.

Discharges from RTAG to Gove Harbour and Melville Bay are the primary risk to the environment. The key environmental management objectives for RTAG are:

- Discharges from RTAG will not adversely impact the current Declared Beneficial Uses and Objectives for the Gove Area marine waters being aquatic ecosystem protection for the duration of the authorised discharge;
- To establish continual feedback and improvement system to inform environmental management.

Monitoring requirements are outlined in **Section 3**. Adverse impact is defined in **Section 4.**

The AMP includes consideration of hypothesis and uncertainty when developing the plan as follows:

Hypothesis

- That the trigger values adopted to determine action levels are protective of the environmental receptor; and
- That intervention levels determined allow sufficient time to assess for impacts and avoid an alert level being reached.

Uncertainties

- Published guidelines are not available for all contaminants of potential concern and therefore background guidelines or limits of reporting are adopted as levels (target, intervention, alert) in some cases. These concentrations do not indicate a risk to a receptor and further risk assessment would be required in instances where these levels are reached;
- Sampling is completed at weekly, monthly and annual frequencies depending on the parameter and media and may not be representative of site conditions. Comparison with an extensive background data set is incorporated to reduce the effect of this uncertainty; and
- Gove Harbour and Melville Bay are areas of local community and other industrial activities and impacts from these other activities to the environmental receptor may also occur. Comparison of site discharge data and background concentrations is undertaken where levels are reached to reduce this uncertainty.

3 ENVIRONMENTAL MONITORING

3.1 Contaminants of Concern

Contaminants of potential concern associated with discharge from RTAG can be classified in the following categories:

- Contaminants from the curtailed alumina refining process – include metal(loid)s (aluminium, arsenic, gallium, molybdenum, and vanadium). These contaminants are also found in wastewater treated via wastewater neutralisation plant (WWNP);
- Contaminants from the sewage treatment plant (STP) – treated water from STP may contain nutrients (nitrogen and phosphorous) and bacteria (Enterococci);
- Contaminants from hydrocarbon sources (including fuel storage areas (tank farms) and oily-water separator units) - includes total petroleum hydrocarbons (TPH).

3.2 Discharge monitoring locations

There are five authorised discharge points at RTAG, as shown in **Table 3-1**.

Table 3-1 WDL authorised discharge points

Authorised Discharge Point	Description	Active Discharge
S001	Seawater Outfall Channel	Treated wastewater from the WWNP and STP
S044	Refinery LFTF bund (housing oil water separator)	Stormwater contained within bunded area
S086	Refinery Tank Farm Bund	
S087		
S088		

In addition to the authorised discharge points, there are a series of authorised monitoring points and compliance points at RTAG used to monitor the marine receiving environment. The authorised monitoring points and compliance points are shown in **Table 3-2**.

Authorised Monitoring locations are shown in Appendix 1, Figure 2 of WDL171-11.

Table 3-2 WDL authorised monitoring points

Authorised Monitoring Point	Area	Discharge Source and Description
S074	Seawater Outfall Channel (Refinery)	Composite sampler at the seawater outfall channel (as per S001)
S094	Public boat ramp (Refinery)	Detects potential bacteriological impacts from S001 discharge
SW2	Arafura Sea – off West Woody Island	Information
SW3	Gove Harbour – off Granite Island	
SW4	Melville Bay – off Dolphin Rocks	
SW7	Offshore Drimmie Arm	
SW8	Inverell Bay/Gove Harbour	
SW9*	Mixing zone boundary	Impact for authorised discharge from Refinery
SW10*	Mixing zone boundary	Impact for authorised discharge from Refinery
SW11	Gove Harbour – off outfall	Information – in seawater discharge plume
RR2*	Mixing zone boundary	Impact for authorised discharge from Refinery
MB1	Gove Harbour outside MZ	Information Sites
MB2	Gove Harbour outside MZ	Information Sites
MB3	Gove Harbour outside MZ	Information Sites
MB4	Gove Harbour outside MZ	Information Sites
S098	WWNP neutralised SuperNatant Liquor prior to entering sea water channel	Measure of concentrations output from the WWNP prior to discharge into sea water channel
S015	Sewerage Treatment Plant (STP)	Measure of concentrations output from the STP prior to discharge into sea water channel

*SW9, SW10 and RR2 are also considered to be compliance points under WDL171-11. As such, the licence specifies trigger values for these locations. The remaining monitoring points do not have specific WDL trigger values.

3.3 Discharge monitoring frequencies and criteria

Trigger values and limits are specified in WDL 171 - 11 for water quality parameters and contaminants at authorised discharge points and compliance monitoring points. Authorised discharge point and compliance monitoring point trigger values, limits and monitoring frequencies are summarised in **Table 3-3** and **Table 3-4**. Monitoring locations are shown on figures below.

Table 3-3 Trigger values, limits, and monitoring frequencies for authorised discharge points

			Authorised Discharge Points					
			S001			S044, S086, S087 & S088		
Parameter	Unit	Analysis Type	Frequency	Trigger value	Limit	Frequency	Trigger value	Limit
pH	pH		C[4] D	9.0	9.5	D^	9.0	9.5
EC	µS/cm		C[4]	-	-	-	-	-
Turbidity	NTU		D	20[1] or 75[2]	100	-	-	-
Alkalinity	mg/L		D	-	-	-	-	-
TSS	mg/L		W	-	-	-	-	-
Aluminium	µg/L	Total and filtered (0.45µm)	W	-	560	-	-	-
Arsenic	µg/L		W	-	200	-	-	-
Gallium	µg/L		W	-	8,000	-	-	-
Molybdenum	µg/L		W	-	38,800	-	-	-
Vanadium	µg/L		W	-	1,000	-	-	-
Total Dissolved Phosphorus	µg/L	Filtered (0.45µm)	M	-	140	-	-	-
Total Dissolved Nitrogen	µg/L		M	-	1,700	-	-	-
Enterococci	Cfu/100 mL	Total	M + R	-	-	-	-	-
TPH	µg/L	Total	H	100	600	W^	100	600

C = continuous where it is a rolling average over 24 hours

D = daily

H = daily when there is a hydrocarbon related incident at the refinery

W = weekly

W^ = weekly when discharging from S086, S087, S088 & S044 only (authorised or otherwise) and at least once per discharge event

D^ daily when discharging from S086, S087, S088 & S044 only (authorised or otherwise) and at least once per discharge event

M = monthly

M+R = monthly and response. Responsive sampling to be undertaken at an identical frequency to S094, until concentrations at S094 are <35 cfu/mL.

1 = Dry conditions – unaffected by rainfall-runoff processes associated with a storm event

2 = storm event – includes the actual rainfall event and the time it takes for the rain that fell at the furthest areas of the catchment to travel through the catchment to the discharge point.

3 = limits apply to filtered (0.45µm) concentrations

4 = continuous data where maximum period between measurements is no greater than one hour.

'-' = no trigger value or no frequency

Table 3-4 Tigger values for compliance points

Parameter	Unit	Analysis Type	Frequency	Trigger value
pH	pH	In-situ	M	7.7 – 8.4 [1]
EC	µS/cm		M	-
Turbidity	NTU		M	20[2]
Dissolved Oxygen	mg/L		M	5.8*[1]
Alkalinity	mg/L	Total	M	-
TSS	mg/L		M	-
Aluminium	µg/L	Total and filtered (0.45µm)	M	56[3]
Arsenic	µg/L		M	20[4]
Gallium	µg/L		M	800[3]
Iron	µg/L		M	-
Magnesium	µg/L		M	-
Molybdenum	µg/L		M	3,880[3]
Vanadium	µg/L		M	100[5]
Total Dissolved Phosphorus	µg/L	Filtered (0.45µm)	M	14^[1]
Total Dissolved Nitrogen	µg/L		M	170^[1]
TPH	µg/L	Total	M^	-
PAHs	µg/L		M^	-
Benzene	µg/L		M^	-
Toluene	µg/L		M^	-
Ethylbenzene	µg/L		M^	-
Xylene	µg/L		M^	-

M = monthly

M^ = monthly when discharging from S086, S087, S088 & S044 only and when safe to do so acknowledging some discharge vents will occur during monsoonal conditions.

'-' = no trigger value 1 = site specific trigger value derived based on 15 years of monthly data collected from Melville Bay

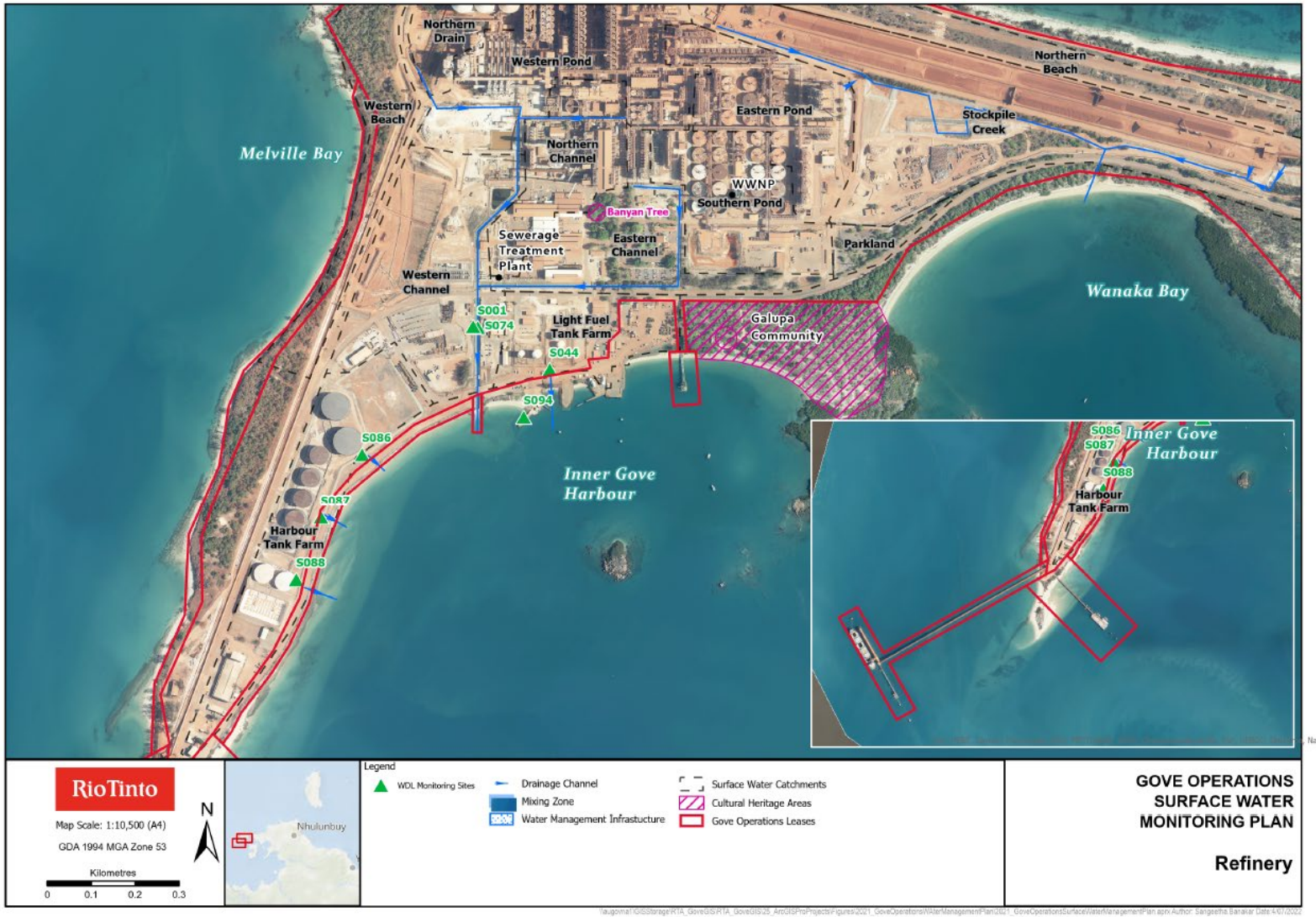
2 = default trigger values for chemical stressors for inshore marine, slightly disturbed ecosystem, ANZG 2018

3 = 95% species protection trigger levels from van Dam, J.W., Trenfield, M.A., Streten, C., Harford, A.J., Parry, D., van Dam, R.A. (2018) Water quality guideline trigger values for aluminium, gallium, and molybdenum in marine environments. Environmental Science Pollution Research, 25:26592-26602.

4 = based on 95% species protection trigger values for As (V) from van Dam, J.W. (2017) Assessing the biological effects of arsenate on tropical marine biota. Report prepared for Rio Tinto. Australian Institute of Marine Science, Darwin.

5 = 95% species protection trigger levels ANZG 2018

WDL 171 - 11 does not specify water quality criteria for authorised monitoring points shown in **Table 3-5**. However, the WDL does provide required monitoring frequencies at these locations.


Northern Drain
Western Pond
Northern Beach
Western Beach
Eastern Pond
Stockpile Creek
Melville Bay
Northern Channel
WWNP Southern Pond
Banyan Tree
Sewerage Treatment Plant
Eastern Channel
Parkland
Western Channel
Wanaka Bay
S001
S074
Light Fuel Tank Farm
Galupa Community
S044
S094
S086
Inner Gove Harbour
S087
Harbour Tank Farm
S088
Inner Gove Harbour
S086
S087
S088
Harbour Tank Farm
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Map Scale: 1:10,500 (A4)
GDA 1994 MGA Zone 53
Kilometres
0 0.1 0.2 0.3
N
Nhulunbuy
Legend
WDL Monitoring Sites
Drainage Channel
Mixing Zone
Water Management Infrastucture
Surface Water Catchments
Cultural Heritage Areas
Gove Operations Leases
GOVE OPERATIONS
SURFACE WATER
MONITORING PLAN
Refinery

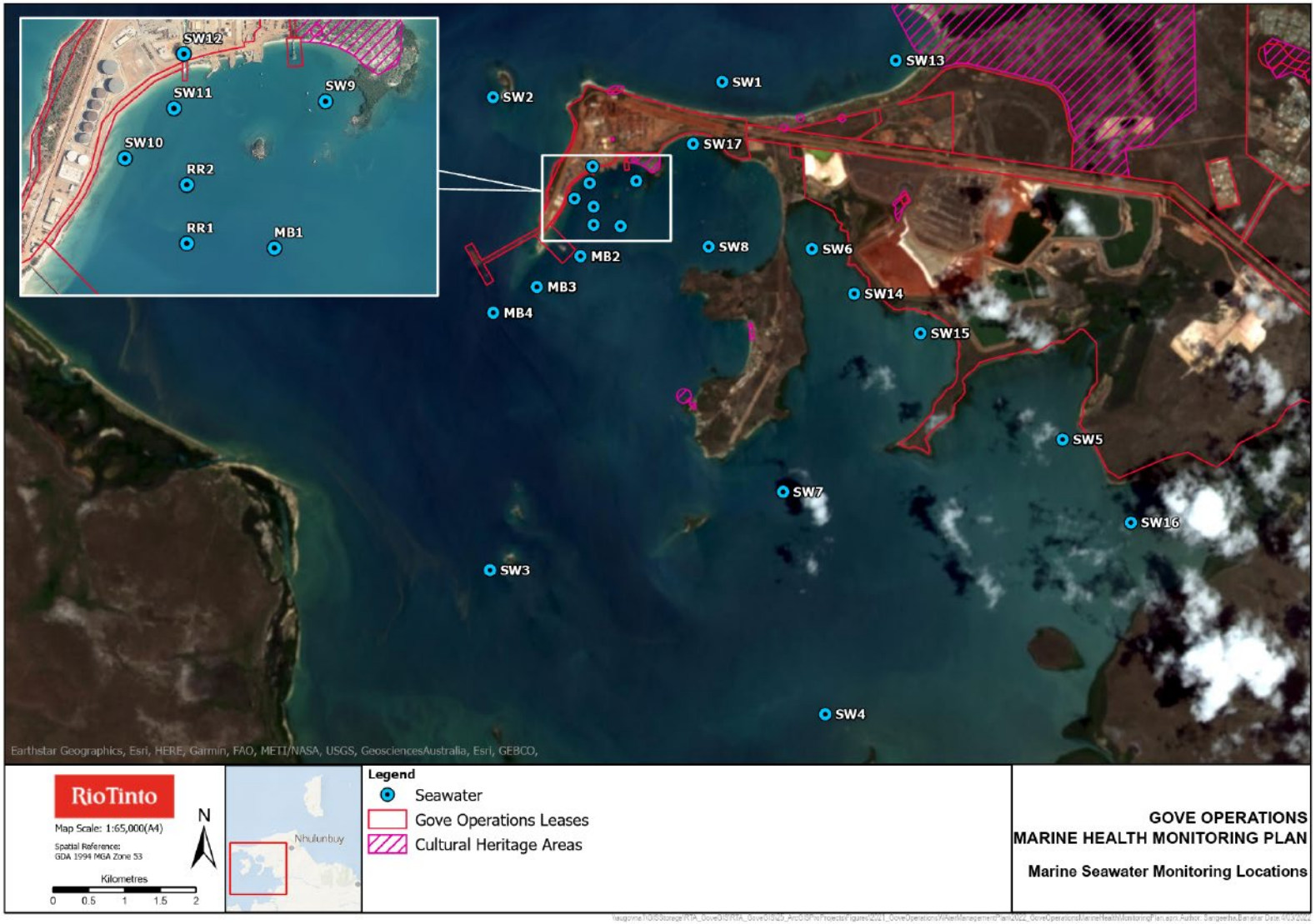

SW12
SW11
SW9
SW10
RR2
RR1
MB1
SW2
SW13
SW1
SW17
MB2
SW8
SW6
MB3
SW14
MB4
SW15
SW5
SW7
SW16
SW3
SW4
Earthstar Geographics, Esri, HERE, Garmin, FAO, METI/NASA, USGS, GeosciencesAustralia, Esri, GEBCO,
RioTinto
Map Scale: 1:65,000(A4)
Spatial Reference:
GDA 1994 MGA Zone 53
Kilometres
0 0.5 1 1.5 2
N
Nhulunbuy
Legend
Seawater
Gove Operations Leases
Cultural Heritage Areas
GOVE OPERATIONS
MARINE HEALTH MONITORING PLAN
Marine Seawater Monitoring Locations

Table 3-5 Required monitoring parameters and frequencies for authorised monitoring points.

			Frequency			
Parameter	**Unit**	**Analysis Type**	**S074**	**S094**	**MB1, MB2, MB3, MB4 & SW3**	**SW2, SW4, SW7, SW8 & SW11**
pH	pH	In-situ / laboratory	D	-	M	M
EC	µS/cm		D	-	M	M
Turbidity	NTU		D	-	M	M
Alkalinity	mg/L		D	-	M	M
TSS	mg/L		D	-	M	M
Dissolved Oxygen	mg/L		-	-	M	M
Chlorophyll a	µg/L		-	-	M	M
Total Dissolved Phosphorus	µg/L	Filtered (0.45µm)	-	-	M	M
Total Dissolved Nitrogen	µg/L		-	-	M	M
Enterococci	Cfu/100 mL	Total	-	M+R	-	-
Aluminium	µg/L	Filtered (0.45µm)	M	-	M	M
Arsenic	µg/L		M	-	M	M
Chromium			M	-	M	M
Copper			M	-	M	M
Gallium	µg/L		M	-	M	M
Manganese			M	-	M	M
Molybdenum	µg/L		M	-	M	M
Vanadium	µg/L		M	-	M	M
Zinc			M	-	M	M
TPH	µg/L	Total	-	-	I	-
PAHs	µg/L		-	-	I	-
Benzene	µg/L		-	-	I	-
Toluene	µg/L		-	-	I	-
Ethylbenzene	µg/L		-	-	I	-
Xylene	µg/L		-	-	I	-

D = daily

I = incidental; within 1 week of elevated concentration at any of the compliance points and monthly thereafter until concentrations at all points return to normal levels

M+R = monthly and responsive; Monthly sampling with Enterococci results compared to trigger value of 35cfu/100mL at S094 and weekly thereafter until concentrations at S094 are <35 cfu/mL

M = monthly

M^ = monthly when discharging from S086, S087, S038 & S044 only (authorised or otherwise) and at least once per discharge event

'-' = no sampling required

Additional monitoring requirements apply for authorised monitoring points S098 and S015 including time discharge commenced and duration of discharge, discharge flow rate and discharge volume. Monitoring requirements of S098 and S015 are shown in **Table 3-6**.

Table 3-6 Discharge load monitoring program

			Frequency	
Parameter	**Unit**	**Analysis Type**	**S098**	**S015**
Flow rate	L/minute	In-situ	D	W^
Volume	L/day			
Discharge period	hh:mm			
Total Dissolved Phosphorus	µg/L	Total	-	W
Total Dissolved Nitrogen	µg/L			
Aluminium	µg/L	Total	W	-
Arsenic	µg/L			
Gallium	µg/L			
Molybdenum	µg/L			
Vanadium	µg/L			

D = daily when discharging via the seawater channel to S001 following installation of instrumentation in accordance with WDL condition 25

W^ = weekly when discharging via the seawater channel to S001 following installation of instrumentation in accordance with WDL condition 25

W = weekly when discharging via the seawater channel to S001

'-' = no sampling required

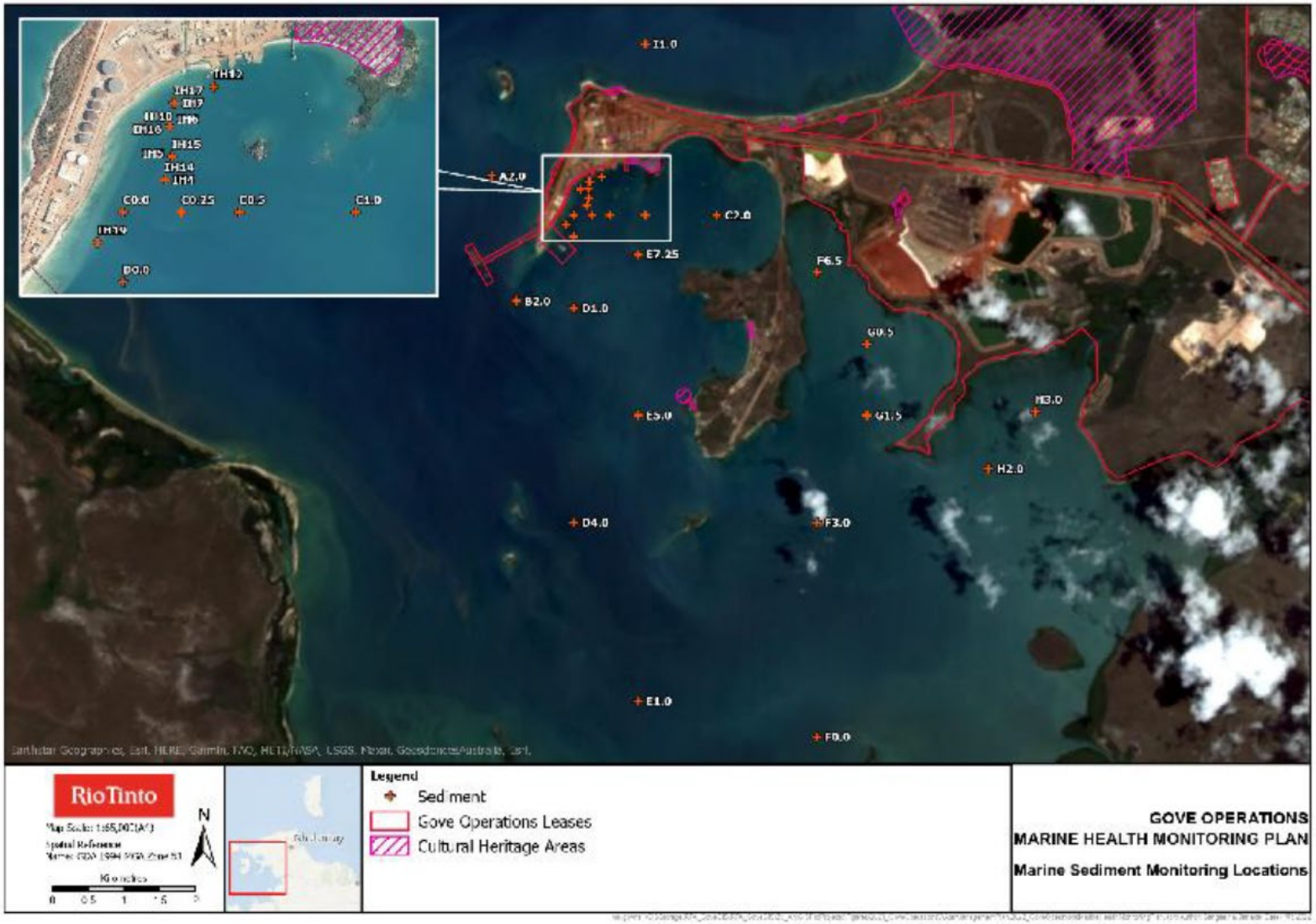
3.4 Sediment and Biological Monitoring

Sediment and biological monitoring will be completed in accordance with the Marine Health Monitoring Program 2022 (APM-EHS-039). The sediment and biological monitoring programs are summarised in **Table 3-7**.

Table 3-7 Summary of sediment and biological monitoring programs

Program	Description
Sediment monitoring	Annual sediment monitoring is conducted at 32 sites across Melville Bay to assess impacts of RTA Gove discharge on marine sediments. Results are compared against sediment quality under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) and background concentrations. In addition, a Closure marine sediment monitoring program commenced in 2019. This monitoring program will be conducted over 7 years up until 2025.
Oyster monitoring	Bi-annual oyster monitoring at four sites across Melville Bay for the purpose of assessing bioaccumulation of contaminants of concern. Results are compared against the Food Standards Australia New Zealand (FSANZ) and background.

Refer to the Marine Health Monitoring Program (2022) for further sediment and biological monitoring information.


I1.0
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IH7
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IH16
IH6
IH15
IH5
IH14
IH1
A2.0
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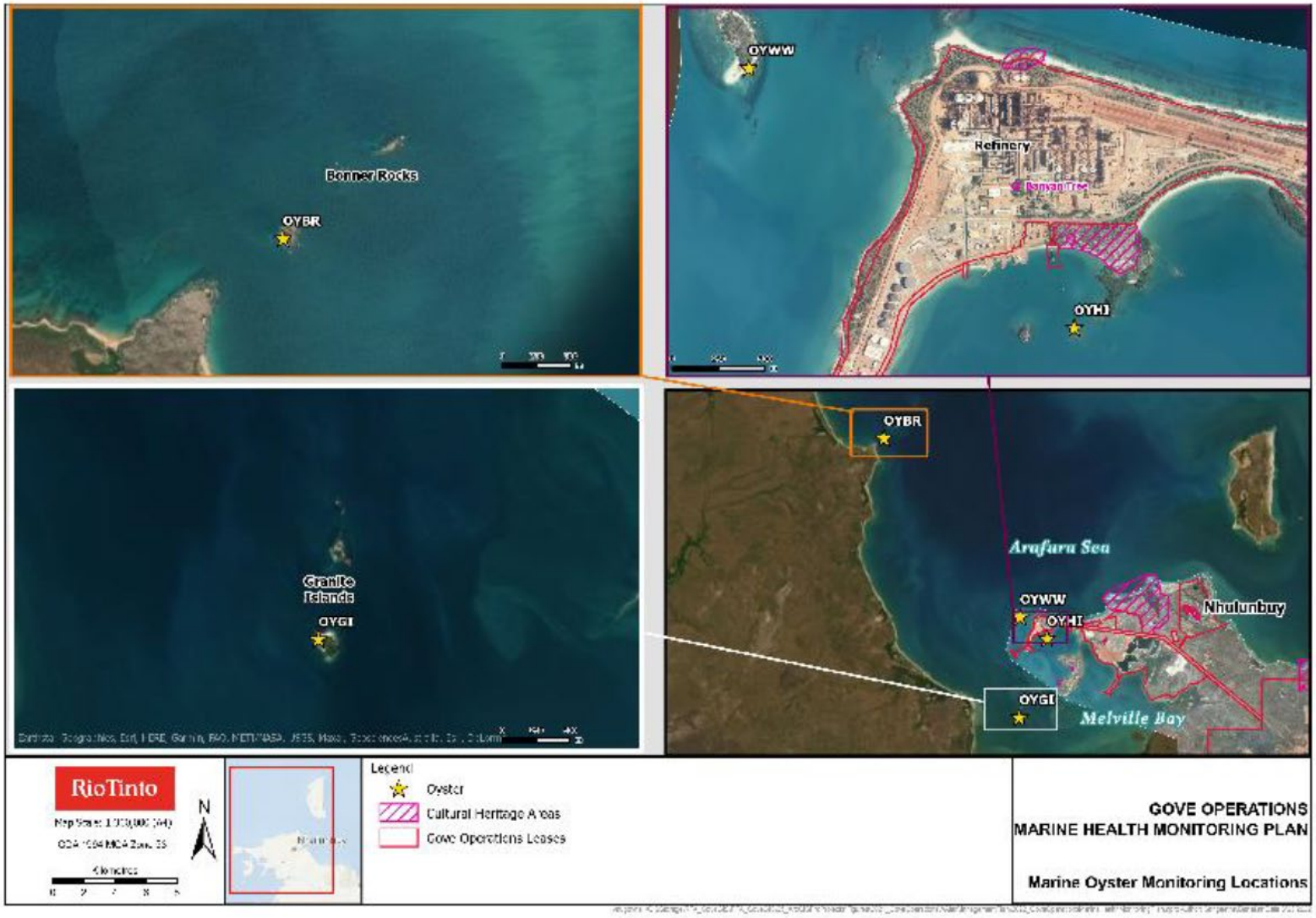
C0.5
C1.0
IH19
B0.0
C2.0
E7.25
F6.5
B2.0
D1.0
G0.5
M3.0
E5.0
G1.5
H2.0
D4.0
F3.0
E1.0
F0.0
RioTinto
N
Legend
Sediment
Gove Operations Leases
Cultural Heritage Areas
GOVE OPERATIONS
MARINE HEALTH MONITORING PLAN
Marine Sediment Monitoring Locations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OYBR
OYWW
Refinery
Banyan Tree
OYHI
Granite Islands
OYGI
OYBR
Arafura Sea
OYWW
OYHI
Nhulunbuy
OYGI
Melville Bay
RioTinto
N
Legend
Oyster
Cultural Heritage Areas
Gove Operations Leases
GOVE OPERATIONS
MARINE HEALTH MONITORING PLAN
Marine Oyster Monitoring Locations

3.5 Reporting

3.5.1 Non-compliance response

A non-compliance is defined as:

- An exceedance of a limit specified in **Table 3-3**
- An exceedance of a trigger value specified in **Table 3-3** and **Table 3-4** of three times or more the trigger value
- An exceedance of a trigger value specified in **Table 3-3** and **Table 3-4** on three consecutive sampling occasions

Reporting of non-compliances will be completed in accordance with the requirements of WDL171 – 11.

Sampling reports include comparison to limits and/or trigger values following the RTAG process for identification of non-compliances.

The Environmental Advisor is responsible for the identification of trigger and/or limit value non-compliances.

The Environmental Superintendent ensures all non-compliances with the WDL 171 – 11 are recorded and the Administering Agency notified as soon as practicable after becoming aware of the non-compliance and in any case within 24 hours of a non-compliance. The notification to the Administering Agency must include:

- When the non-compliance was detected and by whom
- The date and time of the non-compliance
- The actual and potential causes and contributing factors to the non-compliance
- The risk of environmental harm arising from the non-compliance
- The action(s) the have or will be undertaken to mitigate any environmental harm arising from the non-compliance
- Corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur
- A plan for additional monitoring relevant to the non-compliance
- Where a non-compliance relates to an exceedance of Total Nitrogen as specified in **Table 3-3** and **Table 3-4**, further analysis to speciate for Nitrate or Nitrite must be conducted and provided as part of the incident investigation report
- If no action was taken, why no action was taken
- A date when an incident investigation report will be submitted to the Administering Agency

If a trigger value is exceeded, records of exceedances must be kept and include:

- When the exceedance was detected and by whom
- The date and time of the exceedance
- The actual and potential causes and contributing factors to the exceedance
- The risk of environmental harm arising from the exceedance
- The action(s) that have or will be undertaken to address the exceedance and/or environmental harm
- If no action was taken, why no action was taken

If a trigger value is exceeded, an investigation must be carried out to determine the cause of the exceedance and include:

- The actual or potential causes and contributing factors to the exceedance
- The risk of environmental harm resulting from the exceedance
- Actions undertaken to mitigate any environmental harm arising from the exceedance
- Corrective actions undertaken to ensure the exceedance does not reoccur

The Environmental Superintendent is responsible for notifying the Utilities Superintendent of the non-compliance.

The Utilities Superintendent is responsible for implementing the S001 TARP in response to the incident.

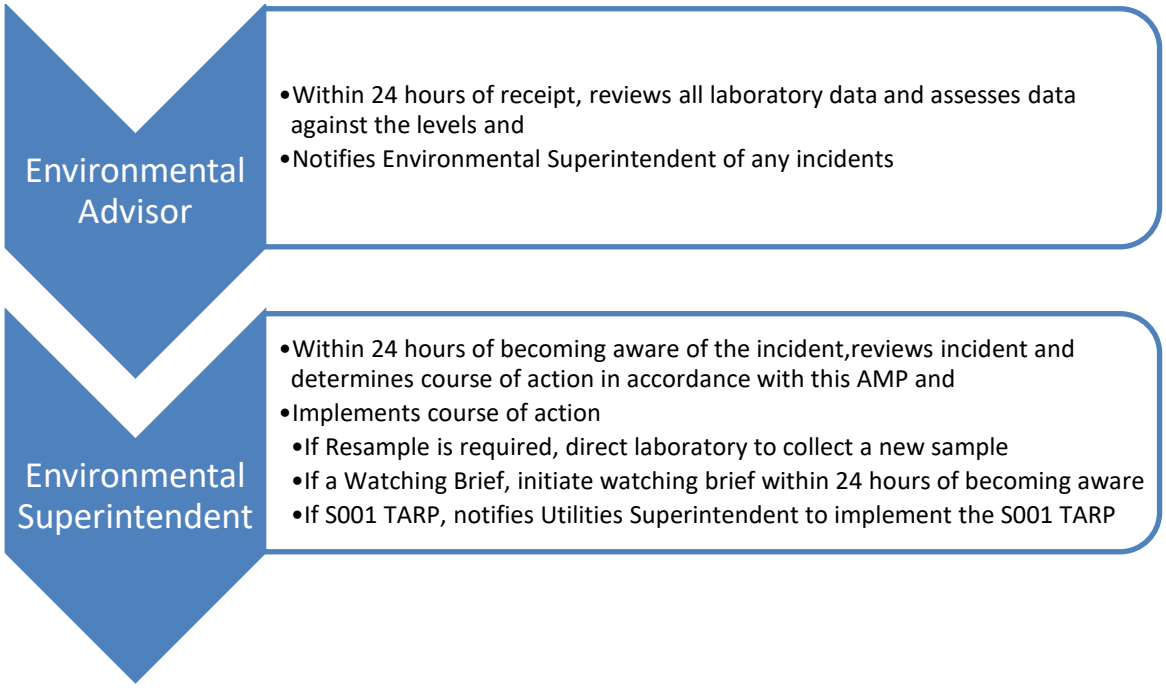
3.5.2 Incident Reporting

Incident reporting is completed in accordance with the Incident and Action Management Plan, GPM-EHS-020.

An incident in this AMP is described as:

- An exceedance of an intervention or alert level identified in **Table 4-5** or **Table 4-6.**

The following flowchart shows roles and responsibilities for identifying and responding to an incident.



If an incident occurs, records of incident must be kept and include:

- When the incident was detected and by whom
- The date and time of the incident
- The actual and potential causes and contributing factors to the incident
- The risk of environmental harm arising from the incident

- The action(s) that have or will be undertaken to address the incident and/or environmental harm
- If no action was taken, why no action was taken

If an incident is exceeded, an investigation must be carried out to determine the cause of the incident and include:

- The actual or potential causes and contributing factors to the incident
- The risk of environmental harm resulting from the incident
- Actions undertaken to mitigate any environmental harm arising from the incident
- Corrective actions undertaken to ensure the incident does not reoccur

3.5.3 Compliance Reporting

RTAG will complete daily, weekly and monthly internal checks to review and compare monitoring data against trigger values and limits and intervention and alert levels according to monitoring frequency requirements.

An Annual Return and a Monitoring Report will be completed and submitted by 17 July each year. The reporting period will be between the preceding 1 April to 31 March.

Each monitoring report must:

- Be prepared in accordance with the requirements of the NT EPA '*Guideline for Reporting on Environmental Monitoring*'
- Microsoft Excel file of data tables of all data required by WDL171 – 11
- Data tables to include monthly and annual contaminant loads discharged from the STP (S015) and WWNP (S098). Contaminant loads must be calculated for total metals and metalloids, and total nutrients which appear in **Table 3-3** and **Table 3-4**. Calculations must be based on daily discharge volumes and contaminant concentrations present on that day. Linear interpolation must be used to estimate concentrations where samples have not been collected.
- Summaries for each authorised discharge point
- Assessment of data representativeness for samples collected from S001, SW9, SW10 and RR2 during discharge periods from the STP and WWNP
- Report on sediment and biological monitoring to demonstrate no deterioration of marine ecosystem health as a result of authorised discharge
- Long-term trend analysis of monitoring data to demonstrate any environmental impacts associated with discharge activity. Data must be made available in Microsoft Excel format.
- An assessment of non-compliances and evaluation authorised discharge trigger values to ensure these are appropriately protective of the receiving environment.

3.5.4 Performance improvement

A progress report relating to the Continuous Improvement Plan as it related to the improvements to the receiving environment, and an options analysis to avoid discharge from S086, S087 and S088 with a view to remove these authorised discharge points from WDL 171 - 11 must be submitted to the DEPWS by 17 July 2022.

4 TRIGGER ACTION RESPONSE PLAN (TARP)

4.1 TARP Structure

The TARP structure comprises three layers each with specific trigger, action, and response.

Performance indicators within the 'Target' layer trigger values suggests that the performance is achieving the objective.

Performance indicators within the 'Intervention Level' layer trigger values suggest investigative actions are recommended to determine the cause and whether mitigation actions are required.

Performance indicators within the 'Alert Level' layer trigger values require investigative action to determine mitigation actions required to rectify or manage the situation.

Non-compliances identified through the TARP are to be reviewed for continuous improvement of site management process as outlined in **Section 5.1**.

4.2 RTAG TARP

A TARP (ERP-CCR-001) already exists for S001 (the S001 TARP) and is included in **Appendix 1**. The TARP for the remaining authorised discharge points and monitoring points is outlined in **Table 4-1** to **Table 4-4.**

Table 4-1 TARP FOR AUTHORISED DISCHARGE POINTS

	TARGET
Authorised Discharge Points **S044, S086, S087 and S088** (as described in **Section 3.5.4,** a performance improvement program is underway to remove **S086, S087 and S088** authorised discharge points)	Water quality at authorised discharge points below Target Levels (see **Table 4-5**)
Mitigation or management required	• Request laboratory verification within 24 hours. Resample if required to verify results within 7 days. • Do not allow discharge until sample is within range

Table 4-2 TARP COMPLIANCE MONITORING POINTS

	TARGET	INTERVENTION LEVEL	ALERT LEVEL
Compliance points **SW9, SW10 and RR2**	Water quality at compliance points below Target Levels (see **Table 4-5**)	Water quality at compliance points within Intervention Level range (see **Table 4-5**)	Water quality at compliance points exceeds the Alert Level (see **Table 4-5**)
Mitigation or management required		• Request laboratory verification within 24 hours. Resample if required to verify results within 7 days. Values that are within the Intervention level but lower than the Alert level will result in a watching brief. A watching brief involves precautionary ongoing data assessment to verify whether or not a trend away from background is occurring, and whether it is correlated to the discharge. This may include further sampling if required. • If the watching brief identifies a trend away from background, determine if this is related to a site source discharge or if this is related to other	• Request laboratory verification within 24 hours. Resample if required to verify results within 7 days. • Review authorised discharge point and authorised monitoring point data and determine if discharge is the cause based on a multiple lines of evidence approach. • If yes, carry out authorised discharge point actions to rectify, refer to S001 TARP, Appendix 1 within 48 hours of becoming aware.

		• sources through comparison to all monitoring data. • If related to a site source, carry out authorised discharge point actions to rectify outlined in the S001 TARP, Appendix 1 within 48 hours of becoming aware.	

Table 4-3 TARP MARINE MONITORING POINTS, EXCLUDING COMPLIANCE POINTS

	TARGET	INTERVENTION LEVEL	ALERT LEVEL
Authorised Monitoring Points	• No change in historical trends and water quality below Target Levels (see **Table 4-6**)	• Statistically significant increasing trend with concentrations in the range of Intervention Levels (see **Table 4-6**)	• Statistically significant increasing trend AND concentrations exceeding Alert Level (see **Table 4-6**)
Mitigation or management required		• Request laboratory verification within 24 hours. Resample if required to verify results within 7 days. • Values that are within the Intervention level but lower than the Alert level will result in a watching brief. A watching brief involves precautionary ongoing data assessment to verify whether or not a trend away from background is occurring, and whether there is any correlation to the compliance points. If further information is required to determine the reason for the concentration variability, then additional sampling locations or sampling frequency may be required. This may include further sampling if required to determine source or significance.	• Request laboratory verification within 24 hours. Resample if required to verify results within 7 days. • Investigate possible sources of contamination (e.g., elevated concentrations at discharge points). Rectify contamination source use actions for authorised discharge points if discharge point is a possible source. • Carry out authorised discharge point actions to rectify, refer to S001 TARP, Appendix 1 within 48 hours of becoming aware. • Assess other authorised monitoring points against background data and long term spatial and temporal trends at this location to determine if statistically significant increase is occurring. Consider review of multiple lines of evidence including discharge data and sediment and biota monitoring. Further investigate in accordance with **Section 5.1.**

Table 4-4 TARP MARINE SEDIMENT AND BIOTA

	TARGET	INTERVENTION LEVEL[1]
Sediment and Biota sampling	• Sediment data below ANZG sediment quality guideline values (SQGVs) where available and no statistically significant increasing trends in COPCs spatially and temporally. • Biota (oysters) data below ANZ Food Standards where available and no statistically significant increasing trends in COPCs compared to background data at reference sites, spatially and temporally.	• Concentrations of COPCs are elevated compared to guidelines or background and/or statistically significant increasing trends are identified.
Mitigation or management required		• Withing six months, complete a cause and effect analysis to identify possible sources of contamination. This analysis will consider all monitoring data and include temporal and spatial considerations.

	TARGET	INTERVENTION LEVEL[1]
		• Rectify contamination source using actions for authorised discharge points if discharge point is a possible source, refer to S001 TARP, Appendix 1. • Where an impact to biota and/ or sediment is identified changes to management practices and monitoring trigger levels is required including further investigation in accordance with **Section 5.1**

1. Any exceedance of Target Level in sediment and/or biota requires intervention. As such, there is no requirement for differentiation of Intervention or Alert levels.

Table 4-5 Criteria ranges for Target, Intervention and Alert Level performance indicators[1]

	Authorised Discharge Point S044, S086, S087 and S088				Compliance Points (SW9, SW10 and RR2)		
Parameter	**Target levels**	**Intervention levels**	**Alert levels**	**WDL Limits**	**Target levels**	**Intervention levels**	**Alert levels[2]**
pH	<9.0	No Level	No Level	9.5	<8.2	8.2 – 8.4	> 8.4
Turbidity					<8	8 - 16	20
Aluminium					<12	12 – 45	56
Arsenic					<4	4 – 16	20
Vanadium					<20	20 – 80	100
Other analytes	< Table 3.3[3]	No Level	No level	< Table 3.3	In order of hierarchy: < Table 3-4 OR < 95% Marine ANZG OR < limit of reporting		

Metal and metalloid criteria apply to dissolved (<0.45µm filtered) concentrations

1 Target and interventional levels are set at fractions of the alert level in order to provide early warning of increasing concentrations.

2 Alert levels at compliance points are equal to the WDL trigger level

3 Intervention levels for 'other analytes' are equal to the target level as levels are either very low and it is not possible to add intervention levels, or levels are high and unlikely to occur in isolation or drive changes to the site operations.

Table 4-6 Criteria ranges for Target, Intervention and Alert Level performance indicators

	Authorised Marine Monitoring Points		
Parameter	**Target levels**	**Intervention levels**	**Alert levels**[4]
Aluminium	8	8 - 16	>16
Arsenic	4	4 - 7.5	>7.5
Vanadium	25	25 - 50	>50[5]

Metal and metalloid criteria apply to dissolved concentrations

[4] Ref for Al GVs: van Dam, J. W., M. A. Trenfield, C. Streten, A. J. Harford, D. Parry, and R. A. van Dam. 2018. Water quality guideline values for aluminium, gallium and molybdenum in marine environments. Environmental Science and Pollution Research 25:26592–26602.
Ref for As GVs: van Dam J.W. 2017. Assessing the biological effects of arsenate on tropical marine biota. Report prepared for Rio Tinto. Australian Institute of Marine Science, Darwin. (49 pp)

[5] ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (www.waterquality.gov.au/anz-guidelines). Criteria for marine water and 99% level of protection were adopted.

5 CONTINGENCY

5.1 Contingency Measures

The following contingency measures may be implemented in response to exceedances of Intervention or Alert level criteria:

1. Confirm concentrations via additional sampling and analysis;
2. Adjust processing conditions e.g., adjust treatment rate, adjust flocculant dose;
3. If unable to control the increasing concentration(s), cease discharge.

Appropriate management measures would be determined based on information available at the time of an exceedance of Intervention or Alert level performance indicators.

A part of RTAG's commitment to continual improvement, follow-up inspections will be completed to assess the effectiveness of implemented management or mitigation measures. Under the site operating conditions, the site is required to notify of non-compliances and incidents within 24 hours of becoming aware.

The requirement for additional management or mitigation measures is assessed following any non-compliance or incident. This iterative review of non-compliances and incident management response is to improve overall water management through a prioritised process that reduces non-compliance frequency, minimises impact to the receiving environment and maintains plant operations.

5.2 Contingency Plan

If an environmental objective is considered to have not been achieved, this will be notified to the relevant line managers. Following internal notifications, RTAG will notify DEPWS and, as necessary, other relevant stakeholders as soon as practicable. RTAG will determine the appropriate course of action for managing identified environmental impacts and submit the proposed course of action to the relevant regulators.

6 CONTINUAL IMPROVEMENT

This AMP will be subject to reviews on an annual basis or following modification to or renewal of WDL 171 - 11. Document reviews will provide necessary updates to incorporate lessons learned on-site, industry knowledge, technological improvements, and improved management techniques.

If necessary, updates to the AMP will be completed in consultation with relevant regulators and/or stakeholders.

Data review and reporting processes are documented in the relevant management plans and/or monitoring programs.

This AMP has been prepared and will be reviewed by a suitably qualified person in accordance with WDL 171 - 11 condition 54.

7 STAKEHOLDER ENGAGEMENT

Stakeholder engagement for water management at RTAG is undertaken following the Gove Operations WDL Consultation and Communication Plan 2020. Engagement incorporates discussion with key stakeholders including traditional owners, at the traditional owner's leader forum, community, regulators, and engagement on the Marine Health Monitoring Program since its early inception.

8 REFERENCES

ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (www.waterquality.gov.au/anz-guidelines).

NT EPA. (2018). Guidance on Adaptive Management.

NT OEH. (2004). Environmental Assessment Report and Recommendations: Alcan Gove Alumina Refinery Third Stage Expansion.

Appendix 1 – S001 TARP ERP-CCR-001

Any Alert level trigger will necessitate immediate action, in some circumstances initiating the shutdown of WWNP. In circumstances where the WWNP is shut down, the WWNP should not be restarted until the risk posed by the initial alert has been satisfactorily managed, enabling conditions to be returned below the Alert level and/or Intervention level.

	Target	Intervention Level	Alert Level
727 Sea World Pumps	Pumps operating in line to operations requirements.	Where only the Eastern seawater pump is available	Where both pumps are not available
Action Required		• Raise priority maintenance notification to rectify the Western pump • Process Engineer to consider if it is possible to adjust process conditions and maintain target levels for pH, turbidity and metal reading at S001. ***NOTE -*** If unable to make adjustments to maintain target levels, shut down WWNP	• Raise priority notification • Shut Down WWNP
Western Pond Level	Western Pond 50% Level or lower	Western Pond between 50% and 95%	Western Pond over 95% with overflow imminent
Action Required		• Ensure both Sea World pumps are operational to assist in dilution.	• Stop all discharges to seawater channel including the WWNP if operating ***NOTE*** – During significant rainfall during night-shift notification is not required. Instead, an email should be sent informing of the time it was suspected the pond went over.
Western Pond Sump Pump (SP702-1) Functionality	Western Pond Pump Functional	Western Pond Sump Pump Non-Functional	Western Pond Pump Non-Functional – Rain Predicted
Action Required		• Inspect pump for general faults (Trip or Estop in) • Raise notification to have the pump immediately repaired – Class4	• Inform supervisor and have pump repair prioritised over other works • Shutdown WWNP if Pond levels exceed 95%
(S001) Continuous pH, Conductivity and level	Continuous monitoring required	Delta V alarm activated on probes	No manual sampling is available
Action Required		• Immediately contact site electricians for rectification • Contact Supervisor to arrange manual sampling every 30mins	• Stop all discharges to seawater channel including the WWNP if operating • Shutdown 727sea water pumps
Sea Water Monitoring Station (S001) pH	S001 pH below 8.7	S001 pH between 8.7 and 8.9	S001 pH >8.9
Action Required		• If confirmation result still remains elevated Inform Process Engineer, who will advise on modifications to process conditions to decrease pH • If the Process engineer is not available see attached flow chart	• Inform Process Engineer, who will advise on modifications to process conditions to decrease pH • If the PE is not available see attached flow chart
Sea Water Monitoring Station (S001)	S001 Turbidity during dry fine conditions <15NTU	S001 Turbidity 15 to 18 NTU dry fine conditions	S001 Turbidity above 18 NTU
Action Required		• Operator to Immediately re-sample to confirm result with the day shift lab • During night shift the operator is to re-sample Turbidity reading • If the conformation result is still elevated Inform Process Engineer, who will advise on modifications to process conditions to decrease Turbidity • If Process Engineer is not available see attached flow chart	• Operator to Immediately re-sample to confirm result with the day shift lab • During night shift the operator is to re-sample Turbidity reading • If the conformation result is still elevated Inform Process Engineer, who will advise on modifications to process conditions to decrease Turbidity • If Process Eng is not available see attached flow chart

Sea Water Monitoring Station (S001)	S001 Turbidity during rain events of 50NTU	S001 Turbidity 50 - 73 NTU during rain events	S001 Turbidity during >73 NTU during rain events
Action Required		• Operator to Immediately re-sample to confirm the result with the day shift lab • During the night shift, the operator is to re-sample the Turbidity reading • If the confirmation result is still elevated Inform Process Engineer, who will advise on modifications to process conditions to decrease Turbidity • If Process Eng is not available see attached flow chart	• Shut down WWNP
Sea Water Monitoring Station (S001)	Metals detected in sample below Intervention Limit	Metals at Intervention Level (see next page)	Metals above Alert Level (see next page)
Action Required		• Inform Process Engineer who will consider actions including ○ Request additional samples ○ Adjustment of process conditions • If Process Engineer is not available, follow the flow chart	• Inform Process Engineer who will consider actions including ○ Request additional samples ○ Adjustment of process conditions • If Process Eng is not available, follow the flow chart
Lab Support for Samples	Day shift Lab provides regular testing and confirmation	No Night Shift lab support	No Lab Support for >24 Hours
Action Required		• CCR to Monitor All Live Parameters, no process changes to occur until samples can be verified	• Stop all discharges to the seawater channel including the WWNP

WDL values summary as taken from WDL171-11. Dated 17th September 2020 and to be updated on the 16th September 2030

	Is a Licence Requirement	Normal Values	Intervention Value	Alert Value	Licence Breach
Environmental Parameters					
pH	Yes	<8.7	8.7 – 8.9	>8.9	9.5
Turbidity	Yes	<15 NTU Dry <50 NTU Rain Event	15 – 18 NTU in Dry, 50 - 73 NTU Rain Event	>18 NTU in Dry, >73NTU Rain Event	100 – Dry Fine 100 – Rain Event
Metals & Metalloids					
1. Arsenic	Yes	<60 µg/L	>=60 µg/L <=75 µg/L	>75 µg/L	200 µg/L
2.Total Iron	No	<200 µg/L	>=200 µg/L <=300 µg/L	>300 µg/L	NA
3.Aluminium	Yes	<50 µg/L	>=50 µg/L <=200 µg/L	>200 µg/L	560 µg/L
4.Vanadium	Yes	<200 µg/L	>=200 µg/L <=250 µg/L	>250 µg/L	1000 µg/L
5.Gallium	Yes	<50 µg/L	>=50 µg/L <=300 µg/L	>300 µg/L	8,000 µg/L
6.Molybdenum	Yes	<100 µg/L	>=100 µg/L <=300 µg/L	>300 µg/L	38,800 µg/L

Communications of interventions and actions.

- All exceedances are to be recorded and the environmental team are to be notified via gove.enviromentalteam@riotinto.com
- The Control Room Operator (CRO) is to ensure the supervisor and Process Engineer is informed anytime an **Intervention level** is reached then record the time and action taken into the CRO daily shift log.
- The Process Eng will also keep any process changes in a log book.
- In the event of an **Alert Value** being exceeded the Shift Supervisor is to inform the Process Engineer and WWNP Superintendent and raise an incident in line with **GPM-EHS-020** – Incident and Action Management if required
- In the event the CRO cannot get in touch with the Shift Supervisor or Process Engineer they are to escalate the matter to the WWNP Superintendent In the event the WWNP is shut down for other reasons, the CRO is required to record the reason and action into the shift log, also send a notification by email with details to the Superintendent Utilities, WWNP Superintendent and Process Engineer.
- In the event of a **Licence Breach,** the CRO is to shutdown WWNP immediately. An incident will be raised in line with **GPM-EHS-020**, communication is to be recorded in the shift log also **FRM-EHS-024** must be filled out. The Shift Supervisor is to contact the WWNP Superintendent, who will then contact the Environmental team.
- In order to operate outside the TARP ERP-CCR-001 the manager of closure will make the final approval for any deviations..

Intervention Level actions in the event of authentic contamination to S001 flow chart